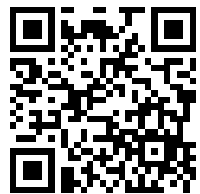


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**HISTORY OF  
THE SECOND WORLD WAR  
UNITED KINGDOM MEDICAL SERIES**

**Editor-in-Chief**

**SIR ARTHUR S. MACNALTY, K.C.B., M.A., M.D., F.R.C.P., F.R.C.S.**



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## FOREWORD

BY THE EDITOR-IN-CHIEF

**T**HIS THIRD VOLUME completes the history of the Royal Air Force Medical Services in the Official Medical History of the Second World War (United Kingdom Medical Series). It is devoted to the campaigns in which the Royal Air Force played a vital and important part. Equally too, the organisation, skill and efficiency of the Royal Air Force Medical Services made its contribution to ultimate victory. Many and varied were the responsibilities of the medical branch. As the previous two volumes showed in dealing with Administration and Commands, the branch expanded from a small one to an organisation whose members served in every quarter of the globe. They faced new diseases and new conditions. They served in the Arctic Circle and under the torrid suns of Africa and India. The medical officers displayed efficiency and resource in adapting themselves to new phases of environment and aerial warfare. They kept ever in mind the objects of their calling, the prevention of disease, the maintenance of health and the skilled treatment of casualties and disease.

They had many difficulties to contend with. Many mistakes were made. There were sins of omission as well of commission. All these the Editor has faithfully recorded. But this History reveals that the triumphs of medical knowledge and achievement outweighed the handicaps, and teaches the lesson that an efficiently organised medical service is a vital factor in the success of a campaign. The chapters on France and Belgium 1939-40, Norway 1940, Greece and Crete 1940-1 impress upon the reader that the medical services were equally resourceful and valuable in defeat and retreat.

This is the first medical history of the Royal Air Force Medical Services. Its completion and setting forth reflects great credit upon the Editor, Squadron Leader S. C. Rexford-Welch. He has kept in touch throughout with my colleagues and myself in the Central Offices of the Official Medical History, and I would express our thanks to him for his cordial co-operation in our editorial work.

I am also indebted to successive Directors-General of the Royal Air Force Medical Services since 1941 for their help and support in the editorial work of the Official Medical History.

This volume of the Official Medical History of the War has been prepared under the direction of an Editorial Board appointed by Her Majesty's Government, but the Editor alone is responsible for the method of presentation of the facts and the opinions expressed.

1956

ARTHUR S. MACNALT Y



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## ABBREVIATIONS

A.A.S.F.	. .	Advanced Air Striking Force
A.C.	. .	Aircraftman <i>or</i> Army Co-operation
A.C.D.	. .	Airmen's Convalescent Depot
A.C.F.F.	. .	Air Component of the Field Force
A.C.H./G.D.	. .	Aircrafthand, General Duties
A.C.S.E.A.	. .	Air Command, South-East Asia
A.D.G.B.	. .	Air Defence of Great Britain
A.D.H.(Mal.)	. .	Assistant Director of Hygiene (Malaria)
A.D.M.S.	. .	Assistant Director of Medical Services
A.D.R.U.	. .	Aircraft Despatch and Reception Unit
A.D.S.	. .	Advanced Dressing Station
A.L.C.	. .	Armoured Landing Craft
A.M.C.U.	. .	Anti-malaria Control Unit
A.M.E.S.	. .	Air Ministry Experimental Station
A.M.G.O.T.	. .	Allied Military Government of Occupied Territories
A.M.W.D.	. .	Air Ministry Works Directorate
A.O.A.	. .	Air Officer in charge of Administration
A.O.C.	. .	Air Officer Commanding
A.O.C. in C.	. .	Air Officer Commanding-in-Chief
A.O.P.	. .	Air Observation Post
A.P.	. .	Air Publication
A.R.E.U.	. .	Air Reception and Evacuation Unit
A.S.C.	. .	Air Supply Control
A.T.C.C.	. .	Air Transport Control Centre
B.	. .	Bomber
B.A.F.	. .	Balkan Air Force
B.A.F.F.	. .	British Air Forces in France
B.A.F.S.E.A.	. .	British Air Forces, South-East Asia
B.E.F.	. .	British Expeditionary Force
B.G.H.	. .	British General Hospital (Army)
B.M.H.	. .	British Military Hospital
B.N.A.F.	. .	British North African Forces
B.P.D.	. .	Base Personnel Depot
B.R.C.S.	. .	British Red Cross Society
C.A.E.	. .	Casualty Air Evacuation
C.A.E.C.	. .	Casualty Air Evacuation Centre
C.A.E.U.	. .	Casualty Air Evacuation Unit



## ABBREVIATIONS

C.C.S.	Casualty Clearing Station
C.E.P.	Casualty Evacuation Post
C.M.B.	Command Medical Board
C.M.F.	Central Mediterranean Forces
C.N.S.	Central Nervous System
C.O.	Commanding Officer
C.R.E.	Civilian Resident Engineer
D.A.D.H.(Mal.)	Deputy Assistant Director of Hygiene (Malaria)
D.A.D.M.S.	Deputy Assistant Director of Medical Services
D.A.F.	Desert Air Force
D.D.M.S.	Deputy Director of Medical Services
D.D.T.	Dichloro-diphenyl-trichlorethane
D.G.M.S.	Director-General of Medical Services
D.I.D.	Detail Issue Depot
D.M.S.	Director of Medical Services
D.P.M.O.	Deputy Principal Medical Officer
D.P.M.O.(F.)	Deputy Principal Medical Officer (Flying)
D.P.M.O.(H.)	Deputy Principal Medical Officer (Hygiene)
D.P.M.O.(Mal.)	Deputy Principal Medical Officer (Malaria)
D.R.	Despatch Rider
D.S.M.O.	Deputy Senior Medical Officer
E.A.C.	Eastern Air Command
E.C.D.	Electrolytically controlled dosing
E.M.S.	Emergency Medical Services
E.P.I.P.	European Privates, Indian Pattern (tent)
E.T.	Early Treatment
E.T.A.	Estimated time of arrival
E.T. Room	Early Treatment Room
F.	Fighter <i>or</i> Form
Fd. Amb.	Field Ambulance
F.F.I.	Free from infection
F/L	Flight Lieutenant
F/O	Flying Officer
F.P.M.O.	Flying Personnel Medical Officer
F.P.R.C.	Flying Personnel Research Committee
F/S	Flight Sergeant
G/C	Group Captain
G.C.C.	Group Control Centre
G.D.	General Duties
G.H.Q.	General Headquarters
G.H.Q.(I.)	General Headquarters (India)

## ABBREVIATIONS

xxi

i/c	.	.	in charge
I.G.H.	.	.	Indian General Hospital
I.M.S.	.	.	Indian Medical Service
I.O.C.	.	.	India Oxygen Company
L.C.T.	.	.	Landing Craft, Tank
L.S.T.	.	.	Landing Ship, Tank
M.A.A.F.	.	.	Mediterranean Allied Air Force
M.A.C.	.	.	Motor Ambulance Convoy
M.A.T.A.F.	.	.	Mediterranean Allied Tactical Air Force
M.C.U.	.	.	Malaria Control Unit
M.E.	.	.	Middle East
M.E.S.	.	.	Military Engineers Service
M.F.H.	.	.	Mobile Field Hospital
M.I. Room	.	.	Medical Inspection Room
M.O.	.	.	Medical Officer
M.O.H.	.	.	Medical Officer of Health
M.R.S.	.	.	Medical Receiving Station
M.T.	.	.	Mechanical Transport
M.T.E. and D.	.	.	Medical Training Establishment and Depot
M.U.	.	.	Maintenance Unit
N.A.A.F.	.	.	North West African Air Force (from 21/7/43)
N.A.A.F.I.	.	.	Navy, Army and Air Force Institutes
N.A.T.A.F.	.	.	North West African Tactical Air Force
N.C.O.	.	.	Non-commissioned officer
N.W.A.A.F.	.	.	North West African Air Force (17/2/43-20/7/43)
N.W.A.T.A.F.	.	.	North West African Tactical Air Force
N.W.E.F.	.	.	North Western Expeditionary Force (Norway)
P.A.C.	.	.	Prophylactic Ablution Centre
P.D.C.	.	.	Personnel Despatch Centre
P.M.O.	.	.	Principal Medical Officer
P.M.R.A.F.N.S.	.	.	Princess Mary's Royal Air Force Nursing Service
P.S.P.	.	.	Prefabricated Steel Planks
'P' Staff	.	.	Personnel Staff
P.U.O.	.	.	Pyrexia of unknown origin
P.W.D.	.	.	Public Works Department
Q.A.I.M.N.S.	.	.	Queen Alexandra's Imperial Military Nursing Service
'Q' Branch	.	.	Quartermaster General's Branch
Q.M.G.	.	.	Quartermaster General

*ABBREVIATIONS*

R.A.M.C. .	. Royal Army Medical Corps
R.A.O.C. .	. Royal Army Observer Corps
R.A.S.C. .	. Royal Army Service Corps
R.C.A.F. .	. Royal Canadian Air Force
R.E. .	. Royal Engineer
R.H.A.F. .	. Royal Hellenic Air Force
R.I.A.S.C.	. Royal Indian Army Service Corps
R.T. .	. Radio Telephony
R.T.O. .	. Railway Transport Officer
S.A.A.F. .	. South African Air Force
S.E.A.C. .	. South East Asia Command
S/L .	. Squadron Leader
S.M.O. .	. Senior Medical Officer
S.N.C.O. .	. Senior non-commissioned officer
S.S.Q. .	. Station Sick Quarters
S.T.C. .	. Special Treatment Centre
U.N.R.R.A.	. United Nations Relief and Rehabilitation Administration
U.S.A.A.C.	. United States Army Air Corps
U.S.A.A.F.	. United States Army Air Force
V.D. .	. Venereal Disease
W/C .	. Wing Commander
W/T .	. Wireless Telegraphy
Z.I, etc. .	. Scales of Medical Equipment (see Vol. I, p. 432 ff.)

## PREFACE

**T**HIS IS THE THIRD and final Royal Air Force volume in the United Kingdom Medical History Series and deals with the major campaigns in which the Royal Air Force was actively engaged during the Second World War. Although entitled 'Campaigns', it aims not so much at describing the course of the actions as at surveying critically the efforts made by the medical forces to assist their combatant counterparts both in triumph and adversity.

In the eleven campaigns described, ranging geographically from the Arctic Circle to the Equator, will be found a steady tide of medical achievement which, although at a low ebb in the initial campaigns, such as those in Norway and France, rose to great heights in the final stages of the Allied victories. Praise and condemnation, it is hoped, have been fairly apportioned, and such lessons as have been learned have been set forth in order that subsequent generations of R.A.F. medical officers might profit from them.

Of necessity, campaigns usually involved living in field conditions and placed a very high premium on preventive medicine for the doctor and elementary health safeguards for the executive officer. This volume reveals the serious discrepancy which existed between theory and practice in the preparation of units for service abroad. Lectures, elaborate training exercises and specially written pamphlets should have been an adequate means of instructing personnel about to be posted overseas, and yet in the field it was often found that even the minimum standards of hygiene were neither understood nor observed. This was due, as will be seen throughout these chapters, to many causes, but chiefly to the failure of those in authority to appreciate the value of instruction in elementary field hygiene, and the refusal to accept or to put into practice such training as had been received.

A study of any of the tables relating to malaria and dysentery will show that the man-hour losses from these two diseases were formidable, especially when it is remembered that they were in a large measure preventable. The dramatic effect of the impact of anti-larval measures, D.D.T. and mepacrine on malaria and of protection of food and water supplies and sulphonamide therapy on dysentery is well illustrated by the improved figures in West Africa and the Far East after their introduction, and must be considered one of the major factors in our victories.

Every medical officer had to be instantly ready to deal with any kind of eventuality, surgical or medical, but 'heroics' comprised only a fraction of the work encountered; such common complaints as colds, aural and skin infections, 'tummy upsets', hernias and varicose veins occurred with the same frequency as in peace-time. This fact, which is borne out by the records of many of the Mobile Field Hospitals, largely dictated medical policy with regard to the disposal of patients to ensure the smallest possible loss of man-hours.

The eleven chapters making up this volume have been arranged in chronological order, but they may also be grouped to represent three distinct phases of the medical story. Firstly, the campaigns in France, Norway, Greece and Crete find the medical services battling against great odds, when low standards had perforce to be accepted and little concrete advance was made either in methods of treatment or the preservation of health in the field. The second phase is typified by the Western Desert fighting, in which great strides in practical Service medicine were made—the introduction of casualty air evacuation and the rôle and function of Mobile Field Hospitals in close support of forward air striking forces being two obvious and important examples—while the North Russia and West Africa narratives illustrate the medical difficulties of setting up supply bases in two very different climates with their individual problems. The final phase, covering the triumph of the Allies in Italy, N.W. Europe and the Far East, demonstrates the practical application of knowledge accumulated from the earlier phases; commanders demanded Mobile Field Hospital support in the forward areas, insisted on vast casualty air evacuation provision and considered such things as dental and ophthalmic forward units as commonplace. This tremendous contrast with the position in 1939 and 1940 is perhaps sufficient vindication for the production of a medical history as a means of recording, in a permanent form, the advances made in medical organisation as well as medical science through the war years.

It only remains for me, as editor, to take this opportunity of thanking most sincerely all those, medical and non-medical, who have given so freely of their time and skill in preparing, often many years after the events described, the drafts from which these volumes have been written. I am particularly indebted to the past Editors of this History, through whose diligence much of the material for these chapters was already available; to Group Captain L. E. A. Dearberg, Air Commodore G. A. M. Knight and Group Captain W. P. Stamm for assistance with the detail of the Middle East Campaign, Malta and West Africa; and

finally to the medical officers who produced narratives for the last four chapters in the Volume—Group Captain H. C. S. Pimblett and Wing Commander W. O. Davies (Italy and Lampedusa), Wing Commander J. St. C. Polson (Return to Greece), Group Captain J. F. Sandow (The Liberation of Europe) and Wing Commander J. M. Urquhart (India and the Far East). Without such assistance the production of a Royal Air Force Medical History of this kind would have been impossible.

S. C. REXFORD-WELCH

The Medical Directorate,  
Air Ministry, London.  
1956.



# CHAPTER I

## FRANCE AND BELGIUM

### 1939-1940

#### INTRODUCTION

**I**N THIS MEDICAL NARRATIVE of the 1939-40 French campaign, a limited amount of operational history has necessarily been included to give the story perspective and to demonstrate how changes in policy and tactics influenced medical organisation and administration.

The campaign merits close study as it provided valuable experience of modern warfare and influenced future medical policy. It was the first major campaign of the Royal Air Force, in which not only were the air forces on the Continent involved but also the whole strength of Bomber Command and major portions of both Fighter and Coastal Commands.

The narrative has been dealt with under six main headings:

- (i) Planning;
- (ii) Mobilisation and establishments (including the move to the Continent);
- (iii) General medical arrangements in France, September 3, 1939 to May 9, 1940;
- (iv) Medical organisation and administration;
- (v) Withdrawal from France, May 10 to June 17, 1940;
- (vi) Medical statistics.

#### PLANNING

##### GENERAL

The plans made before the war for the employment of the Royal Air Force in France provided for the dispatch from Great Britain of two air formations which were to carry out operations, and two air missions which were to co-ordinate higher policy with the French Command. The two air formations were the Air Component of the Field Force (A.C.F.F.), subsequently known as the Royal Air Force Component, British Expeditionary Force, and the Advanced Air Striking Force.

The A.C.F.F. was a mixed force consisting originally of fighter, army co-operation and bomber reconnaissance squadrons. Its rôle was to carry out reconnaissance and provide fighter protection for the British Expeditionary Force (B.E.F.) and its operational control was wholly the responsibility of the Commander-in-Chief, B.E.F., to whom the Air Officer Commanding was to act as chief adviser on air



operations. It was designed as a highly mobile force, for it was to operate with the Army and move with it at short notice.

The Advanced Air Striking Force (A.A.S.F.) was originally intended to consist of two echelons of bomber squadrons, the first equipped with Fairey Battle aircraft from No. 1 Group, Bomber Command, and the second with Blenheim aircraft from No. 2 Group, Bomber Command. The Force was planned to carry out raids over Germany, particularly the Ruhr, from well-established bases in the Rheims area. It was, in fact, an extension of Bomber Command and was controlled operationally by the Air Officer Commanding (A.O.C.) A.A.S.F., who was himself under the direction of the Air Officer Commanding-in-Chief (A.O.C. in C.), Bomber Command. There were no fighter squadrons in the Force as originally composed; fighter defence was to be provided by the French, but subsequent events showed that they were unable to provide either the necessary airfield defence or escort for bomber aircraft.

The A.A.S.F. differed from the A.C.F.F. in two respects. Firstly, as its main airfields were to be covered by the Maginot Line it was not planned to operate on a mobile basis and secondly, its administrative responsibilities were to be greater than those of the A.C.F.F. Many of the requirements, including signals, were to be provided by the Army for both Forces, but whereas the A.C.F.F., in the B.E.F. area, would be able to share the Army services and to use Army lines of communication, the A.A.S.F., in the French area, would have to organise and maintain some of its own rearward services and lines of communication and be responsible for the detachments provided by the Army to maintain the rest of the services required.

It was proposed that operational control at unit level on the Continent should be based on the system used at home, where two squadrons and a station headquarters were established on each main airfield. On mobilisation each station headquarters was to become a wing headquarters and move with its two squadrons to operate on the Continent as a self-contained unit.

#### MEDICAL

A staff exercise was held at Uxbridge in 1934 at which was considered the possibility of an air force operating independently, when such a force would have to maintain itself in the field without the assistance of the Army administrative services which would support a R.A.F. Expeditionary Force Contingent. Normally, the Army provided a large part of the medical field organisation and the Royal Air Force, if it was to operate by itself, would have to undertake many new responsibilities. It was directed, therefore, that a general plan should be made that would show, among other things, what medical services the R.A.F.

would require for the reception, treatment and evacuation of all types of casualties.

Estimates were to be made on the assumption that the R.A.F. Force would be 10,000 strong and would consist of headquarters units, twenty squadrons, an aircraft depot, three or four air stores parks, and the necessary administrative units. The Force was to be regarded as operating under continental conditions with well-organised bases and port facilities in Allied territory, but exposed to air attacks on a considerable scale. It was thought essential that units should be mobile and capable of rapid concentration. The strengths were to be made up of 640 flying personnel, consisting of 160 officers and 480 airmen, and 9,460 ground personnel. The wastage rate among aircrews was estimated at 30 per cent. per month, of which 60 per cent. would be killed or missing. The estimated total casualty rates per month of ground personnel were 2 per cent. battle and 9 per cent. non-battle casualties; of these casualties it was thought that 1 per cent. and 1.5 per cent. respectively would represent absolute wastage and would require replacement. Estimates were produced of the extra medical man-power thought to be necessary for such an expedition, excluding the medical personnel and equipment already established on units.

It was estimated that two Royal Air Force medical receiving stations of 30 beds, each capable of expanding to 40 by the use of stretchers, a motor ambulance convoy of 30 ambulances, two hospital trains of 50 cots each, a base hospital of 600 beds, a field hygiene section, a medical stores park and a dental centre would be needed. The proposed establishment was for a matron, 49 sisters, 37 medical officers and 299 other ranks, including several A.C.H./G.Ds. but no ambulance drivers or reinforcement personnel.

The pre-war organisation and establishment of the medical branch (*see* Volume I, Chapter 1) did not allow for such an expansion, but it was stated that certain reserves were available and that it would be possible to call up for service 9 retired officers, 40 officers of the Reserve of Air Force Officers and 200 medical airmen; the remainder of the personnel would have to be obtained by other means. The peace-time establishment of the P.M.R.A.F.N.S. did not permit the filling of the proposed hospital establishments and there were no available reserves on which to draw. Lastly, the provision of medical stores and equipment from R.A.F. sources alone was out of the question because the Medical Supply Depot at Kidbrooke (*see* Volume I, Chapter 8) was at that time too small for the task.

On receipt of this information, the Director of Organisation asked what expansion would be necessary to provide medical services for an air striking force on the Continent, in addition to the Royal Air Force medical provision already determined for a Royal Air Force contingent

working with the Army. Information was also requested on the requirements for developing adequate reserves to complete war establishments, for maintaining and expanding them after arrival on the Continent, and for providing enough senior medical officers with suitable staff experience. The problem of equipping such a Force was to be investigated on the assumption that it would be needed by April 1939.

It was thought that between 132 and 142 medical officers and between 663 and 693 medical airmen would be needed and it was stated that only 62 reserve and retired medical officers and 300 airmen would be available. The reserves of airmen available in April 1939 could not be forecast with any accuracy. The additional medical officers would be obtained either by increasing peace-time establishments or by the more economical method of forming new reserves. The only feasible method of obtaining the extra medical airmen was to form a reserve of men from the St. John Ambulance Brigade as the Naval Authorities had already done. No difficulty was expected in providing the necessary equipment and medical stores, if sufficient time was allowed for the expansion of the Medical Supply Depot and the collection and distribution of equipment. It was maintained, however, that once the Force was on the Continent the replenishment of medical stores would have to be undertaken by the Army.

On May 11, 1936, the Chief of Air Staff ordered immediate steps to be taken for the formation of the necessary medical reserves. The re-organisation of the various reserves took place in 1937, when the Medical Branch of the Royal Air Force Volunteer Reserve was formed.

Meanwhile, the War Organisation Committee investigated the problems of supply and maintenance of the R.A.F. on the Continent. Difficulties arose over determining the division of responsibility for the air forces between the R.A.F. and the Army;\* plans existed for the operation of the two Services together in all probable theatres of war, but no scheme of operations which would produce the independence of either the Army or the Air Force could be adopted. As far as France was concerned, the early formation by the Army of a base supply organisation for the R.A.F. might reduce the subsequent mobility of the fighting elements of the Expeditionary Force and tie them down to operating on the lines of communication developed for the Air Force. There was also a possibility that the R.A.F., though in the same theatre, might have to operate apart from the Expeditionary Force; this would entail the organisation of a second line of communication for which there would probably not be sufficient men.

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\* A discussion of the problems is beyond the scope of this narrative; they are mentioned here because medical organisation within air forces depended upon the organisation of the Air Force as a whole.

However, on the assumption that the Royal Air Force would be responsible for the medical requirements of the A.A.S.F. forward of railhead, and that the A.C.F.F. would be catered for as laid down in previous plans, the re-organisation of the proposed medical force proceeded. Establishments and scales of equipment were drawn up and some modifications were made in the organisation, administration, and proposed use of the two medical receiving stations.

It was agreed in January 1937 that the Army should supply a casualty clearing station for the A.A.S.F. and in the autumn the division of medical responsibility between the Army and the Royal Air Force was finally determined. It was agreed that the Army would provide full medical facilities for the A.C.F.F., except unit medical services which were to be supplied by the Royal Air Force, and a casualty clearing station (4 C.C.S.), a motor ambulance convoy (3 M.A.C.), a mobile field bacteriological laboratory and a field hygiene section for the A.A.S.F. The Royal Air Force would be responsible for unit medical services and the provision of the equivalent of a field ambulance convoy to serve units of the A.A.S.F. in the area forward of the two medical receiving stations. To provide these services, medical personnel and equipment, ambulances and motor transport fitted with Flint stretcher gear were to be established on a wing basis of two squadrons per wing.

#### MOBILISATION AND ESTABLISHMENTS

##### ADVANCED AIR STRIKING FORCE

*General.* Mobilisation began before war was declared. Headquarters, No. 1 Bomber Group of the A.A.S.F. was formed at Abingdon\* and its units mobilised under Bomber Command authority at various stations within the Command. The mobilisation of the second bomber group, which was to follow the first to the Continent, was not completed, and Headquarters, No. 1 Group, became Headquarters, A.A.S.F.†

The aircraft of the advanced parties of No. 1 Group moved by air to their war stations in the Rheims district on September 2, 1939 and the Group was ready to operate at reduced effort the next day—when war was declared. The arrival of the last of the rail parties on the 20th and the road parties on the 29th completed the transfer of the Force.

The auxiliary units which accompanied the Force to France were No. 1 Medical Receiving Station and Nos. 4 and 5 Air Stores Parks. No. 2 Medical Receiving Station and No. 6 Air Stores Park which

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\* No. 1 Bomber Group, A.A.S.F., was formed from No. 1 Group, Bomber Command.

† See General Medical Arrangements in France, September 3, 1939 to May 9, 1940—Changes of Policy (page 15).

were to have gone to France with the second bomber group were sent to reinforce the first group in October.

*Medical.* Medical establishments are shown in the following table; except for the Principal Medical Officer and his staff, medical personnel moved to France with their units.

Unit	Medical Officers						Medical Airmen				
	G/C.	W/C.	S/L.	Major	F/L. or F/O.	Totals	F/S.	Sgt.	Cpl.	A.C.	Totals
H.Q.A.A.S.F.	1 P.M.O.	1 D.P.M.O.*	1	1 D.A.D.M.S.	—	4	1	4	3	1	9
H.Q. Group	—	—	—	—	1	1	—	—	1	4	5
H.Q. Wing with 2 Sqdns.	—	—	—	—	2	2	—	1	2	6	9
Medical Receiving Station	—	1	1	—	4†	6	1	1	6	15‡	23
Aircraft Depot	—	—	1	—	1	2	—	1	2	7	10
Air Stores Park	—	—	—	—	1	1	—	—	1	4	5
Base area servicing flight	—	—	1	—	1	2	—	—	1	2	3
Fighter Sqdn.	—	—	—	—	1	1	—	—	1	6	7

\* Later D.P.M.O. (H.).

† 1 quartermaster, 1 dental officer.

‡ 1 corporal dental clerk orderly.

Each Bomber Echelon was to constitute a Group. Establishments were for each of the two Group Headquarters. The holding of the second Echelon in England made these establishments redundant as No. 1 Group Headquarters became Headquarters A.A.S.F.

#### AIR COMPONENT OF THE FIELD FORCE

*General.* The A.C.F.F. was formed mainly from No. 22 (Army Co-operation) Group, Fighter Command. Mobilisation began before war was declared and Headquarters, A.C.F.F. formed on August 25, at Farnborough, units of the Force being mobilised under Bomber and Fighter Command authority at stations within these commands.

Four squadrons flew to France at short notice on September 8 and 9, and operated as an independent wing for the first fortnight on the Continent. The advance party left on the 14th and in the next five days the remainder of the Force crossed to France, being followed by

their aircraft at the end of the month. The Headquarters Staff were established finally by the beginning of October, at Mareuil, near Arras.

*Medical.* Establishments were as shown below:

Unit	Medical Officers					Medical Airmen				
	G/C.	W/C.	S/L.	F/L. or F/O.	To- tals	F/S.	Sgt.	Cpl.	A.C.	To- tals
H.Q.A.C.F.F.	1 P.M.O.	1 D.P.M.O.	—	1	3	—	2	1	5	8
Wings with Headquarters and 2 Sqdns.	—	—	—	2	2	—	—	2	6	8
Fighter Sqdn.	—	—	—	—	—	—	—	1	6	7

Other Establishments      Similar to those tabulated for the A.A.S.F.

Medical personnel moved to France with their units and established aid posts, medical inspection and crash rooms on arrival. The independent wing, which flew to France on September 8 and 9, went without transport and the squadron medical officers took only such medical stores and equipment as they could themselves handle. The wing was therefore entirely dependent upon the French for the usual services and for the hospitalisation of patients.

#### PROBLEMS OF MOBILISATION

*Personnel.* Men on the Class E reserve\* who were called up passed on mobilisation through the Personnel Transit Centres, where they were medically examined to determine their fitness for service and 'kitted up'. Unfortunately, these early medical examinations were often very cursory and medical officers of the units to which the men were posted had to re-examine almost every individual after several had been found unfit for their duties. Many inoculations and vaccinations which had been overlooked had also to be carried out. The scarcity of information added to the difficulties because the forms recording the results of the medical examinations carried out at the transit centres did not arrive at units with the men, and Forms 64 which should have shown medical categories and inoculation states were seldom completed. It was necessary, therefore, to hold medical boards and re-categorise or invalid many of those who were found unfit for the duties of their trade. The depletion of the strengths of units by such examinations and boardings had to be made up by replacements through

\* The Reserve formed after the War of 1914-18.

Command channels; it was not surprising that there was difficulty in re-establishing units to their full complements during the rush of mobilisation.

A substantial proportion of the man-power of all units consisted of reservists who had neither received any training in the inter-war years in their trades, nor been re-mustered when they changed their trade in civil life. In consequence, many airmen were incapable of performing the duties of their trade on mobilisation; for instance, a sergeant wireless operator on the reserve had been a dental mechanic for fifteen years and knew next to nothing about radio equipment. Similarly, some reserve despatch riders and motor transport drivers who had not driven since the last war had been recalled for driving duties. Despite road instruction, for which time could ill be afforded, these drivers were so inexperienced that on the move to France cars had to be driven by officers, including medical officers, from the stations at which the units formed to their destinations in France and for some time afterwards until these drivers had received more instruction or had been replaced. This was not entirely an executive problem: some of the airmen were unfit medically for their duties and others faced with disagreeable tasks chose to 'escape' by way of the medical officer. However, even with this re-check of medical fitness for service on the Continent, many men had to be returned to the United Kingdom later when it was discovered that they were suffering from such diseases as carcinoma of the stomach, Korsakoff's syndrome, and bi-lateral inoperable hernia.

*Equipment.* The collection and distribution of general medical stores and equipment presented little difficulty, although anxiety was caused by the late delivery of such essential items as motor transport and water trailers, which in many instances had to be collected within a day of embarkation. There was little opportunity to check stores which arrived so late or to obtain replacements if needed. Many water trailers arrived without spares or chemicals and some medical officers had to purchase the latter locally at the port of embarkation.

#### MOVE TO FRANCE

The moves to France were accomplished without undue mishap and many units reached their destinations without incident, though others were less fortunate. Some took very much longer than others to travel similar distances by road and on occasion main parties arrived before the advance parties which had left a few days earlier. There was little sickness on the move, which was fortunate because facilities for more than first-aid treatment were meagre. On the arrival of units at their destinations the pre-war arrangements made for their siting often had to be altered.

A description of the move of one of the units to its base in France illustrates nearly all the difficulties and mistakes experienced to a lesser extent by other units. The advance party, some 150 strong, left by road with the motor transport on September 18, 1939, with a medical officer and a corporal nursing orderly. Their medical equipment consisted of a surgical and a field dressing haversack, both loaned by Henlow sick quarters, some M. & B. 693 tablets, some T.A.B. vaccine and a small supply of water purification tablets.

On September 23, the main party embarked at Southampton, arriving at Cherbourg the following day. Nantes was reached by train on the 25th and the party proceeded to the main airfield at Nantes which was their destination.

The only available medical equipment for the main party during the trip to France was a field medical pannier and some shell dressings, and even these would not have been available had they not been borrowed from Henlow sick quarters, for the full scale of equipment (Z.1 of A.P.132)\* was not available until they reached their destination. The party reached the airfield they were to occupy, to find that the advance party had not yet arrived, so that they were without tents, water trailers, water testing materials, medical and other major equipment. On further examination it was found that the site which had been allotted for the tented camp in the secret plans was a vineyard in full harvest; similarly, the sick quarters earmarked on the plans was unusable. Fortunately, it was discovered that the water pipe line running to a concrete mixer in one of the hangars was tapped from the municipal supply and this source was used until other lines were laid. There were no latrines and no spades with which to dig deep trenches, so as a temporary measure shallow trench latrines were prepared with borrowed equipment. There were no cookers or cooking facilities but a French squadron was able to lend one mobile field kitchen which, fired with scrub wood, was used to prepare the meals of the depot. Everyone lived on stew.

After four days the advance party arrived with the full equipment and re-organisation of the depot began. A tented camp was pitched in an orchard pending the transfer of the men into huts, which were not erected nor fit for occupation until about mid-January. The water trailers were found to be unserviceable on arrival, but they were used as water carts by filling them from the mains and not using the purification plant. There was no information about the position of other R.A.F. units, though in a few days contact was made with neighbouring units, both R.A.F. and Army. It was not until a fortnight after arrival that contact was established with the Principal Medical Officer, A.A.S.F.

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\* See R.A.F. Volume I, Chapter 8, page 432.



## MEDICAL RECEIVING STATIONS

*Development.* The Medical Receiving Station (M.R.S.) was a small mobile field hospital peculiar to the R.A.F.\* It was created in various forms from time to time when a small hospital was needed to treat R.A.F. casualties and sick in circumstances where hospital treatment could not be provided by the Army. Such a unit was used in the 'Z' expedition in Somaliland in 1919-20, when the need became apparent, but it was not until much later that the forerunner of the M.R.S. as constituted for the French campaign was developed.

In 1932, at an Air Staff exercise in Singapore, the set conditions postulated circumstances in which no Army medical units would be available to treat air force casualties. A small mobile field medical unit was planned with its personnel and equipment transportable by air and its size determined by the number of patients which could be accommodated in a hospital marquee tent. It was soon found that the effectiveness of such a unit would be small because the payload of aircraft of that date limited the amount of equipment which could be carried. The idea of air transport had therefore to be abandoned and plans were made for a larger unit capable of holding between 30 and 40 patients on the lines of communication for a week if they were likely to be fit to return to their units in that time, or evacuating them to a base hospital after preliminary treatment.

The opportunity for putting these plans into practice arose in 1935 during the Abyssinian crisis. The size and equipment of the redesigned unit were based to some extent on those for an Army casualty clearing station. Two units were formed, one in the Sudan and the other at Mersa Matruh in the Western Desert. The establishment comprised 4 medical officers and 26 airmen, with sufficient equipment for an operating theatre and 25 hospital beds. The unit had one ambulance and other transport was provided by an air stores park nearby. Evacuation of patients was carried out by train to railhead 70 miles distant, by sea and occasionally by air in Vickers Virginia aircraft. The expected hostilities did not occur and both units were disbanded. The lessons learnt were that the units were immobile from lack of transport and that the equipment was too heavy and unwieldy.

When plans were made in 1936 for the employment of two medical receiving stations on the Continent the scales of equipment were amended and it was decided to make the unit self-sufficient administratively, to provide it with more transport for unit use, and attach to it a motor ambulance convoy to collect and transfer patients. Additional transport for Service use was to be obtained from air stores parks as before.

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\* See R.A.F. Volume I, Chapter 5, page 265.

*No. 1 Medical Receiving Station.* No. 1 M.R.S. was formed in the United Kingdom some months before the outbreak of war and underwent several test mobilisations. The last practice mobilisation was held at Harwell in July 1939, when the unit was visited by many medical officers. During this exercise several suggestions were made to improve the equipment and some had been authorised, but war was declared and the unit moved to France before they could all be put into effect.

The establishment consisted of 5 medical officers, a dental officer, an officer quartermaster and 69 airmen. Additional motor transport drivers were provided for the move to France. Transport consisted of 8 prime movers, 5 ambulances, 2 three-ton tenders and one van; 2 motor cycles and a staff car were provided later. Initial equipment and stores were issued to scale Z.4(b) of A.P.132.\*

The unit mobilised on August 25, 1939 at Halton and a survey of the stores and equipment was made. The Z.4(b) equipment, particularly in its medical content, had to be supplemented by purchase from local chemists. The surgical equipment was also regarded as not entirely adequate and supplementary supplies were obtained from Kidbrooke before the M.R.S. embarked. No portable X-ray set was included. It was soon found that the packing of medical stores was unsatisfactory, as reliance had to be placed on ordinary wooden packing cases.

On September 9, a convoy of 2 officers and 24 airmen left Halton and an advance party consisting of a squadron leader and one airman flew the next day to Rheims, which was reached early in the afternoon. Another party of 3 officers and 44 airmen made their way to Rheims by land and sea, reaching it on September 14, and proceeded to the village of Prosnes, 12 miles east of Rheims. Rations were supplied partly from railhead stores and partly from No. 4 Air Stores Park at Ludes, 15 miles away. Communication with Headquarters, A.A.S.F., at Mareuil-sur-Ay was made twice daily by charabanc.

The quartermaster, with a party of 22 airmen, took the transport to Avonmouth for embarkation. The road conditions were difficult because many Army convoys were travelling the same way. Although the Royal Air Force party arrived well before time they had to await a ship with a sufficiently powerful derrick to hoist the heavy vehicles aboard and it was not until four days later, September 12, that vehicles were shipped and the party embarked. On arrival at St. Nazaire unloading was carried out by the airmen; 50 Army vehicles had to be moved before the M.R.S. transport could be released. A mixed convoy, Army and Royal Air Force, moved off for Rheims the same day in groups of 45 vehicles. Differences of opinion about the distance to be travelled each day, insufficient French money and the absence of an interpreter made the

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\* See R.A.F. Volume I, Chapter 8, page 434.

journey difficult. The route was not marked out and arrangements for petrol replenishment were poor. Eventually, with the assistance for the last 30 kilometres of a staff officer from H.Q., A.A.S.F., the transport reached the M.R.S. site on September 23.

On September 24, tentage was erected on a new site because the planned location proved to be the bed of a stream. Buildings in the village of Prosnes were taken over for use (Fig. 1). Contact runs were made with the Royal Air Force wings at Rheims, Berry-au-Bac, Auberive, Bétheniville, and Challange. The M.R.S. opened on September 25, receiving its first ten patients on that date. The dental surgery opened the next day.

*No. 2 Medical Receiving Station.* Mobilisation of No. 2 M.R.S. began at Halton on September 15, 1939, when 5 officers and 51 airmen were posted to the unit. The remainder of the personnel arrived the next day and inoculation and kit inspection began at once. Five ambulances and one three-ton lorry with trailer were collected from Norwich on the 18th and a party was sent to Carlisle to fetch three other prime movers with trailers five days later. None of the ambulances was equipped to scale and there were other deficiencies in the equipment of the trailers, such as covers, spare wheels, and chemicals for the water trailer.

On September 30, the road party consisting of 2 officers and 32 airmen left for Avonmouth. The next morning they were taken to the docks where they had to split into two sections because their transport was to be loaded on to two boats. Loading began later in the afternoon and continued for the whole of the next day, the men assisting in the work. Accommodation at night was provided at a nearby Army rest camp. On the second day it was found that five vehicles, including the water trailer, were not on board and it was at first proposed that these should follow in the next convoy five days later. However, the loading was completed and transport and troops sailed on October 2, the men being embarked on a passenger boat with a large number of Army troops. The crossing was rough and many were seasick. Disembarkation was effected at St. Nazaire two days later.

On arrival at the port, accommodation for the men was found in a shed at the docks and the officers were billeted in hotels under Army arrangements. There was a two-day wait while the transport was disembarked and it was not until October 6, that the convoy assembled in the marshalling yards at Savanay ready for the road journey to Mareuil-sur-Ay.

In the meantime the rail party, consisting of 4 officers and 44 airmen, had moved to Henlow for entraining and reached Southampton on the afternoon of October 5. The party embarked the same evening taking four days' rations with them. Cherbourg was reached on the morning

of the 6th after a rough and overcrowded crossing. On disembarkation the party was taken to a transit camp at the port, but no food was issued by the R.A.S.C. because they were unable to provide rations without 48 hours' notice. Cherbourg was left on the evening of the 9th and the journey to Epernay was broken at Batignelles where beds and a meal were provided. Vertus was reached the next evening.

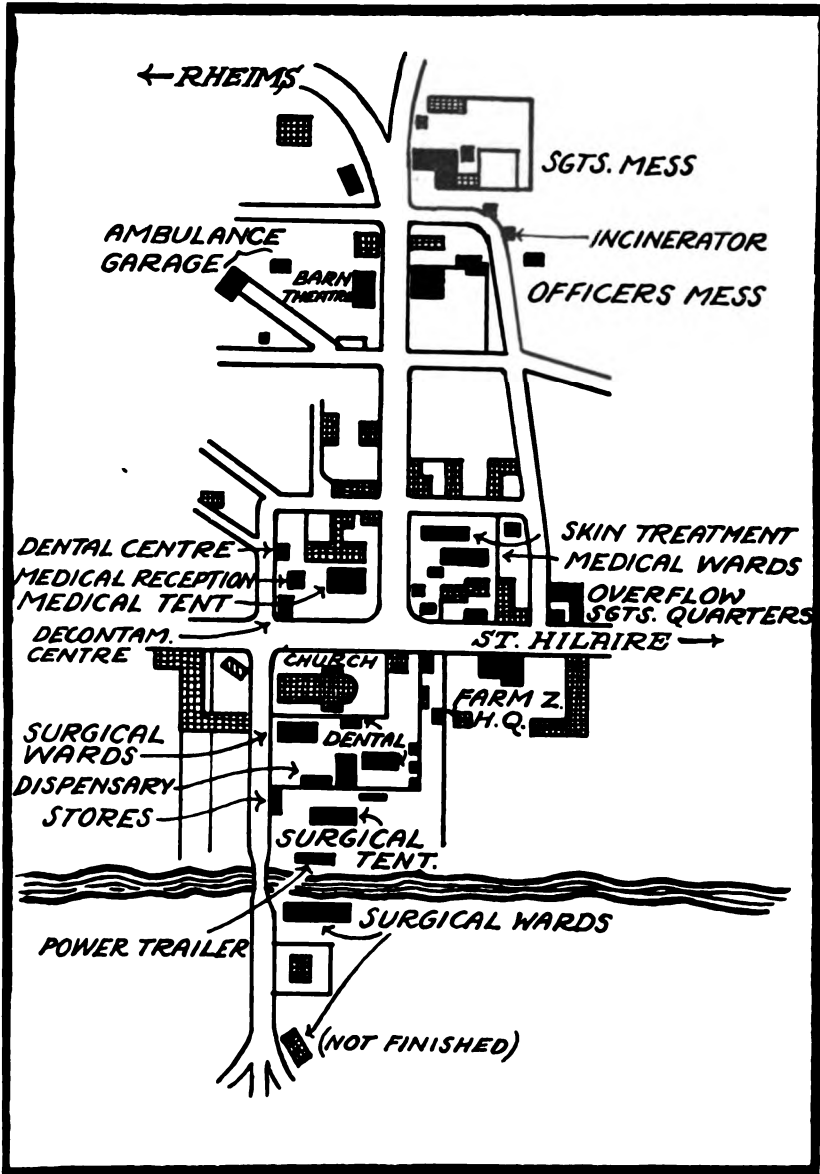


FIG. 1. Plan of No. 1 M.R.S. at Prosnès.

By this time the road party with the transport had finished their three-day journey and were parked at Vertus. This convoy had experienced difficulty in finding the route and obtaining petrol for the journey. Rations had been supplemented with food bought on the way, and meals were provided by the cooking trailer. On October 12, the unit

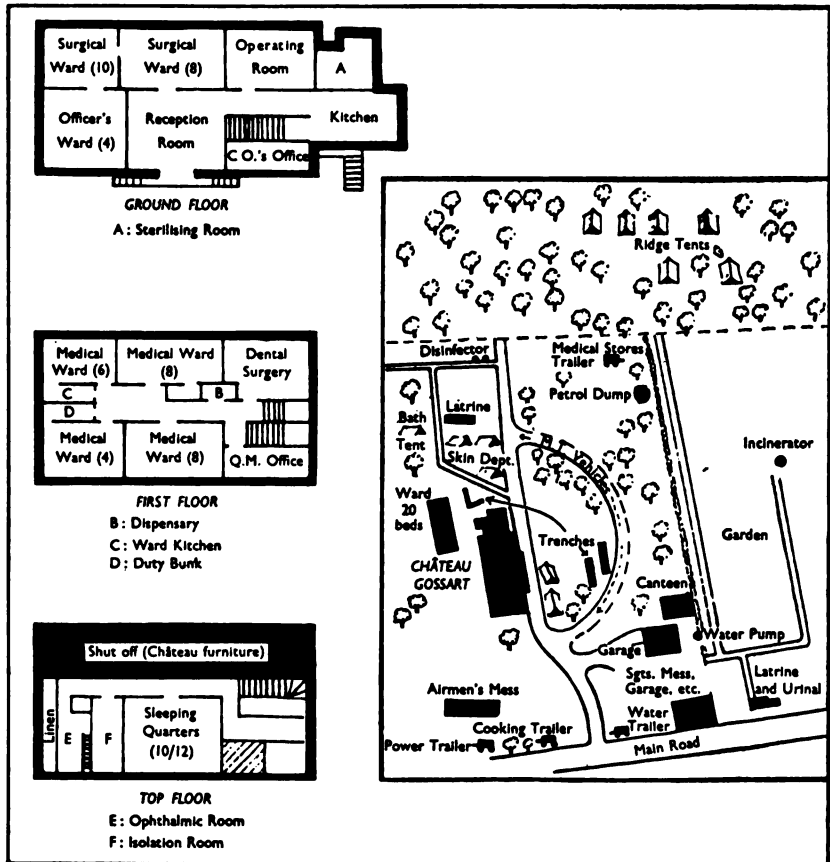


FIG. 2. Plan of No. 2 M.R.S., Château Gossart.

assembled and a search was made for a more suitable site, the pre-arranged one being unsatisfactory because the ground would not support the weight of the vehicles. Château Gossart at Mareuil-sur-Ay was chosen (Fig. 2). Two extra motor vehicles were collected on the 19th to complete establishment and the movement of stores from Vertus was completed by November 2.

The château provided accommodation for offices, an operating theatre, two surgical wards and a kitchen on the ground floor, medical

wards on the first floor and stores and sleeping quarters on the top floor and in the basement respectively. Officers were accommodated in the village, and the airmen used the château lodge, stables and one room in the château itself. The M.R.S. opened with 10 beds and 30 stretchers on November 6 and admitted 7 patients the same day.

#### GENERAL MEDICAL ARRANGEMENTS IN FRANCE SEPTEMBER 3, 1939—MAY 9, 1940

Arrangements had been made before the war for the French to provide most of the services needed on arrival on the Continent, including hospital accommodation and treatment until the medical organisation was established. In the A.C.F.F. patients were taken to the nearest French civilian hospital, but, because units were so widely dispersed, no particular hospitals were chosen in the towns close to the units concerned.

In the A.A.S.F. it was possible to centralise hospital treatment. In Rheims, the Maison Blanche hospital provided excellent facilities for all medical and surgical in-patients, while those with infectious diseases or requiring isolation were sent to the Maison de Retraite hospital. Suspected cases of venereal disease were admitted to a girls' school which had been converted by the French authorities into a special hospital. After the medical receiving stations had opened in the A.A.S.F., casualties were transferred to them from units for further treatment and thence to 4 C.C.S. if necessary. Patients who needed prolonged treatment or ultimate evacuation were transferred by train from 4 C.C.S. to 4 British General Hospital at La Baule, west of Nantes. Arrangements for ambulance trains were made through the D.M.S., B.E.F., but if only a small number of patients were to be transferred, a diesel hospital coach was used or attached to a train and provided a satisfactory means of transportation.

Small units such as servicing and signals units had no establishment for a medical officer, but were provided with medical orderlies and suitable medical equipment. Sick parades for these units were held by British or French medical officers according to their availability; patients requiring hospital treatment were admitted to the nearest French civilian hospital.

#### CHANGES OF POLICY

The destruction by air attack of the Polish Air Force on the ground during the first 48 hours of the invasion of Poland dictated an entire change of policy in France. It became essential to disperse the flying strengths where possible, and in consequence most of the other elements, of the forces on the Continent. This change in policy affected the

A.A.S.F. more than the A.C.F.F. and was partly responsible for the holding of the second bomber group in England.

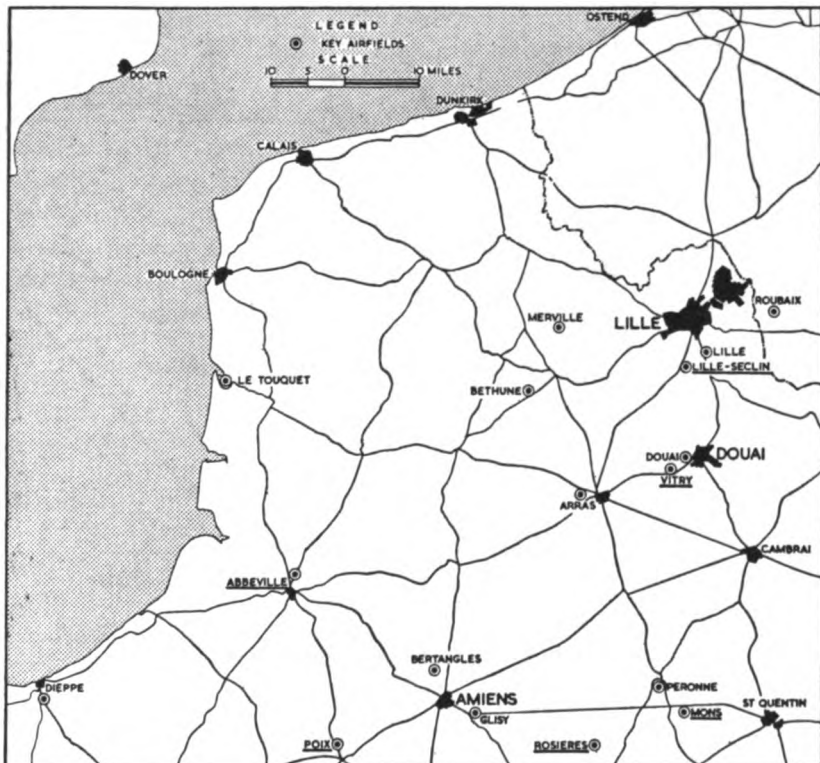
The airfields which the French had allotted to the two air formations before the war were occupied by the R.A.F. on their arrival in France. Other airfields became available from time to time, but their availability did not affect the problems at this early date. On paper the allocation seemed satisfactory. The airfields for the A.C.F.F. were widely distributed and those in the more forward areas were reserved mostly for the fighter squadrons; the Army Co-operation squadrons had to be content with airfields placed farther back, and most of the units of the A.C.F.F., other than fighter squadrons, were therefore situated behind the Corps and G.H.Q. areas of the B.E.F. One result of this was that at least two squadrons had to operate from each airfield. In the A.A.S.F. area, satellite airfields had not been prepared, but as it had been decided not to dispatch the second bomber group from the United Kingdom, there were sufficient airfields available to operate the new dispersal scheme of one squadron at each airfield.

The new arrangements had a considerable effect on the medical organisation of both Forces. Although the wings of the A.C.F.F. were dispersed considerably in relation to each other, the dispersal of the squadrons of each wing was not great. In the A.A.S.F. wing headquarters and their squadrons were, however, split up and placed on separate airfields sometimes as much as 30 miles apart. This arrangement caused serious difficulties, both executive and medical. For example, there was only one cipher book per wing, whereas after dispersal three were needed; similarly, medical personnel, medical equipment and ambulances had to be redistributed with the result that the medical facilities became inadequate in some respects. These deficiencies affected chiefly medical personnel and medical facilities, but they gave rise to other problems, not recognised at first, which hindered the efficient working of purely medical units and the administration of the lines of communication.

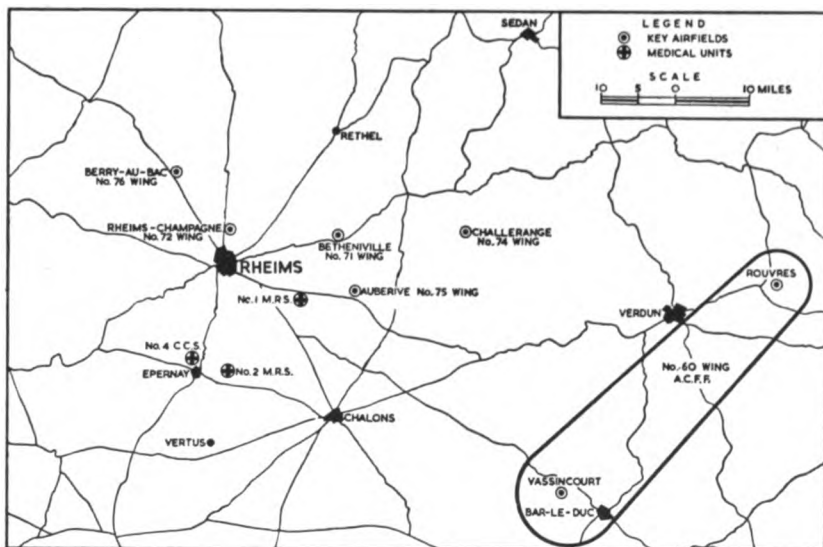
#### LOCATIONS OF OPERATIONAL UNITS

The six wings of the A.C.F.F. were sited on arrival in France at Mons, Abbeville, Poix, Lille-Seclin, Merville and Rosières airfields. By January, the A.C.F.F. had been reinforced and the airfields in use at various times are shown in map 1 (opposite). Airfields occupied on arrival in France are underlined.

The location of wings of the A.A.S.F. on arrival in France is shown in map 2 (opposite). Two squadrons of No. 60 Wing A.C.F.F. went to Vassincourt and Rouvres on October 2, and were transferred to the A.A.S.F. on October 15. They were administered by No. 67 Wing which was formed on November 6.

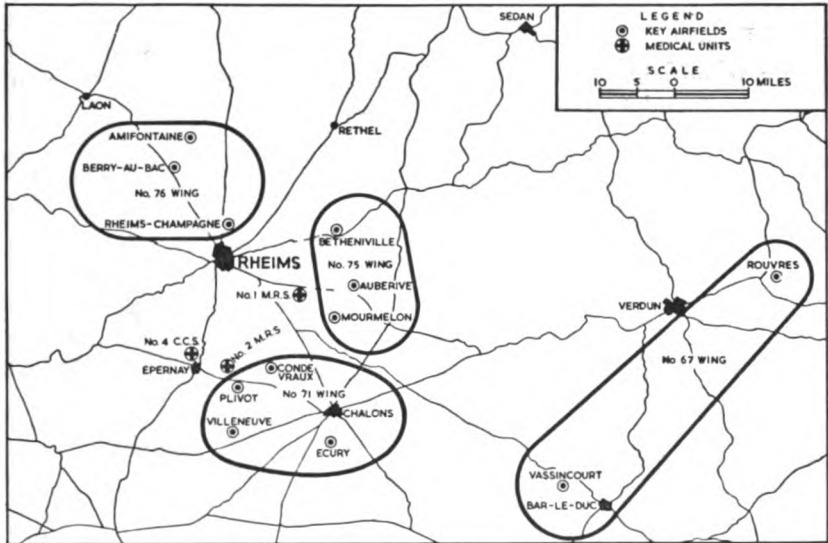


MAP 1. Location of the six wings of the A.C.F.F. in France, September 1939.

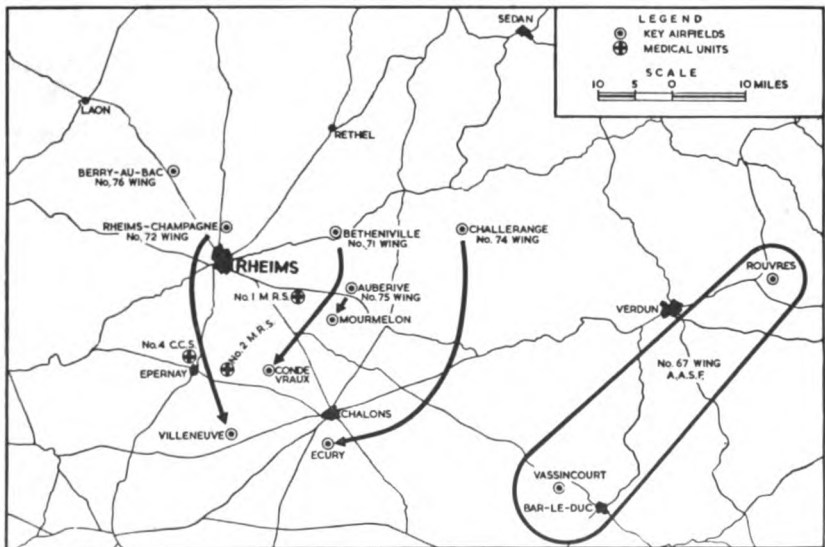


MAP 2. Location of wings of the A.A.S.F. in France, September 1939.





MAP 3. Location of squadrons of the A.A.S.F. after dispersal.  
September 12, 1939.



MAP 4. Location of wings of the A.A.S.F. on January 28, 1940.

On September 12, the squadrons of the A.A.S.F. were dispersed; headquarters and one squadron of each wing remained at the base airfield and the other squadrons moved as shown in map 3 above. The administration by wings of these squadrons became cumbersome with such dispersal and on January 28, 1940 the six wings of the

A.A.S.F. were reduced to four and wing control established over groups of airfields in the same area. The wings then controlled two, three, three and four squadrons (*see map 4*).

#### MEDICAL FACILITIES

The admission of British patients to French hospitals created a minor problem until the field medical units were established. The French hospital authorities were always most willing to give assistance and accepted patients without demur, but once a patient had been admitted to a French hospital it was not always easy to arrange his disposal when he was fit for discharge or required evacuation to a base hospital. The hospital authorities were unfamiliar with British Service procedure and one of the tasks of the R.A.F. principal medical officers was to maintain a wide liaison so that patients would not be delayed in hospital pending discharge or evacuation to base. When the field medical units opened, all cases fit to be moved were transferred by ambulance from the French hospitals to the C.C.Ss. or the M.R.Ss. The administrative difficulties could be overcome in this way, but British patients in both Forces disliked being admitted to French hospitals, for although they were well treated, often no one was detailed to look after their needs and the hospital food was unlike that to which they were accustomed. Their inability to speak French added to their discomfort. When possible, it became preferable to transfer patients, if they could tolerate the journey, to Army field medical units in the A.C.F.F., even though these were some distance away, rather than admit them to a local French hospital. In the A.A.S.F. it was much easier to arrange in-patient treatment after the opening of the field medical units.

*Field Sick Quarters.* After arrival in France the need arose for some intermediate medical provision at units for patients who, though not seriously ill, required something better than a bed on a stretcher, and more convenient than a bed in a billet without nursing facilities and some distance from the camp. The problem was solved by establishing at wings field sick quarters of from four to six beds. The extra equipment needed was obtained from Army advanced medical stores depots, Red Cross supplies on the Continent, R.A.F. medical stores in the United Kingdom, and by local purchase and construction. The medical staff of such sick quarters usually consisted of a unit medical officer with two nursing orderlies from the wing and two or three from the squadron establishments; rations and medical stores were drawn as usual. In the A.C.F.F. the medical resources of the squadrons on each wing were pooled but Z.I.\* equipment was kept intact as far as possible

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\* *See R.A.F. Volume I, Chapter 8, page 432.*

at the aid posts. In the A.A.S.F. the formation and administration of field sick quarters was not so simple because squadrons of the same wing were dispersed at different airfields sometimes many miles apart; consequently, the Z.I equipment had to be distributed among the airfields and the sick quarters had to be within access of all squadrons or, if the airfields were far apart, a separate sick quarters established for each squadron, in the billeting areas.

The houses requisitioned for use as sick quarters had many disadvantages owing to local forms of architecture and the standards of hygiene and sanitation of the villages in which they were situated. It was not easy to find a house that had running water, drainage and electric light, particularly in the villages south of the Marne such as Plivot in the A.A.S.F. area, where the houses, being in a more rural district, were not as satisfactory nor as easy to adapt as those elsewhere. However, despite the unsuitability of many of the buildings, the sick quarters justified their existence, largely owing to the drive and improvising ability of medical officers, who were able to adapt some of the houses satisfactorily.

*Transport.* The dispersal of squadrons in the A.A.S.F. necessitated the splitting of transport between airfields. This was unfortunate because there was a general shortage of transport and no specific allocation for the use of medical officers. It was originally planned that medical units of the A.A.S.F. were not to be as mobile as those of the A.C.F.F.; after the dispersal of units, however, the mechanical transport provided was inadequate to effect movements even from one airfield to another. Assistance was supposed to be given by the attachment or loan of vehicles from the supply and transport sections of each air stores park, but in practice this arrangement did not work well, with the result that sometimes when medical units wished to move transport was not available. There was similar difficulty among units of the A.C.F.F. and even the P.M.O. of this Force was not at first allotted a car for his duties. Early in 1940, some unit medical officers of the A.C.F.F. were supplied with eight h.p. Renault vans for their use, but until then they and their colleagues of the A.A.S.F., where there was a much greater degree of local dispersal on wings, were reduced to waiting on the roads to pick up any vehicle, civilian or military, which happened to be passing, to enable them to visit sick in billets, aid posts and field sick quarters. The resultant physical and mental fatigue lowered the speed and efficiency with which they could carry out their duties. Assistance was always available through the Army motor ambulance convoys for the transfer of casualties, but no transport could be authorised by them for the daily use of a medical officer, and although commanding officers of wings and units always tried to make transport available, it could never be guaranteed and its

availability was more fortuitous than planned. The medical officer of Headquarters Unit, A.C.F.F. was responsible, in addition to his unit commitments, for the care of Army personnel of the Air Formation (Signals) units attached to the Force. He was allowed no transport for visiting the many dispersed units of this formation and his work was made possible only by the allotment of a car and a driver by the commanding officer of the units he was visiting.

The distances between units in the A.A.S.F. area after dispersal made essential some alterations in the disposition of ambulances. Vehicles from 3 Motor Ambulance Convoy were attached both to units and to the M.R.Ss. and new areas of collection were allotted to the latter. No. 1 M.R.S. at Prosnès thereafter accepted patients from all units north-east of a line passing through Berry-au-Bac, Reims, Châlons and Bar-le-Duc and No. 2 M.R.S. from all units south of this line. Ambulances had to be attached also to some battery sites and various units which had arrived in France without unit ambulance transport. In addition, 25 ambulance cars had to be detached from Headquarters, Lines of Communication, for use in their area. The result was that of 75 ambulance cars on establishment, only 25 remained with the motor ambulance convoy.

#### LIVING CONDITIONS

It is generally agreed that the personnel in both the A.C.F.F. and the A.A.S.F. suffered discomfort in France, particularly during the winter of 1939-40, to an extent that affected adversely their efficiency and morale. A great volume of criticism arose from the men themselves and later from the public at home when they began to hear accounts of the campaign. Much of this criticism was uninformed and, as is usual, exaggerated accounts of what was viewed as official inefficiency were put about. It is therefore necessary to try to discover what the real causes of failure were and to determine to what extent these were due to mistakes of one kind or another.

The R.A.F. grew as a highly technical service, composed chiefly, even in its earliest days, of technicians, tradesmen and aircrew, and operating with the Army, which provided all domestic facilities. It was this latter fact which became one of the major topics of discussion when the question of the separate operation of an air force in the field was raised in 1934. As has already been described, some extra equipment and man-power to supply what was normally provided by the Army was established in the independent force to be; on the other hand the extra men and equipment which would be needed to provide all the ancillary services for such a force in the field had not been established for the A.A.S.F. by the time of the Munich crisis. After this date, when great efforts were being made to expand the Services,

there was neither time nor man-power to enlist and train sufficient men or provide the necessary equipment.

Some of the difficulties in France must therefore be attributed to the general lack of preparedness and some to the fact that the Forces were operating under new conditions in field warfare; the admittedly greater difficulties of the A.A.S.F., however, must be regarded as due to the unfamiliar situation caused by operating in an area away from the complete Army field organisation.

The difficulties in which medical officers were chiefly interested arose mainly from the housing, feeding and sanitation of units. For some days after arrival men slept where they could, in barns, outhouses and even in pig-sties, the criterion of comfort being a roof, preferably one that did not leak. The initial problem of arranging billets was troublesome, because most of the airfields were little more than an open grass space near a small village. Unless an officer had gone with an advance party to arrange billets, it frequently happened that the local authority responsible either had not been informed, or if informed had not been given the correct number for whom accommodation had to be provided. Many of the villages near the airfields were small and scattered and because billeting regulations forbade the use of farm buildings or schools without the acquiescence of the French Military Authorities, it was seldom possible to arrange billeting accommodation for more than two men at a time unless barns and lofts were used. Many of the houses available were comparatively well built, but the other accommodation varied from poor to average and, in one village, 70 men were housed in a farm loft above 30 oxen in the stalls below. Officers were usually accommodated in billets or an empty house. Each unit had a certain amount of tentage but it did not always travel with the men to the Continent, being sometimes forwarded from the ports by the Railway Transport Officers (R.T.Os.) when the units' destinations were known. Some units took adequate tentage with them because they were to be located outside any possible billeting areas—in fact one unit remained under canvas throughout the winter. The degree of secrecy pervading the whole move to France hindered the organisation and was responsible for many of the delays in making contact with headquarters and other units, both Army and R.A.F., in the surrounding districts. Plates I and II illustrate the weather conditions under which British troops served in the winter of 1939-40.

There was much temporary overcrowding in the early days of the occupation of any billeting area, but the standard of 45 square feet per man was generally maintained. Various types of pre-fabricated huts were erected at certain units later on. The unsuitability of many of the quarters was not the only cause of the prevalent discomfort; the lack of a universal scale of equipment, both personal and unit, was also

contributory. For the first few weeks the men slept on boards covered with straw, which was changed as the need arose. Bed boards were obtained or constructed at some units and at others wooden frames with wire or canvas mattresses were made. Beds were also locally built or purchased so that in time many had a suitable foundation upon which to sleep. (*See Plate III.*)

Billets were heated by small solid fuel or oil stoves and initial issues were supplemented by local purchase. Units under canvas used oil stoves or outside braziers.

Personal equipment consisted mainly of two uniforms, a change of socks and two blankets, but there were units at which men for some time had only the uniform they were wearing and one blanket. It should be remembered that battledress had not been introduced, so that regulation tunics and slacks were worn. There was no method by which uniforms could be cleaned because unit drying rooms were yet to be established.

The standard of messing throughout the French campaign was good once the R.A.S.C. were established, but before the arrival of Army supplies the standard was indifferent or poor and, among other things, stale or mouldy bread was issued by the French authorities on more than one occasion. In consequence, unit commanders utilised transport, and occasionally operational aircraft, to fly supplies from their home stations. The French field kitchens were infested with flies, and field cookers, set up in the villages, were close to the primitive sanitary contrivances common in most of the billeting areas. In this respect the R.A.F. was not entirely blameless when R.A.F. kitchens were later established; many cookhouses were sited in poor positions and some were actually placed in farmyards. At a later date messing huts were erected on the outskirts of villages and the dining halls were used as recreation rooms after meals. Grease traps were not always satisfactory and the standard of cleanliness in many of the kitchens left much to be desired. Trailer cookers were used at first but the burners soon became unserviceable. The burner difficulty was never entirely overcome during this campaign although later designs were an improvement. The N.A.A.F.I. provided canteens at various units, but the hygienic and sanitary conditions were sometimes unsatisfactory, particularly when the personnel in charge were inexperienced.

Water purification was supposed to be undertaken at all units but the purification plants were complicated and soon became unserviceable; in these circumstances they were often used as water carts, being filled from some main supply and the water chlorinated. Those which did work were often handicapped by the narrowness of the lanes when going from one section to another and the water trailers, in contrast to the plants which were prime movers, were often without means of

traction and were more difficult than the prime movers to manage on the country roads.

Latrines were either of the deep trench or bucket variety and refuse and excreta were normally buried; Otway pits and incinerators were also used although local complaints were received over the use of incinerators, because it was thought that the smoke from them would reveal the location of units to hostile reconnaissance aircraft.

#### MEDICAL ORGANISATION AND ADMINISTRATION

After a few weeks on the Continent living conditions improved and it was possible to assess the value of the existing administrative arrangements. It was found that the original system of administration had many faults in that it was made unwieldy by the dispersal of units and the long lines of communication. Medical administration, as an integral part of the general administration, required adaptation to the new conditions.

#### STRENGTHS AND RATIOS OF MEDICAL OFFICERS PER 1,000 PERSONNEL

In the third week of January 1940, the strength of the A.C.F.F. was approximately 5,800 R.A.F. and 2,000 Army personnel, a total of 7,800. There were 21 R.A.F. medical officers in the Force—5 at Headquarters (including 2 pool medical officers), 13 squadron medical officers, and 3 at air stores parks. The 2,000 Army personnel received medical attention at unit level from R.A.F. medical officers. The ratios of medical officers per 1,000 personnel were therefore 3·6 for the R.A.F. alone and 2·7 for the total Force.

In the A.A.S.F. area the strengths of the R.A.F. and the Army respectively were 8,513 and 4,518: a total of 13,031. There were 7 R.A.F. medical officers at headquarters (including 3 pool medical officers attached to units), 10 squadron medical officers, 3 at air stores parks, 2 in the base area, 1 at No. 1 Mission and 10 at the two medical receiving stations, a total of 33.

No medical officers were provided by the Army for units such as the Royal Engineer, Pioneer, Signals and Ordnance Corps, except for the 53rd and 73rd A.A. Regiments of the 12th A.A. Brigade of Artillery, each of which had a medical officer. All these companies consisted of at least 300 men and one, 2 Formation (Signals), was over 700 strong. These units were also without medical equipment when they arrived in France. For the first two months, until medical officers and equipment arrived for them, the D.A.D.M.S. at H.Q., A.A.S.F., had to undertake four sick parades a day in addition to his ordinary staff duties. By January 1940, the R.A.M.C. provided 3 medical officers for outlying units in addition to the 2 already established on 3 Motor



PLATE I: Severe weather conditions in France in the winter of 1939-40.  
Rain and mud



PLATE II: Severe weather conditions in France in the winter of 1939-40.  
Snow



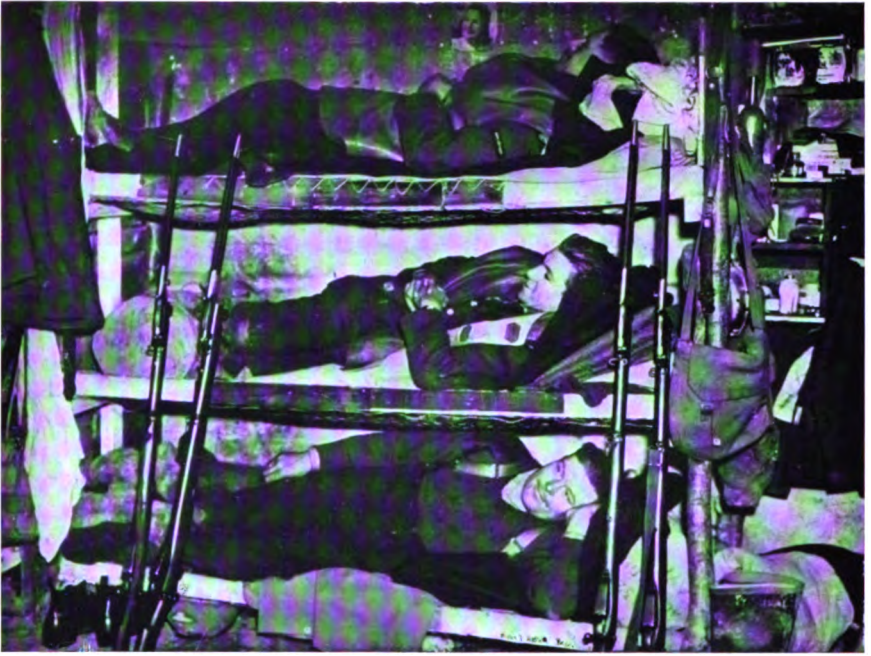


PLATE III: Home-made three-tiered bunk employed to alleviate crowding in billets



PLATE IV: Insanitary conditions in a copse on the perimeter of an airfield

Ambulance Convoy. There were, of course, the medical officers in 4 C.C.S. who numbered 10. The ratio of R.A.F. medical officers per 1,000 R.A.F. personnel was approximately 3.9; including the 15 R.A.M.C. doctors, the ratio for the whole Force was approximately 3.7 per 1,000 personnel.

#### FORMATION OF BRITISH AIR FORCES IN FRANCE (B.A.F.F.), MEDICAL PROPOSALS

As reorganisation on the Continent proceeded, plans were made to centralise the command of the air forces. Information was meagre at this stage concerning the possible duties of the proposed A.O.C. in C. The P.M.O., A.A.S.F., put forward proposals for the establishment of a P.M.O. for the combined Forces, the A.C.F.F. and the A.A.S.F. reverting to groups instead of being independent commands. Headquarters, British Air Forces in France (B.A.F.F.) was formed on January 15, 1940, its formation being a compromise solution of the difficulty of satisfying the desire of the B.E.F. for an executive Air Headquarters on the Continent. The A.C.F.F. and the A.A.S.F. were very different in composition, their degree of dependence on the Army and their areas of operation; the two Forces had to work, in theory, in complete co-operation with the French and it was inevitable that no really satisfactory system of control and administration could be devised within the framework of the composition of the Forces involved without a major reorganisation, which at that time was out of the question. The A.O.C. in C., B.A.F.F., had, in consequence, no normal command administration and was concerned only with higher policy and certain services such as signals, meteorology, finance and maintenance. There was no staff medical officer appointed to Headquarters, B.A.F.F., to represent either of the P.M.Os., the only medical officer being the flight lieutenant posted to look after personnel on headquarters unit establishment. The many difficulties which arose from such a system of administration are too obvious for comment.

#### HOSPITAL TREATMENT

The arrangements made for the hospital treatment of patients in both Forces has been described and mention made of the difficulties which occurred after the adoption of the policy of dispersal. In the A.C.F.F. area, the C.C.Ss. were placed by the Army where they could best admit casualties from the B.E.F.; in consequence, their locations bore little relation to the most suitable positions for units of the A.C.F.F. At first, patients from all but the more advanced units had to travel to the forward areas in which the Army field medical units were located, and then back to base hospitals, past their original units, on the regular

lines of communication. This procedure was obviously unsatisfactory and a working agreement was made by which R.A.F. patients were admitted to the nearest Army medical unit direct, even if it happened to be a base hospital. For notifying the P.M.O., A.C.F.F., of admissions, a postcard system was introduced so that men could be struck off strength before 21 days had elapsed, if they were unlikely to be fit for service in that time; replacements could then be applied for without delay.

In the A.A.S.F. the siting of the two M.R.Ss. and 4 C.C.S. was unfortunate in that their close proximity to one another altered the use for which they had been designed and authorised. 4 C.C.S. was admirably situated at Epernay; No. 1 M.R.S. was but 6 miles away and No. 2 M.R.S. only 16 miles farther on. The original function of the M.R.S. was to hold and treat both medical and surgical patients if they were likely to be fit to return to duty in 14 days, or evacuate them to the C.C.S. after preliminary treatment. 4 C.C.S. was to hold and treat those patients admitted to it from the M.R.Ss. and from the surrounding districts and to evacuate them to base hospitals along pre-arranged lines of communication.

The static nature of the war and the small numbers of casualties altered the rôles of field medical units. The C.C.S. was not filled to capacity and was thus able to hold and treat patients and return them to units instead of evacuating them to base hospitals. The direct result of this policy was that it became preferable for the M.R.Ss. to send all patients, other than those with very minor complaints, to the C.C.S., which was a larger unit, better equipped than either of the M.R.Ss., and staffed by Q.A.I.M.N.S. nurses. The M.R.Ss. in turn were expanded and accepted more patients with minor complaints from the field sick quarters as the winter progressed and the incidence of upper respiratory maladies increased. The alteration in the rôle of each field medical unit raised the question as to whether or not the C.C.S. should become a R.A.F. responsibility entirely by taking it over from the Army and altering its status to that of a small hospital and staffing it with R.A.F. medical officers. This proposal was considered and agreement in principle was obtained from the Army authorities by the D.G.M.S., R.A.F., on his visit to France in January 1940, and the possibilities were explored.

It was realised that the motor ambulance convoy and the R.A.M.C. officer in charge of blood transfusion would have to remain and be attached to the proposed hospital. The A.O.C., A.A.S.F. agreed to the proposals but, after discussion at the Air Ministry, they were disallowed by the A.O.C. in C., B.A.F.F., and the project was abandoned for two reasons; firstly, because the site at Epernay was too far advanced for a static hospital, and secondly because, if the R.A.F. agreed to man the proposed hospital, it would be committed to the formation of a

second medical unit of equivalent size to cater for personnel who were to be established on the new airfields being constructed in the Le Mans area south of Paris. This commitment would have been difficult to fulfil at that time, but it became clear during the discussions that in future operations and in similar circumstances it would be preferable for the R.A.F. to provide its own hospitals. Meanwhile, the C.C.S. was expanded to over 200 beds and plans were made for its further expansion to 400 or more beds; before this could be done, however, the offensive began on May 10, 1940.

The evacuation of casualties from 4 C.C.S. was carried out by ambulance train or diesel coach to La Baule Hospital, west of Nantes. The distance was about 300 miles and this, together with the fact that a hospital train could not proceed until a full load was ensured, made the evacuation of patients to base a tedious affair. The policy of sending patients on this long journey was soon abandoned and casualties were sent by train to the base hospital at Dieppe after it had been established, or to the United Kingdom by air.

#### AIR EVACUATION OF CASUALTIES

In the very early stages of the campaign civil aircraft were used to transport stores, equipment and men to France and were sometimes loaded on their return journey with patients for transfer to the United Kingdom. It was not always possible to arrange for the air evacuation of patients because the aircraft had to maintain certain fixed schedules for flying and the evacuation of casualties usually meant making a diversion and an extra landing before nightfall. Arrangements were made in advance by signal for the reception of casualties at an airfield in the United Kingdom, usually at R.A.F. Station, Benson, but because of the late reception or non-arrival of signals and the difficulties of working extra schedules, many patients were landed at Shoreham airport and the medical officer at R.A.F. Station, Tangmere, 24 miles away, had to make *ad hoc* arrangements for the collection, holding, and onward transfer of patients, because there were no adequate medical facilities at the airport. However, many severely wounded casualties were flown from the Continent and during the first six weeks in France, 139 injured men were flown by air to the United Kingdom from A.A.S.F. alone. The number of casualties for air evacuation was, however, comparatively small and the opportunity was taken to return to the United Kingdom, Class E Reserve personnel who were found unfit for service on the Continent. The usual procedure was for the P.M.O. to arrange the evacuation of casualties by air from Rheims-Champagne airfield.\* Patients were sent direct from the M.R.Ss., and

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\* Arrangements were made later to use Villeneuve airfield because it was much closer to No. 2 M.R.S. and 4 C.C.S.

occasionally from the C.C.S., to the airfield for emplaning, but it was the custom to hold patients in the M.R.Ss. who were due for evacuation by air.

More casualties were transported by air in the A.A.S.F. than in the A.C.F.F. Many transport aircraft landed at Amiens from the United Kingdom and then went on to Rheims-Champagne airfield before discharging the rest of their load. In consequence, apart from those aircraft which returned to the United Kingdom from Amiens, few were available for the evacuation of casualties even if it had been possible to arrange their transfer without a holding medical unit near to the airfield. A few casualties were flown out from the A.C.F.F. but no records are available to determine the exact numbers.

#### MEDICAL BOARDS

Medical boards in the A.C.F.F. were held at units or at headquarters. Patients unfit for service on the Continent were sent back to the United Kingdom but, as there was often much delay in arranging their return, it became easier to transfer them to R.A.F. hospitals in England 'for further treatment' than to board them in France and let them pass through the usual channels. The introduction of leave boats and trains facilitated the removal of most unfit men, because they could be evacuated more quickly by these means.

When medical, surgical, ophthalmic and X-ray examinations or bacteriological investigations were needed, they were carried out by the Army medical specialists and reports were made available for the information of the board. In the A.A.S.F. similar arrangements for boarding were made but specialists' opinions were obtained from the M.R.Ss. and facilities for X-ray examinations and bacteriological investigations from 4 C.C.S.

#### HYGIENE AND SANITATION

The supervision of the hygiene and sanitation of units from headquarters was made difficult by the lack of experience of some of the medical officers in field warfare and the lack of trained sanitary assistants. It was found necessary to ask Air Ministry to ensure that medical officers proceeding to the Continent were provided with the necessary Manual of Hygiene and Sanitation. Plate IV shows how insanitary conditions could arise near airfields.

Flies from the numerous village middens were a serious problem, but fortunately in this matter the cold weather soon provided a solution. Fly-proof kitchens were established at some units and messing in billets was avoided as a matter of general policy, arrangements being made to serve meals in local halls or large buildings.

Many of the water purification plants became unserviceable through scarcity of spare parts and lack of maintenance by men specially trained in their use. The onset of the cold weather caused further trouble because the pipes in the plants froze even if they were lagged with straw and sacking round the most vulnerable parts of the machinery and warmed by a small stove. Various unit modifications were made but it was not until after the visit by the Director of Hygiene in February 1940, that official modifications were recommended and authorised.

#### MEDICAL STORES\*

The dispersal of units in the A.A.S.F. in the early stages of the campaign caused deficiencies in medical stores and equipment. Each squadron had been supplied with full Z.1 equipment which provided sufficient for the wings until dispersal and the change over from semi-mobile to more static warfare. The location of wing headquarters personnel away from either of the wing squadrons left over 300 men without medical stores of any kind unless the Z.1 equipment held by each squadron was raided. Similarly, several units which became isolated from their parent headquarters had to be equipped with medical stores. Extra Z.1 equipment was ordered from England and flown across to fill the deficiencies.

It had been decided before the war that replenishments of medical stores would be obtained from Army medical stores depots and that any equipment peculiar to the R.A.F. would be demanded separately from Air Ministry with the authority of the P.M.O. concerned. The Army established a base medical stores depot at Dieppe and several advanced medical stores depots in the forward areas.

In the A.C.F.F. units made their demands on Army advanced medical stores depots in accordance with these arrangements. In the A.A.S.F., however, unit medical officers notified their requirements monthly to the nearest M.R.S., which in turn rendered a consolidated demand to the nearest Army advanced medical stores depot and collected the stores by road, informing medical officers when stores were ready for collection. 4 C.C.S. made its own demands and was responsible for the collection of its own stores. There was no difficulty in obtaining stores from the United Kingdom, although sometimes the Army were out of stock of certain items, particularly sulphapyridine. On units one of the main shortages was of stock mixtures which had to be demanded when the field sick quarters were established, or obtained by local purchase, because there was no provision for such mixtures in the mobilisation scales of medical stores and equipment.

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\* See R.A.F. Volume I, Chapter 8, page 432.

**DENTAL PROVISION**

There was no establishment for R.A.F. dental officers in the A.C.F.F. and there were insufficient Army dental officers to carry out the very large amount of work to be done in the B.E.F. alone. In consequence, R.A.F. dental patients could only be seen in emergencies. There was also delay in obtaining dentures and getting dental repairs carried out. Many Class E reservists were found to be edentulous and until they could be provided with teeth they had to be given special subsistence allowances to purchase soft food locally. French dental surgeons were also employed and until a system of obtaining dentures from the United Kingdom within 14 days by air had been established, the men were provided, where it was essential, with dentures from French sources by local purchase. Later, two R.A.F. dental surgeons and two dental orderlies with travelling dental equipment were sent out from the United Kingdom. In the A.A.S.F. a dental surgeon and a corporal dental orderly were established at No. 1 M.R.S. but there was no dental officer for the base area for some time. The arrangements made for providing dentures from the United Kingdom did not work so satisfactorily in the A.A.S.F. as in the A.C.F.F. and there was much delay in obtaining dentures during which the airmen concerned had often been moved to another unit.

**VENEREAL DISEASE**

Lectures on venereal disease were given by medical officers to all units after mobilisation and at intervals thereafter on the Continent. E.T. rooms were established at each unit and the usual preventive measures were taken, such as placing out of bounds certain houses and streets. However, it was soon apparent that the incidence of venereal disease in France was higher than in the overseas commands in the pre-war years. Every effort was made to reduce the rate of infection, but the large amount of professional and amateur prostitution prevalent in France at that time made control difficult. It is of interest to note that the pay of each infected man was reduced while he was under treatment (a policy of which the medical authorities did not approve) and the consequent incentive to conceal the disease may have further influenced the rate of infection.

In the A.C.F.F., P.A.Cs. (Prophylactic Ablution Centres) were established where necessary and facilities for personal cleansing were also provided by the French in towns in which there were large numbers of French troops. In the A.A.S.F., Early Treatment (E.T.) Rooms were established in two brothels in Rheims which were in bounds between 1600 and 2300 hours. A corporal or L.A.C. nursing orderly was provided at each of these E.T. rooms and no man was permitted to enter the house without a sheath, but whether or not it was used is

unknown. Each man's number and unit, but not his name, were recorded, so that should he contract venereal disease at a later date his movement could be traced to check the efficiency of the control arrangements.

Men who contracted venereal disease were treated at Army centres in the A.C.F.F. and at French centres in the A.A.S.F. until the end of 1939, when all treatment was undertaken by the M.R.Ss. and 4 C.C.S. with the assistance of the mobile bacteriological laboratory attached to the latter. Continuation treatment was given on the Continent and as a general rule no cases were sent to the United Kingdom.

#### FLYING STRESS

One of the unknown factors before the war was the probable reaction of aircrews to the hazards likely to be encountered in modern air warfare. The R.A.F. had been engaged in various operations throughout the world between the wars, but had not met any opponent of equal merit in the air. The advances made in psychological medicine during this period were not applied to Service conditions and the instruction given to medical officers in the psychological care of flying personnel was based entirely on the observations and theories of Dr. W. H. R. Rivers, F.R.S., who had been in charge of beds at the R.A.F. Central Hospital in the later stages of the War of 1914-18. His opinions were officially accepted and were published in paraphrase form in A.P. 1269\* in the section concerning the care of flying personnel from the psychological aspect. The validity of these opinions will not be criticised, but newly appointed medical officers could not but be aware that certain observations were not in keeping with modern thought. Such a situation is of historical interest in so far as it shows that at the beginning of the war there was a lack of precise knowledge about the whole field of the psychological aspects of aviation medicine. The whole problem was treated largely as an unknown quantity and in consequence emphasised unduly, in that over-elaborate preparations were made to treat the expected number of cases of 'flying stress'.

It was realised that a more up-to-date approach to the problem was needed and in May 1939, a pamphlet called 'Notes for Medical Officers on the Psychological Care of Flying Personnel' was published by Air Ministry and issued to all medical officers on the Continent by the end of the year. It set forth the duty of medical officers in discovering psychoneurosis among members of aircrew and explained the methods which should be employed in combating it, and disposing of those who suffered from it. It was stated that medical officers must keep

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\* Manual for Medical and Dental Officers of the Royal Air Force.



flying personnel under their medical charge up to the highest possible pitch of efficiency; they were to realise that physiological and psychological fitness were so closely linked that it was useless to concentrate on one to the exclusion of the other, and it was pointed out how dangerously easy it was to be deceived about the true causative factors of disturbances which were commonly puzzling in the field of medicine.

Soon after the outbreak of war the Consultant in Neuropsychiatry gave additional instruction on the subject to newly joined medical officers during their preliminary training. In so short a time, however, it was possible only to describe briefly the more important aspects and it was left to medical officers themselves to obtain further knowledge by practical experience at operational units. Their first duty in this respect was to get to know the aircrew and form a working liaison with their commanding officers who, though without medical knowledge, had funds of valuable experience on which to draw.\*

In November 1939, a visit was made to units in France by a specialist in neuropsychiatry and a medical wing commander who later became the first Flying Personnel Medical Officer in the R.A.F. The object of the visit was to determine the conditions prevailing in France and to discuss with the P.M.Os. their possible influence on the incidence of 'flying stress' and other neuropsychiatric conditions, the measures taken for their prevention and what provision there was for the treatment and disposal of any cases which occurred.

It was found that morale and health were satisfactory and although a few cases of neurosis were seen, there were no cases of true 'flying stress'. It was realised that this was probably due to there being no intensive operations, but it was felt that this same fact would shortly affect morale, because of the inevitable boredom and apathy which would result if steps were not taken to improve general living conditions, to ensure full employment, good discipline and adequate recreation and to lay down a definite policy about leave. Most R.A.F. officers were able to obtain 60 hours leave in Paris every three weeks, but their expenses were considerable. Aircrew were being granted leave at the same rate as officers and it was suggested that aircrew engaged on operational duties might justifiably be granted a more generous allowance in view of the nature of their duties and the special need for physical and mental fitness. Commanding officers were divided in their opinions on how leave was to be granted: some thought periodic home leave followed by return to duty in France would be best, and others that there should be a fixed period of duty in France without leave, followed by a fixed period of duty in the United Kingdom. The

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\* See R.A.F. Volume II, Chapter 1, 'Problems of Aviation Medicine', page 122, where the subjects of Flying Stress and Morale are dealt with at length.

latter policy was favoured as likely to have a better psychological effect and was adopted, with minor modifications, for the time being.

It was difficult during the 'slack' period to estimate what provision should be made to treat cases of neurosis on the Continent. At that time neither the special base C.C.S., nor the hospital planned to treat such cases, had been opened. Those cases which did occur were treated in a section of the established base hospitals. There was no alternative, because of the difficulties of evacuation, to admitting these patients either direct, or through one of the field medical units, to the base hospitals and in consequence it was difficult to ensure that R.A.F. patients would be evacuated home to either Matlock or Torquay hospital.\* In the A.A.S.F. patients could be evacuated by air ambulance from one of the M.R.Ss., but in the A.C.F.F. arrangements would have to be made with the Army authorities. Fortunately the number of patients was small and did not justify the establishment of any special neurological centres in France for the R.A.F. at that time. When the fighting began on a large scale no special arrangements were necessary because again there were very few cases and for those which did occur evacuation by air was arranged as required.

#### CLIMATE—EFFECT ON LIVING CONDITIONS

The exceptionally severe winter of 1939–40 in France caused great hardship among those troops who were still not well housed after three months on the Continent, and considerable discomfort to everyone. The winter was notable in the meteorological history of France and records show that the last winter of comparable severity occurred as far back as 1879.

The cold weather began with frost on December 21, 1939, but there had already been cold spells lasting several days in the same and preceding months. There was a five-day warmer interval between January 4 and 8, but thereafter heavy frosts continued until January 29, when another warmer period intervened, followed by a further period of frost between February 10 and 18.

The mean temperature for January 1940 was exceptionally low throughout France. In Paris there were 23 days of frost in January, during which the average temperature was 27·5° F., 10° lower than that normally experienced; in fact, Paris had not had such a cold January since 1838, over a century earlier. In that city the lowest temperature recorded was 4·5° F. (27·5 degrees of frost). In January there were 31 days of frost at Nancy and Metz, 30 days at Abbeville, 29 at Beauvais and 28 at Rheims. In parts of France noted for their mild climate during the winter months there were many days of frost,

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\* See R.A.F. Volume I, Chapter 5, pages 223 and 239.

Brest having 13, St. Jean-de-Luz 12, Perpignan 10, Toulon 7 and Antibes 5. The coldest period in France was from January 9 to 26, during which drift ice began to form on the River Marne and persisted until the end of the month. In the suburbs of Paris frost penetrated to a depth of 45 cm. from soil level. At many other towns in the A.C.F.F. and A.A.S.F. areas even lower minimum temperatures were recorded.

*Minimum temperatures: January 1940*

Town	Degrees Fahrenheit	
	Temperature	Frost
Valenciennes . . .	-2	34
Paris . . . . .	4.5	27.5
Le Havre . . . . .	11.3	20.7
Rennes . . . . .	1.6	30.4
Brest . . . . .	15.1	16.9
Tours . . . . .	5.6	26.4
Bottiers . . . . .	4.3	27.7
Rheims . . . . .	-10.8	42.8
Metz . . . . .	-10.8	42.8
Dijon . . . . .	4.3	27.7
Le Puy . . . . .	1.2	30.8
Lyons . . . . .	— .9	32.9
Angouleme . . . . .	5.4	26.6
Bordeaux . . . . .	7.2	24.8
Biarritz . . . . .	15.8	16.2
Toulouse . . . . .	9.9	22.1
Perpignan . . . . .	9.6	22.4
Marseilles . . . . .	12.7	19.3
Antibes . . . . .	26.3	5.7

There were three days of snow in December, five in January and six in February. The actual snowfall per day was unexceptional but the remarkable fact was that the snow lay in the Paris region and elsewhere for nineteen days without dispersing. The unique weather manifestation, however, was the advent of glazed frost between January 26 and 29 throughout an area north of a line passing through Le Havre, Tours, Bourges, Dijon and Mulhouse. In parts of this area the deposit of glazed frost was over 10 cm. thick and the diameter of the layer of ice formed round some electric wires was as much as 8 cm. Telephone and telegraph circuits were put out of action and in Normandy alone 3,600 high tension cable supports came down and thousands of trees had their branches broken by the accumulated weight of ice.

The Director of Hygiene visited the air forces in France in the third week of February 1940, towards the end of the period of cold weather, and his report is a valuable historical record because it describes the living conditions and hygiene of units during the winter. At the time

of his visit nearly all airmen were billeted in houses, barns and lofts, in villages and towns in the vicinity of airfields. Most of the billets were satisfactory in that they had ample floor space per man, adequate protection against the elements, some form of heating and simple ablution facilities. In the A.C.F.F. all men were sleeping off the ground either on bed boards or improvised beds locally constructed by themselves or the Army; in the A.A.S.F., however, a large number of men were still sleeping on the floor, some units being more affected than others. A few of the billets, in particular at Bétheniville and Auberive in the A.A.S.F. and Lille-Seclin in the A.C.F.F., were unsatisfactory and at the last-named airfield one billet, a large hut holding many men, was known as the 'Black Hole of Calcutta' because in addition to the overcrowding all the windows were permanently blacked out.

In both Forces the arrangements for the withdrawal of dirty blankets and their replacement by clean ones had not been satisfactory. At many units blankets had been in continuous use for six months and in addition to needing cleansing on hygienic grounds were often filthy because of the mud brought into the billets on gumboots, which were the only suitable footwear on many airfields, in spite of the medical arguments against their constant use.

The severe weather also interfered with the arrangements made for transporting men to the neighbouring towns for baths at least once a week. The roads were often unusable in many districts and only at a few units were there bathing facilities. Organised games were necessary when there was little operational activity but the difficulty of arranging for baths after a game was not conducive to cleanliness, especially when men had played in uniform because there was little sports clothing. Standardised bath-houses with drying rooms had been planned for both Forces and were to be provided at all places where R.A.F. units were likely to be stationed permanently but none were in use at that time. The provision of a mobile bath-house and drying room was being considered for each command but had not yet been authorised.

In view of the poor standard of hygiene at units throughout France, recommendations were made for the establishment at Headquarters of both commands of the post of D.P.M.O. (Hygiene) to supervise and direct the general hygiene and sanitation at all units and to ensure that the correct preventive measures were being taken. It was found that certain cookhouses in the A.A.S.F. were still sited in farmyards and that few had efficient grease traps or fly-proofed stores. The last point was considered most essential and it was felt that adequate proofing should be carried out immediately, because even in the extreme cold there were flies in the cookhouses of several units. The canteens served by the Expeditionary Force Field Institute needed constant supervision and better amenities; the serving counters and tables had a rough

finish and could not be properly cleaned, while the grease traps were of poor design and construction.

Latrines were unsatisfactory in both commands. Few were fly-proof, and, in many of those that were, the self-closing lid mechanism did not work well. Most of the excreta and refuse was being buried and it was recommended that more incinerators should be used. Elsan closets were recommended for each isolated post of the wireless intelligence screen and for No. 1 M.R.S. because there were no lavatories in the buildings occupied by the patients, the outside latrines being used even in the cold weather.

Official modifications to the water purification plants were recommended so that the pipes most prone to freezing could be drained in cold weather. The establishment at Headquarters of a N.C.O. trained in the use and maintenance of such plants was also advised so that the serviceability and efficient operation of all water purification plants could be ensured. Portable Bell sterilisers were recommended for all small isolated units which were dependent on village water supplies.

#### MEDICAL RECEIVING STATIONS

It will be remembered that No. 1 M.R.S. opened at Prosnes on September 25, 1939, 4 C.C.S. at Epernay on October 11, and No. 2 M.R.S. at Mareuil-sur-Ay on November 6. No. 1 M.R.S. had therefore to operate for over a fortnight without lines of communication for the evacuation of patients or a British base hospital. In consequence, its rôle became that of a holding unit until the opening of 4 C.C.S. and special arrangements had to be made for the evacuation of casualties which were unsuitable for treatment in a M.R.S. This difficulty arose as early as September 28, when nine aircrew battle casualties were admitted suffering from burns, fractures and dislocations. After preliminary treatment arrangements were made for their evacuation by air in transport aircraft from Rheims-Champagne airfield to the United Kingdom; this was the first instance of the evacuation by air of aircrew battle casualties from France during the war. Further arrangements were made later whereby Villeneuve rather than Rheims-Champagne was used for evacuation because it was within 20 minutes journey by ambulance of 4 C.C.S. and No. 2 M.R.S. after these units had opened up.

Each M.R.S. made the best use possible of local amenities for accommodation and did not rely entirely on tentage although hospital marquee tents and double lined ridge tents were used. Additional accommodation in prefabricated hutting had been promised by October, but did not materialise until much later. By the end of January 1940, No. 1 M.R.S. had two huts, one for surgical and one for medical patients, and others were being built. During the winter additional accommodation

was taken over in local houses, No. 2 M.R.S. had a corrugated iron isolation ward and wooden huts had been built in the château grounds for a medical ward and an airmen's dining hall. No. 1 M.R.S. soon found the operating tent unsatisfactory and transferred the theatre to requisitioned buildings. No. 2 M.R.S. had already established an operating theatre in the château and both M.R.Ss. found it more convenient thereafter to establish the operating theatre in a house rather than in a tent during the remainder of the campaign. By April, all the huts needed to replace tentage were completed except for the laying on of water, but before they could be occupied the offensive began and they had to be abandoned.

Each M.R.S. was designed to accommodate 10 bed and 30 stretcher patients and the C.C.S. 50 bed and 100 stretcher patients. It was soon apparent, particularly during the quiet period, that the M.R.Ss. were capable of dealing with much greater numbers and approval was asked for an increase in the bed accommodation to 40 and the stretcher accommodation to 60. The extra beds and stretchers were actually provided from the air stores parks while approval was awaited and for the rest of the campaign this accommodation was used. The need for additional transport became apparent during October and two despatch riders, to carry despatches and mails between units and the M.R.Ss., and a 15-cwt. van to collect rations and other stores, were added to the establishments.

In December, living conditions deteriorated because of the bad weather and when the frosts came most patients were accommodated in requisitioned houses, hospital marquee tents and double lined ridge tents which were kept reasonably warm with oil stoves. More beds had been obtained and patients were not treated on stretchers unless this was absolutely unavoidable. When the roads became icebound in January and there were falls of snow, mechanical defects began to appear in the transport vehicles and two heavy ambulances had to be written off after crashes. The incidence of upper respiratory infections increased and accounted for more than half the admissions. The thaw began on January 29, with the onset of heavy rain. The hospital marquee tents became awash despite preventive trenching and the single tiled roofs of some of the requisitioned houses let in rain. The roads began to break up and the French authorities banned the use of all vehicles of over three tons weight. This ban was imposed without warning and before alternative arrangements could be made to rig stretchers in lighter vehicles, the Albion ambulances being overweight. Many units of necessity disregarded the ban and continued to transfer patients to the M.R.S. by Albion ambulance when the transport of the M.R.S. itself was immobilised. The ban was lifted in certain areas for 24 hours on February 2, but otherwise remained in force until February 12.

By April the weather began to clear and living conditions to improve but the offensive began before full benefit could be obtained from the fine weather.

#### WITHDRAWAL FROM FRANCE

MAY 10-JUNE 17, 1940

During the withdrawal and evacuation from France nearly all medical records were either lost or destroyed. The medical history of this period has therefore been obtained from accounts written from memory by medical officers after their return to the United Kingdom. Unfortunately, many were unable to record their experiences while these were still fresh in their minds because of the work entailed in preparing for the expected invasion of England and many accounts were not written for several months or until they had been specifically requested. It has been possible, as a general rule, to confirm dates which had an operational significance but other dates mentioned must be considered as approximate although they may in fact be accurate.

The history of the period between May 10 and June 17, 1940, consists of a description of the withdrawal of headquarters as it affected the medical staffs, of the difficulties experienced during the move and of an account of the field medical units during this last phase of the campaign.

#### HEADQUARTERS

The German advance was extremely rapid. The A.C.F.F. was forced to withdraw to England within ten days of the onset of the offensive and the A.A.S.F. continued operations for only a further four weeks before the final evacuation. During the latter part of this period medical administration had to be left almost entirely in the hands of unit medical officers because of the frequent moves and the difficulties of central supervision with indifferent communications. Landline communications between the D.M.S., B.E.F. and the P.M.O., A.A.S.F. were severed on May 19, so that after that date arrangements had to be made with the D.D.M.S. line of communication at Le Mans to obtain those facilities which the Army provided up to railhead.

There was no change in the medical organisation of the A.C.F.F. in the first few days of the offensive apart from providing a medical officer to look after some of the visiting Fighter Command squadrons which used advanced airfields in France during the day and returned to home airfields at dusk. As soon as the extent of the break-through became known and the limits of operating in France realised, evacuation of the A.C.F.F. began. After the bridges over the Somme were destroyed on May 20, units north of the river fell back to Boulogne and those to the south towards Cherbourg and Brest.

The P.M.O., A.C.F.F. moved with Headquarters from Mareuil, near Arras, to Boulogne on the night of May 18, and was ordered to proceed by road to Rouen on May 20. Progress was very slow because of the congestion on the roads, and by the morning of the 21st, within nine miles of Abbeville, it became impossible to progress further and it was learned that the town was already in enemy hands. After some difficulty the P.M.O. returned the same day to Boulogne where he was ordered to embark that afternoon on an empty ammunition ship with the last of the ground personnel of the A.C.F.F. from north of the Somme.

It will be remembered that the A.A.S.F. was planned on a less mobile basis than the A.C.F.F. and was supposed to be given protection in the east by the Maginot Line. However, by May 15, the Germans had advanced west from Sedan through Rethel to within ten miles of the most northern airfield and it became advisable to move the Force south from around Rheims to airfields in the Troyes area which had been built during the winter months. One wing headquarters with four squadrons was withdrawn to Nantes and the three remaining wings operated from three groups of airfields, the airfields in each group being adjacent to one other, as shown in the map overleaf.

By June 7, Headquarters, A.A.S.F., had withdrawn to Muides leaving a small advanced headquarters at Troyes. The three wings operated from Châteaudun and Le Mans, Herbouville, and Bougé and Houssay airfields. During this stage of the campaign more than one squadron operated from each airfield.

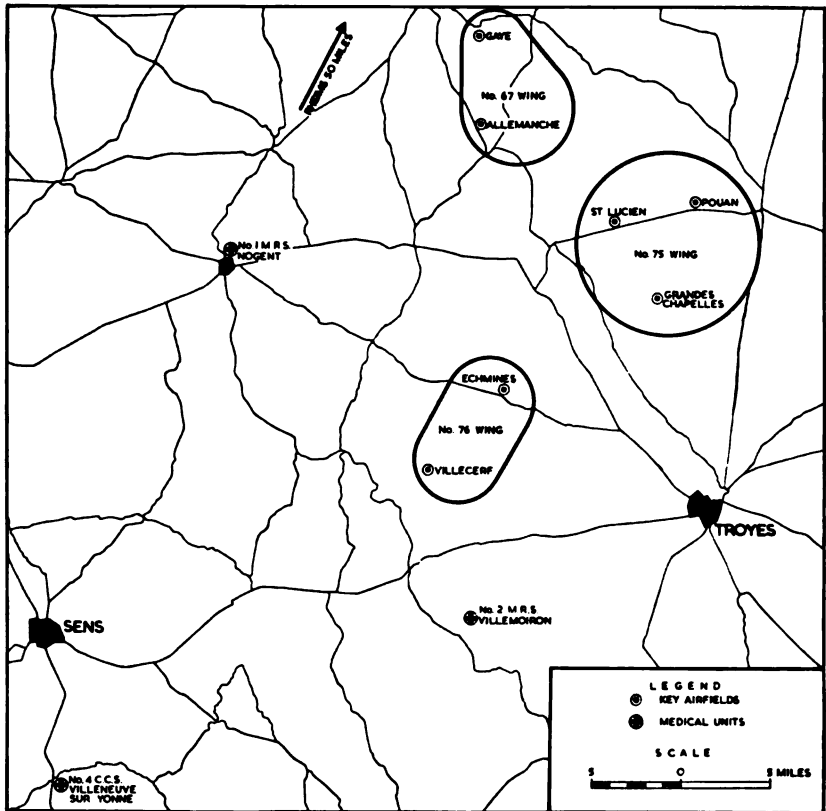
On June 16 orders were given for a further retreat to the area around Angers and thence to Brest; at the same time the P.M.O., A.A.S.F., was ordered to Headquarters, B.A.F.F. at Nantes from which he went to La Pallice for embarkation on June 17, arriving in England on the 22nd.

Contact between medical staffs and units of both Forces was satisfactory until the withdrawal began. Once the retreat had gained momentum its very rapidity prevented the maintenance of landline communications and often where communications were established they were cut by enemy agents. As the situation became worse rumours abounded and liaison began to depend more and more upon personal contact. General information, however meagre, was obtainable from B.B.C. news broadcasts, but the lack of local information, such as the position of field medical units, delayed or even prevented the admission of patients to hospital.

In the A.C.F.F. contact between units and the P.M.O. was made possible by a team of officers under the orders of the D.P.M.O.(H.) who visited units by car as often as possible to keep medical officers informed of the locations of the various Army field medical units, which were themselves on the move. However, as the withdrawal



proceeded it became increasingly difficult even by this means to arrange admissions, and finally unit medical officers had either to retain casualties or arrange their transfer by personal negotiation once a field medical unit had been located. As the confusion grew, medical officers retained all but the most severe casualties which would have



MAP 5. Location of the three wings of the A.A.S.F. in the Troyes area, May 15, 1940.

suffered from lack of hospital treatment. Orders were given to other medical officers to collect R.A.F. patients who were fit to move from the C.C.Ss. and French hospitals. Most patients were transferred without incident but some were more difficult to locate, particularly when they had been admitted direct to civilian hospitals and the Service authorities not informed. Many were taken to the coast in ambulances driven by medical officers who were thus able to supervise and administer any treatment necessary on the journey.

In the A.A.S.F. the withdrawal was of a strategic more than a compulsory nature and communications were maintained for a longer

period, but once they began to break down similar difficulties were experienced. Units moved, often with very little warning, and occasionally without orders, at the discretion of commanding officers. After the offensive began each unit was prepared to move at short notice and for this reason very little equipment other than locally made furniture was left behind in the early stages of withdrawal. Patients were evacuated to 4 C.C.S., whence they were sent by ambulance train to 9 British General Hospital at Le Mans. During the last two weeks in France communications became increasingly difficult to maintain and it was inevitable that sometimes when patients were taken for admission, it was found that the field medical units had moved to new locations.

Wing sick quarters were established at each new site, but apart from the really sick and casualties due to enemy action, the numbers on sick parade dropped almost to nil, so that the problem of moving patients who had been admitted to sick quarters did not arise. During the move food was purchased locally and cooked in field kitchens. Sanitary arrangements were made according to the expected length of stay.

The shortage of transport throughout the A.A.S.F. and its effect on medical administration and organisation before May 10, has already been described. Increases in transport establishment had been authorised but units were still dependent upon the air stores park for any additional transport needed. When all units were on the move at the same time the difficulties experienced during the static phase of the war were accentuated and there was a general shortage of vehicles for the task. When the A.A.S.F. moved on May 15, there were in addition to R.A.F. personnel approximately 7,000 Army troops in units which were only 65 per cent. mobile. A hundred vehicles had to be loaned to these units by the R.A.F. Additional transport was purchased in Paris, but because tools and spares were not delivered with each vehicle, regular maintenance was impossible. In the last few days before embarkation, petrol was difficult to obtain and most units had to abandon their heavy equipment and trailers when their inclusion in the convoys would have delayed the withdrawal to the ports. All transport was abandoned at the ports, where arrangements had been made for its destruction.

Few casualties were sustained *en route* despite the bombing, which became more frequent as the ports were approached. The greatest loss of life occurred from enemy action at sea after embarkation.

#### FIELD MEDICAL UNITS

4 Casualty Clearing Station and 3 Motor Ambulance Convoy. Records of 4 C.C.S. and 3 Motor Ambulance Convoy (M.A.C.) for the last three months in France were destroyed during the retreat, but it is

known that the C.C.S. continued to admit patients from the M.R.Ss. and nearby units until it was withdrawn. The site at Epernay was abandoned on May 16-17 in favour of one at Villeneuve-sur-Yonne, south of the Seine, where the unit operated until May 26. Patients were transferred after treatment to 9 British General Hospital at Le Mans and later to La Baule hospital near Nantes. After May 26, the C.C.S. moved to the Château Dulair.

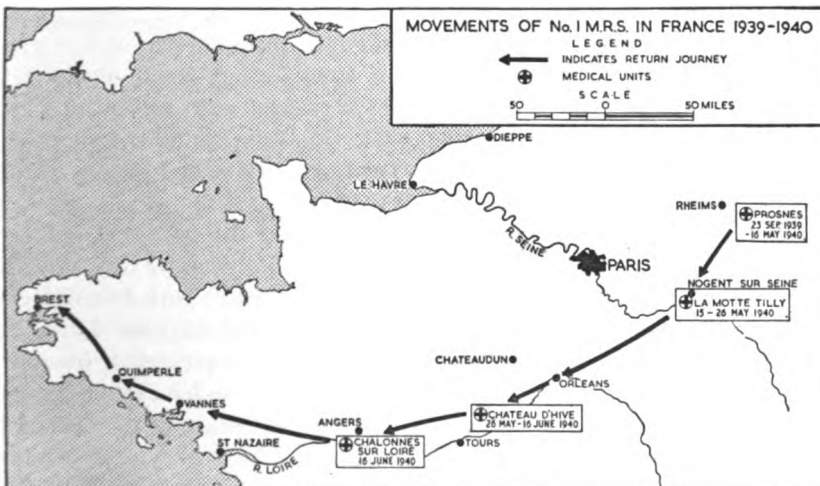
*No. 1 Medical Receiving Station.* On May 14th, the Commanding Officer of No. 1 M.R.S. was instructed to reconnoitre a new site in the area to the west of Nogent-sur-Seine, 60 miles to the south, and on the 15th a message was received that the unit was to be prepared to move at three hours' notice. Three lorries were obtained from No. 4 Air Stores Park with four drivers from No. 5 Air Stores Park. The first convoy left in the evening of the same day, arriving on the new site, La Motte Tille, in the early hours of the next morning. The second convoy, which left Prosnes at 0300 hours on the 16th, arrived at 0930 hours. Three Army patients who had been admitted before the move accompanied the convoy.

On arrival at the new site a reception tent and two small ridge tents for the wards were erected. The surgical unit and operating theatre were assembled in empty houses and the unit was ready to accept patients the next day. Two days later further stores and equipment were collected from the previous site.

Attempts were made to find more suitable accommodation for the unit but because No. 1 M.R.S. expected to move again at short notice no changes were made. On May 21, it was decided to move No. 2 M.R.S. to base for return to the United Kingdom and to effect an exchange of officers between the two units. In the meantime another site was reconnoitred in the Châteaudun-Orleans-Tours area. The French were uncooperative in this district, but a firm policy resulted in the Château d'Hive, near Tours, being taken over, in spite of protests that it had already been requisitioned by the Ministry of Fine Arts. The M.R.S. moved to the Château d'Hive on May 26, and received every possible assistance from the owners. A billiards room was turned into an operating theatre and a large room next to it served as an acute surgical ward with accommodation for twelve patients. The airmen were billeted in the out-houses and officers slept in tents. Fifteen beds and fifteen stretchers were set up in one large hospital marquee for medical cases and two small hospital marquees were erected for minor surgical and dermatological cases. A third marquee became an officers' ward. The M.R.S. was operational by the following day, May 27.

On June 15, orders were received that the unit was to stand by to move at one hour's notice. All equipment was packed that evening and

in the early hours of the next day a new site was selected near Angers. It was arranged that the unit would meet on the outskirts of the town pending further instructions. A small château with large grounds near Chalonnes, twelve miles south-east of Angers, was chosen and taken over, tents and marquees were erected and again a billiards room was used for the operating theatre. Headquarters A.A.S.F. was informed of the arrangements that had been made and that the unit was ready to receive cases. At midday, however, a dispatch rider arrived and informed one of the officers that the entire A.A.S.F. had moved to Nantes and wanted to know why the unit had been left behind. It was decided therefore not to increase the accommodation but at the same time not to strike any of the tents which had been erected. Orders were obtained by personal contact in Angers that the unit was to go at once to Brest for embarkation. As instructions were to the effect that the unit was to reach Brest not later than 0600 hours on June 17, it was decided to abandon all trailers and to proceed with prime movers only. Brest was reached on the morning of June 17 within fifteen minutes of the specified time. All transport had to be abandoned at the port and the unit embarked with approximately 10,000 other troops on a ship designed to take 1,600. The journey was uneventful and Plymouth was reached on the morning of June 18. The moves of the unit are shown in the map below.



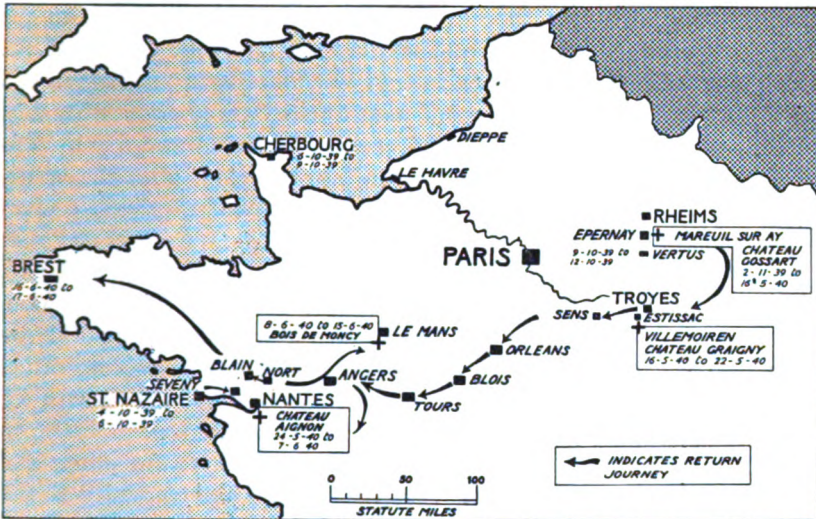
MAP 6. Movements of No. 1 M.R.S. in France 1939-40.

*No. 2 Medical Receiving Station.* The unit operated between May 10 and 15 at Mareuil-sur-Ay and, on May 14, a new site 60 miles south was chosen at Estissac near Troyes. Orders were received at 1000 hours on May 15 for the M.R.S. to prepare to move at three hours' notice. Four lorries, without drivers, were supplied from No. 5 Air Stores

Park. The unit was packed to the limit of available transport in the space of six hours and had to leave behind only one-eighth of the equipment including the relatively immobile stores such as incinerators and large sterilisers. Patients who were almost well were returned to their own units and those needing further treatment were sent to 4 C.C.S. which was not due to move until the next day after the arrival of an ambulance train. At 0200 hours on May 16, an order was received to stand by to move at one hour's notice but it was not until 1135 hours, following further instructions, that the move began. Roads were almost completely blocked by refugees on foot and in vehicles, French Army transport and troops marching to new locations. The first 19 miles of the journey took nearly three hours. One of the vehicles was driven by a N.C.O. of the unit and the others by officers, because of the shortage of drivers. The new site, Château Graigny, near Villemoiron, was reached at 1830 hours. By the evening of May 17 the emergency operating theatre was ready for use and the next day the M.R.S. was in full operation. On May 21, after an exchange of officers with No. 1 M.R.S., the unit prepared to move to Nantes and the heavy equipment was taken to a siding at Estissac for transfer to base by train. At 1400 hours on May 22, the unit left by road in a convoy of 10 vehicles, with all personnel and the remainder of the equipment, for Nantes *via* Sens, Blois, Tours and Angers. The convoy parked at dusk each night on the side of the road, continuing its journey at dawn, and Nantes was reached in the afternoon of May 24.

At Nantes no accurate information could be obtained about the future of the unit. In the meantime twelve tents and a marquee for stores were established in a camp near Château Aignon three miles from the depot. Stores arrived by train and unloading began three days later.

On June 1, re-equipment was completed and the unit was held in reserve against air attacks on the base area. On June 7, the M.R.S. returned to the Le Mans area. Four three-ton lorries with five drivers were obtained for the move, which was completed on June 8, but it was found that the château allocated had already been taken over by the Army; it was therefore necessary to open up under canvas in the Bois de Moncy close to Le Mans. A few casualties were admitted during the stay and on June 15, the unit withdrew to Nort, 30 kilometres north of Nantes. The unit then retreated to Brest, reaching the port in the evening of the 16th. The few French patients who had been admitted were discharged to a local hospital and at 1700 hours on June 17, the unit embarked after destroying all secret documents and taking the transport to a centre for demolition. The M.R.S. disembarked at Plymouth on June 18 and was routed *via* Locking to Halton. The moves of the unit are shown in the map opposite:



MAP 7. Movements of No. 2 M.R.S. in France 1939-40.

### MEDICAL STATISTICS

The method of keeping statistics at the beginning of the war makes it impossible to show accurately the total sick incidence per 1,000 per annum. Similarly, it has not been possible in this narrative to quote casualty rates among aircrew, but an indication of what the losses might be can be obtained by comparing the aircraft losses in the various commands. During the campaign the A.A.S.F. lost 229 aircraft and the A.C.F.F. 279. Bomber Command lost 166, Fighter Command 219 and Coastal Command 66. Over 900 operational aircrew were lost to the Service by death, injury or capture, at a time when such a wastage was an extremely severe drain on the resources of the Royal Air Force.

#### WORK OF THE MEDICAL RECEIVING STATIONS IN FRANCE

*No. 1 Medical Receiving Station.* No. 1 M.R.S. served forty-four units between September 29, 1939, and June 15, 1940, including Headquarters, A.A.S.F., and later Headquarters, B.A.F.F., nine wings, seventeen squadrons, three air stores parks, and many smaller units from time to time. The greatest number of patients provided by any one unit was 100 from Headquarters, A.A.S.F., while Nos. 71, 72, 75 and 76 Wings and Nos. 88, 142, 218 and 226 Squadrons provided more than 40 patients each during the campaign. The M.R.S. itself sustained 31 casualties.

The total number of cases held for more than 48 hours was 917, excluding Army patients for whom records are not available. Approximately 25 patients per week were admitted during the 37-week period

in which the M.R.S. operated. There were 150 admissions due to upper respiratory infections\* and a small number, not exceeding 20, of exanthemata. There was one case of meningococcal meningitis and one of undulant fever. Septic conditions totalled 50, eye conditions 23, and ear conditions 20. Dental admissions did not exceed 13 and included two cases of Vincent's angina. There were 22 cases of scabies, a few cases of pediculosis pubis and 113 admissions of proven or suspected venereal disease.

Gastric and abdominal conditions, including 5 cases of appendicitis, amounted to 76, and there were, in addition, 5 cases of food poisoning from one unit. Neuropsychiatric cases, including anxiety states, 'flying stress' and psychosis, did not exceed 30. The surgical cases admitted were 105, comprising 12 with gun-shot wounds, 10 with burns, 11 flying casualties with various injuries, 34 head injuries and 38 fractures of various kinds. In addition, 24 cases of minor injury to joints and 17 with contusions and bruises were admitted. The remainder of the admissions were distributed among many disease groups and were of no special interest. Of the 917 cases admitted 552 were transferred to 4 C.C.S., 265 were discharged cured and 11 were transferred to 9 British General Hospital. Of the remainder, 49 were evacuated to the United Kingdom at various times and one to a base hospital. Only two patients died in the M.R.S. The disposal of the balance of 37 cases is not known. The total number of admissions to the unit including cases held for less than 48 hours was considerably in excess of the 917 cases mentioned above. During the six months from November 1939 to April 1940, 1,333 cases, or approximately 222 per month, were admitted. An indication only of the numbers of Army patients treated can be given from other records, which show that during the months of February, March and April there were approximately 300 admissions.

*No. 2 Medical Receiving Station.* The units served by No. 2 M.R.S. totalled thirty-two and included Advanced Headquarters and Headquarters, B.A.F.F., four wings, ten squadrons, five air stores parks and nine other units of various kinds. The largest source of intake was No. 150 Squadron from which 95 patients were admitted. Other units which provided more than 30 patients were Nos. 1, 73, 103 and 105 Squadrons, and Nos. 4 and 6 Air Stores Parks. The M.R.S. itself had 28 casualties.

In the period between October 20, 1939 and June 21, 1940, with a three-week period in June during which only one patient was admitted, the total admissions, excluding Army personnel, numbered 610, or approximately 19 per week. As in No. 1 M.R.S., the number of

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\* Influenza and coryza 51, acute bronchitis 49, tonsillitis 30, pleurisy 11, pneumonia 7 and pyrexia of unknown origin 2.

admissions was highest for upper respiratory infections, totalling 125.\* There were 51 exanthemata cases of which 40 were due to German measles and there were 4 cases of meningococcal meningitis. Infestations included 14 cases of scabies and 16 of pediculosis (mainly pubic) and there were 81 admissions for proven or suspected venereal disease. Septic conditions accounted for 19 cases, eye conditions 10 and ear 8. There were 7 dental admissions. Gastric and abdominal complaints totalled 24 and included two cases of appendicitis. Major surgical conditions amounted to 44 and included 9 gun-shot wounds and burns, 7 head injuries, 24 fractures of various kinds and 4 patients with multiple injuries. Minor surgical conditions included 15 cases of joint injury and 23 cases of other minor injuries. Neuropsychiatric cases numbered only two and the remainder of admissions fell into some 40 disease groups and were not of special note.

Of the 610 admissions, 239 were discharged cured, 320 were transferred to 4 C.C.S. and one to 9 British General Hospital, three were flown direct to the United Kingdom and one was admitted to a French civilian hospital. The disposal of 42 admissions is unknown. There were only four deaths, all battle casualties. Admissions of Army personnel varied from month to month and the only figures available show that in January and April, 104 cases were admitted.

CASUALTIES DUE TO ENEMY ACTION

Two sets of statistics are available which show casualties due to enemy action but unfortunately there is a degree of overlap, so that the number of deaths may include some personnel who are also shown in the 'presumed dead' figures which follow:

*Total Casualties September 3, 1939-June 19, 1940*

		<i>Deaths</i>	<i>Injuries</i>		
Due to enemy action in the air	September 3, 1939- May 10, 1940	45	72		
Due to enemy action in the air . . .	} May 11, 1940- June 19, 1940	{ 140	433		
Due to enemy action on the ground . . .				} 362	71
Due to enemy action at sea . . . . .					
		<hr style="width: 50px; margin: 0 auto;"/>	<hr style="width: 50px; margin: 0 auto;"/>		
Total casualties due to enemy action . . .	September 3, 1939- June 19, 1940	407	632		
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\* Influenza and coryza 84, acute bronchitis 10, tonsillitis 14, pleurisy 5, pneumonia 8 and broncho-pneumonia 4.



The figures for enemy air action September 3, 1939–May 10, 1940 can be further analysed as follows:

	<i>Deaths</i>	<i>Injuries</i>
A.A.S.F. . . . .	24	45
A.C.F.F. . . . .	21	27

Similarly, the total figures for enemy action in the air, on the ground and at sea, for May 11, 1940–June 19, 1940, may be sub-divided as under:

	<i>Deaths</i>	<i>Injuries</i>
A.A.S.F. . . . .	242	370
A.C.F.F. . . . .	85	141
H.Qs., B.A.F.F. . . . .	35	49
	} 362	} 560

*Presumed Dead.* The number of aircrew presumed dead for the R.A.F. in France was 13 for both Forces up to December 31, 1939, and 5 from January to the end of April 1940. In May 236 aircrew were presumed dead and up to June 17, a further 64, a total of 318.

#### *Flying Accidents*

		<i>Deaths</i>	<i>Injuries</i>
September 3, 1939–May 10, 1940	A.A.S.F.	32	43
	A.C.F.F.	28	39
May 11, 1940–June 19, 1940	A.A.S.F.	4	13
	A.C.F.F.	6	9
		—	—
Total September 3, 1939–June 19, 1940		70	104
		—	—

*Burns.* Between January 1 and June 17, 1940,\* there were 16 cases of burns due to enemy air action, 14 due to enemy ground action, 3 to flying accidents and 58 from other causes including scalds.

*Missile Injuries.* Between January 1 and June 17, 1940,\* there were 78 such injuries due to enemy air action, 30 due to enemy ground action and 18 from other causes.

*Venereal Disease.* Two sets of statistics are available for the 291 days of the French campaign. The first set enables a comparison to be made between the incidence of venereal disease in the A.C.F.F. and in the A.A.S.F. but because for some weeks there were no facilities in the A.A.S.F. for the microscopical examination and differential diagnosis of cases the figures include patients with non-specific urethritis and soft chancre. The second set of statistics was prepared for the whole Force and although more accurate does not allow any comparisons to be made between the A.A.S.F. and A.C.F.F. and between different units. A reliable figure for cases of non-specific urethritis and soft

\* Figures not available for the whole campaign.

chancere would not necessarily be obtained by subtraction of the total number in the second set from that of the first set.

It was thought at first that the A.A.S.F. had a much higher incidence per 1,000 per annum than the A.C.F.F., but subsequent analysis of the statistics showed that this was due to the large number of cases contracted by men of No. 21 Aircraft Depot at Nantes, a unit which was in the A.C.F.F. up to December 8, 1939, and in the A.A.S.F. thereafter. This unit had an incidence for all cases of 93 per 1,000 per annum and if it was excluded from the statistics the incidence in the A.C.F.F. became 52.25 per 1,000 per annum and in the A.A.S.F. 52.31 per 1,000 per annum.

There were 598 cases in both Forces between September 3, 1939, and June 17, 1940, which, with an average strength of 15,172, gives an incidence of 49.43 per 1,000 per annum.

The incidence among officers and airmen was almost equal. Operational squadrons had a high incidence during inactive periods and a lower one when fighting began. For instance No. 105 Squadron, with an average strength of 373, had 23 cases in the 38 weeks it was on the Continent (an incidence of 84.4 per 1,000 per annum), but between March 8 and June 14 (15 weeks), there were only 2 primary cases, and in the last 8 weeks before the evacuation of the squadron no cases were reported. Similarly, between January 1, 1940, and March 31, 1940, the number of cases occurring in operational squadrons was 72 in the A.A.S.F. and 54 in the A.C.F.F., a total of 126, whereas between April 1 and June 16, the A.A.S.F. had 50 cases and the A.C.F.F.\* 28, a total of 78.

There were 454 cases of acute gonorrhoea and 14 of primary syphilis, the incidence being 37.53 and 1.16 per 1,000 per annum respectively, a total incidence of 41.41 per 1,000 per annum. In addition there were 19 cases of soft chancre and 7 other cases of mixed aetiology. The total number of days of sickness for the A.A.S.F. and A.C.F.F. combined and the average number of days per case are tabulated below. Attention

### *Morbidity from Venereal Disease*

	Total cases	Total days of sickness	Average No. of days sickness per case
Gonorrhoea, acute .	454	12,402	27.3
Gonorrhoea, relapse .	6	122	20.3
Syphilis, primary .	14	520	37.1
Soft chancre .	19	405	21.3
Totals	493	13,449	26.5

\* Cases from units of the A.C.F.F. still in France.

is drawn particularly to the total days of sickness, for it is rarely appreciated how much time was lost to the Service\* through a disease which must be considered as individually preventable.

The morbidity and mortality statistics, including non-effective rates, for the R.A.F. in France and Belgium for the period September 3, 1939 to June 19, 1940 are tabulated below:

*The R.A.F. in France 1939-40 Morbidity and Mortality Statistics*

Strength (Average) . . . . .	15,172
<i>Total sickness</i>	
Number of cases . . . . .	14,926
Incidence per 1,000 per annum . . . . .	1,234.0
Average duration of sickness (days) . . . . .	9.1
Average days of sickness per head . . . . .	9.0
Number sick daily per 1,000 strength . . . . .	30.8
<i>Sickness excluding cases of 48 hours and under</i>	
Number of cases . . . . .	7,210
Incidence per 1,000 per annum . . . . .	596.1
Average duration of sickness (days) . . . . .	17.3
Average days of sickness per head . . . . .	8.2
Number sick daily per 1,000 strength . . . . .	28.3
Number of cases of sickness of 48 hours duration and under	7,716
Number invalided to the United Kingdom . . . . .	740
Incidence per 1,000 per annum . . . . .	10.8
Number invalided from the Service . . . . .	131
Incidence per 1,000 per annum . . . . .	61.2
Number of deaths . . . . .	789
Incidence per 1,000 per annum . . . . .	65.3

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\* It should be emphasised that these remarks were made prior to the introduction of the antibiotics.

## CHAPTER 2

# NORWAY 1940

### INTRODUCTION

**T**HIS WAS AN EXPEDITION undertaken at very short notice and therefore with little or no preparation, so that most of the medical arrangements from start to finish come under the heading of improvisation. The narrative should therefore be read in this light. Operations lasted so short a period that, as was to be expected, the sickness rate was negligible. An outstanding feature was the very small number of casualties resulting from aerial bombardment, those which occurred being almost without exception among personnel who could not or did not take cover. Though at the time thought possibly to be due to exceptional circumstances, a low casualty incidence from bombing was found to be a constant feature throughout the war and in all campaigns.

The campaign, which was both of short duration and small in its commitments of personnel, can, as far as Royal Air Force medical personnel were concerned, be conveniently divided into two different phases: the landing of Gladiator aircraft of No. 263 Squadron on the frozen lake near Aandalsnes as air support for the military and naval operations aimed at taking and holding Dombaas; and the Harstad-Narvik expedition in which the capture and wrecking of the iron ore port was achieved with the air support of two fighter squadrons operating from Bardufoss in the Tromsø region.

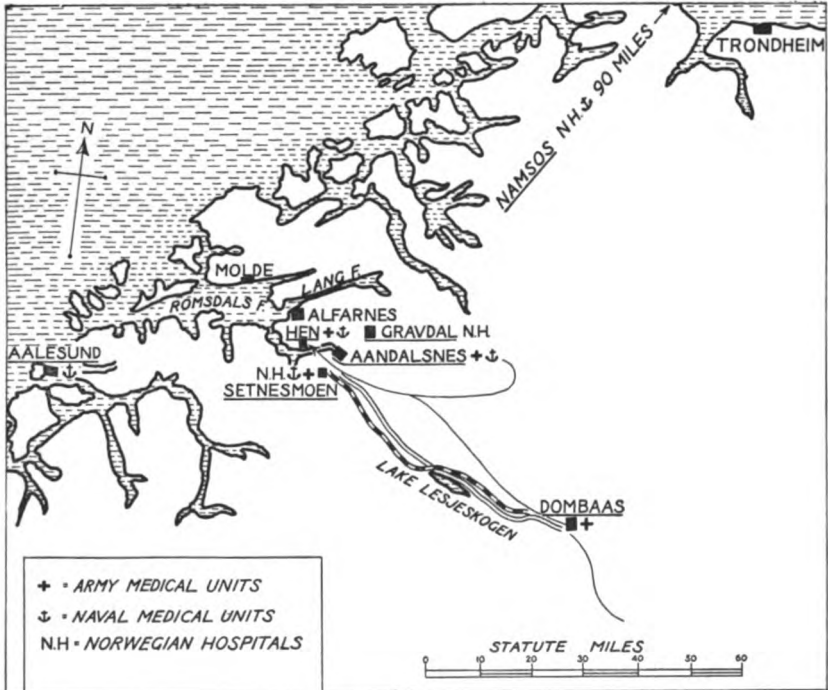
#### AANDALSNES OPERATION APRIL 20-MAY 2, 1940\*

Two combined naval and military operations are mainly concerned—the ‘Primrose’ plan, which was the landing of 700 seamen on April 17, for the purpose of seizing Aalsund, and the ‘Sickle’ plan, which was the landing of a military force of 1,000 men at Molde who were to proceed *via* Aandalsnes and seize Dombaas. The R.A.F. component was to provide fighter support for the military operations and establish a high-powered W/T station for communication with the United Kingdom. For the first purpose R.A.F. personnel were landed at Aandalsnes from a warship on April 22 with a deck cargo of 45 tons of petrol. There were five officers and a servicing flight of one officer and 70 men, who at once proceeded with their petrol and stores to a convenient railway tunnel (the line was out of action) where the petrol was dumped. They then marched by road to the frozen lake

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\* See Map 1.

(Lesjeskogen) which had previously been reconnoitred and found suitable for operation by Gladiator aircraft and where Norwegian labourers were already at work clearing a runway on the lake's surface and making preparation for reception of the aircraft. The officer in



MAP 1. Aandalsnes Campaign.

charge of the W/T station docked on April 23 and brought with him all necessary equipment and a servicing party.

No. 263 Squadron, consisting of 18 machines and their pilots, flew in two separate flights from the aircraft carrier *Glorious*, which was 250 miles off shore, on April 24. The machines were landed without mishap on the lake's 700-yard runway at 1900 hours and operations began at once with the reconnaissance of an unidentified aircraft, which proved to be Norwegian though perhaps flown by an enemy pilot. Contact with the enemy began shortly before 0500 hours on April 25, when the first Heinkel 115 was shot down. A quarter of an hour later the first bombing attack on the lake was delivered and from 0700 hours until 2000 hours, bombing and machine gun attacks on men, aircraft and the lake's surface were practically incessant.

The incidents of this day, an epic among fights against unparalleled odds, cannot be dealt with in detail here. It must suffice to say that in

spite of inadequate servicing facilities, frozen-up machines and the lake's surface becoming progressively worse as the day went on, the squadron made a total of 31 interceptions, resulting in 6 enemy aircraft shot down and 8 others put out of action. Thirteen of the squadron's 18 machines were destroyed by the enemy. One pilot sustained a bullet wound of the ear, another was shaken by bomb blast and a third had his face and hands burnt by a 'near miss', but there were no other casualties and fighting continued until the number of machines which could still take the air was reduced to five. At the end of the day, the lake had 150 bomb holes in it and orders were given for the remainder of the unserviceable aircraft to be burnt and the stores and the five still serviceable machines to be taken down to another landing ground on a small plateau near Aandalsnes, which was only 80 yards wide and 500 yards long.

On April 27, three Gladiators took the air and ground attacks were delivered on the enemy at Kvam and two Heinkels damaged. Petrol was exhausted, however, and the engines of two machines had already seized up, so no further action was possible, while attempts to get to grips with the enemy, who was attacking Aandalsnes all that day, were frustrated because the absence of oxygen made it impossible for our pilots to reach the height of 25,000 feet at which the Germans were operating.

On April 29, arrangements were made for the embarkation of the squadron personnel, who made their way to the coast in order to be picked up by the naval sloop H.M.S. *Fleetwood*. As this was too full to take them all, some of the personnel had to march a distance of 20 miles by road to Alfarnes on the Langfjord where they were called for the next day and returned to the United Kingdom on H.M. destroyers, docking at Scarborough on May 2. The pilots embarked on the freighter *Delius* on April 29, when they were bombed continuously from 0800 hours until 1400 hours; they reached Scapa Flow on May 1.

So ended the Aandalsnes operation and the squadron returned to re-form with a record of 49 sorties, 37 engagements with the enemy, 6 confirmed and 8 unconfirmed victories.

#### THE HARSTAD-NARVIK EXPEDITION MAY 7-JUNE 9, 1940\*

Harstad, a small port on the Vaagsfjord 33 miles north-west of Narvik, was the base for this expedition. The Air Component consisted of personnel of two fighter squadrons, No. 263, flying Gladiators, and No. 46, flying Hurricanes.

The original aim of the combined naval, military and air forces was to secure and maintain a base in Norway from which (a) iron ore

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\* See Map 2.

supplies *via* Narvik could be denied to the Germans; (b) supplies to them *via* Lulea could be interfered with; and (c) a part of Norway could be preserved as a seat of government.

Aircraft were to play their part in the operation by protecting four main areas: the naval anchorage at Skaanland (on the Tjeld Sound, 16 miles south of Harstad); the military base area at Harstad; sea and land forces in contact with the enemy; and R.A.F. occupied aerodromes. The primary object was to destroy enemy aircraft approaching these areas and to co-operate with the land forces when required in accordance with instructions issued by the Military Commander, General Auchinleck. It was intended that military operations in the coastal district of Bodö (120 miles south-south-west of Harstad) should be covered by air support based on a landing ground there, but local conditions made this possible for a short period only; with this exception the civil aerodrome at Bardufoss formed the sole operational headquarters of both fighter squadrons throughout the campaign.

The strength of the forces under General Auchinleck's command on May 25, the climax of the campaign, was just over 27,000, of which the Air Component accounted for approximately 1,000 men.

No. 4 Base Area, Air Component, North Western Expeditionary Force (Norway) (N.W.E.F.) was formed at Uxbridge on April 22, 1940, and embarked at Leith on May 7 with 29 officers and 386 other ranks, including the advance echelon of No. 263 Squadron. They reached Harstad on May 11. The advance party of No. 46 Squadron left Glasgow three days later and arrived at Harstad on May 17. On May 14, the aircraft carriers *Furious* and *Glorious*, carrying pilots, with their machines, of Nos. 263 and 46 Squadrons respectively, left the United Kingdom with an escort of four destroyers. There were 18 Gladiator and 20 Hurricane aircraft. In the meantime the advance party of No. 263 Squadron was unloading its stores at Sjövegan (a small hamlet on the northern shore of the Sagfjord, six hours by steamer from Harstad) for transport over the mountains to the aerodrome which was in course of preparation at Bardufoss. The second echelon of No. 263 Squadron, which had arrived in Norway on May 18, was transferred with the remainder of the stores by lake steamer to Sörreisa (50 miles from Harstad on the Solbergfjord) which was a convenient landing place about half as far by road from Bardufoss as Sjövegan was. The advance party of No. 46 Squadron had proceeded to Skaanland where preparations were made for the landing of the Hurricanes on a narrow strip of ground which it was hoped to make serviceable for operational purposes.

By now (May 20) the aircraft carriers were standing off shore waiting for the signal to fly off the machines. The Gladiators on the *Furious* were signalled to fly off to the aerodrome at Bardufoss the next day.

The *Glorious*, however, with its Hurricanes, returned to Scapa Flow as Skaanland aerodrome was not yet ready to receive the machines and they were not finally flown off until May 26.



MAP 2. Narvik Campaign.



The Gladiators, led by a Swordfish aircraft of the Fleet Air Arm, landed at Bardufoss in the early morning of May 21, their arrival being marred by an accident which occurred on the way when two machines crashed into a 3,000 feet mountain on the Island of Senjen; one pilot was killed and the other saved, although his machine was destroyed. Operations at Bardufoss began at once and the first contact with the enemy was made on May 23. On May 25, a total of six victories had been achieved, including one four-engined enemy aircraft shot down near Harstad, at the cost of two Gladiators badly damaged in action. The high average of patrols was maintained. On May 26, a request for patrol of the Bodö region was sent by the military authorities and three pilots from Bardufoss flew to the landing ground there; the condition of the ground was so bad that all three machines were 'bogged down', but though one crashed in taking off, the other two were able to operate and at least two enemy aircraft were brought down. Refuelling was done from 4-gallon tins\* on the landing ground and patrols continued over the area of military operations, making possible the evacuation of 2,000 Army troops from Rognan and earning special commendation from the military authorities, who were thus enabled to extricate their men from a precarious position at a crucial time.

On May 26, the Hurricanes from the *Glorious* attempted to land at Skaanland. The first machine made a difficult but successful landing, the second turned up on its nose; two more got down safely, but another accident occurred to the fifth. It was considered that Skaanland was unsuitable for further operations and the remaining Hurricanes were directed to Bardufoss to join the Gladiators of No. 263 Squadron. From May 27 until evacuation both squadrons operated from this station. The pilots of No. 46 Squadron made their first contact with the enemy on May 27-28, when they brought down a Junkers 88 and destroyed two four-engined flying boats at Rombaksfjord where combined military operations were in progress. At the same time a section of No. 263 Squadron delivered ground attacks on the German troops embarking at Beisfjord (adjoining Narvik) and also made many raids, including one on the German headquarters at Hundaalen near the Narvik-Lulea railway. The strong air attack delivered by the enemy on Vestfjord (between the Lofoten Isles and the mainland between Bodö and Narvik) was broken up by the Hurricanes. Narvik was, in fact, retaken by the Allies on May 28.

On May 30, bad weather interfered with all but a few sorties which were made by No. 263 Squadron; operations by the latter were at a standstill on the 31st but No. 46 Squadron patrolled the Harstad and Skaanland area and also covered the Bodö evacuation during the evening.

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\* In view of the quantity of petrol required for an aircraft this method of fuelling was most laborious and time-consuming.

On June 1, the weather was still bad, but the next day a large number of sorties was made by both squadrons and there were many successful engagements. Bad weather was experienced again on June 3, 4 and 5, during the period when the withdrawal of the Forces began. On June 6, patrols continued and it was noted that the enemy showed no inclination to engage. At midnight on June 6, the remaining 10 Gladiators led by a Swordfish and accompanied by Hurricanes from No. 263 Squadron took off and landed successfully on the *Glorious*. Thus ended the operational activities of the two squadrons with 26 confirmed and 5 unconfirmed victories by No. 263 Squadron and 11 confirmed and 8 unconfirmed by No. 46 Squadron. The remainder of the ground personnel of the two squadrons and all base headquarters staff embarked for the United Kingdom at various times between June 3 and 9, arriving home between June 10 and 13.

On June 9, occurred the tragic loss of the *Glorious*, sunk by the German units *Scharnhorst* and *Gneisenau*; among the casualties were 16 R.A.F. officers, including the Commanding Officer of the Air Component, and three sergeant pilots.\*

#### MEDICAL NARRATIVE

In the following account the Harstad and Narvik expedition is dealt with exclusively, as no account of medical arrangements is available for the Aandalsnes ('Primrose' and 'Sickle') operation referred to at the beginning of this chapter.

#### OUTWARD VOYAGE

Headquarters staff, No. 4 Base Area, and ground personnel of No. 263 Squadron, accompanied by the Principal Medical Officer, and the medical officer of No. 263 Squadron, sailed from Leith in the M.S. *Chrobry* on May 7. Army personnel (including R.A.M.C.) were also on board and arrangements were made for first-aid posts to be suitably manned and dispersed over the ship. Equipment was provided from the contents of Nos. 1 and 2 medical camp boxes, two medical companions, one surgical haversack and a packet of 40 shell dressings. Improvised rope tourniquets and buckets of strong tea (for burns treatment) were also held at each post. The accommodation on the ship was satisfactory and apart from seasickness the journey was uneventful, Harstad being reached exactly four days after sailing. On arrival the weather was cold, several inches of snow remaining on the ground.

A similarly uneventful journey was experienced by the medical officer of No. 46 Squadron who, also accompanied by ground staff of

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\* See section 'Medical Narrative—Casualties'.

the squadron and R.A.M.C. personnel, reached Harstad on the M.V. *Battery* on May 17.

#### GENERAL MEDICAL ARRANGEMENTS

The Air Component, N.W.E.F., comprised a R.A.F. Headquarters and two fighter squadrons (Nos. 46 and 263) and included No. 4 Base Area Headquarters, Base Personnel Staff Office, Base Accounts Office, Port Detachment Office, Equipment Section and Base Erecting Party; personnel of No. 3 Transportable W/T Unit and No. 11 Observer Screen were also among the units located at the military base at Harstad. Other units of the Air Component were eventually located at Bardufoss aerodrome, while No. 11 Observer Screen was scattered at various points including Bodö, Bardufoss, Harstad and the adjacent village of Merkur. Sjövegan and Sörreisa, which acted as landing points for transport of personnel and stores to the aerodrome at Bardufoss, accommodated port detachments at various times, and Sörreisa was used as the embarkation point when personnel were withdrawn from Bardufoss aerodrome. Works services were under an officer attached to Headquarters for liaison with the Royal Engineers, who undertook the actual building, man-power for aerodrome construction being supplemented by Norwegians.

The strengths just prior to the evacuation are shown in the table below. Total personnel were 73 officers and 940 other ranks.

<i>Harstad</i>		<i>Off.</i>	<i>O.R.</i>	<i>Skaanland</i>		<i>Off.</i>	<i>O.R.</i>	
Headquarters . . .	15	84	Servicing Flight . . .	—	32			
No. 4 Base Area . . .	6	132	No. 46 Squadron . . .	3	—			
No. 3 Transportable								
W/T Unit . . .	2	64	Total		3	32		
No. 11 Observer Screen	4	116		—	—			
(Servicing Flight) . . .	11	51	<i>Bardufoss</i>					
Total	38	447	No. 263 Squadron . . .	17	273			
	—	—	No. 46 Squadron . . .	14	164			
			No. 11 Observer Screen	—	14			
				—	—			
			Total		31	451		
				—	—			
<i>Bodö</i>			<i>Sörreisa</i>					
Reconnaissance Party . . .	—	—	Port Detachment . . .	1	10			
No. 11 Observer Screen	—	—		—	—			
			Total		1	10		
				—	—			

R.A.F. medical personnel comprised the P.M.O. with 5 medical orderlies at Headquarters; the M.O. of No. 263 Squadron and 7 medical orderlies; and the M.O. of No. 46 Squadron with 3 medical orderlies.

There were 3 additional medical orderlies in No. 4 Base Area and one in the Servicing Flight. Medical equipment to Scale Z.1\* was provided for each squadron, but in fact only one set was available during the campaign and this had to be shared by the two squadrons. Though the wide dispersal of personnel seemed to indicate the need for a Medical Receiving Station, the shortness of the campaign made such provision impossible.

A large number of Army personnel were distributed throughout the area of operations and hospital facilities were organised by the R.A.M.C. Military medical units included 137 and 147 Field Ambulances, 22 British General Hospital, 21 and 25 Field Hygiene Sections, 21 Mobile Bath Unit, Personnel and Ambulance Transport and Base Depot Medical Stores. The Army maintained 22 General Hospital at Harstad to which R.A.F. hospital cases were transferred and also a Casualty Clearing Station at Taarstad whence R.A.F. and other casualties were transferred to the general hospital. Harstad also possessed a civil hospital which was not used by the British Forces, though arrangements had been made by the A.D.M.S. to make use of Norwegian hospital facilities at Moen and other locations should this be necessary. There was also a 600-cot hospital ship temporarily available in the Harstad area.

It was arranged with the British military authorities that full use of the existing medical facilities would be made on a reciprocal basis, the R.A.F. dealing where necessary with Army casualties at outstations and the R.A.M.C. admitting R.A.F. casualties requiring hospital treatment. R.A.F. medical facilities were in fact made available to military personnel chiefly at Bardufoss; to naval personnel injured in the sinking of H.M.S. *Curlew* at Skaanland; and to Norwegian civilians working on aerodrome construction at Skaanland and Bardufoss.

22 British General Hospital in Harstad had 450 beds and was eventually installed in five separate houses scattered throughout the town. It was made clear that while this hospital could accommodate normal R.A.F. sick, it could not guarantee to deal with casualties on a large scale. It was for this reason that the proposal was made for a M.R.S. to be dispatched to Norway, but the campaign was over before the necessary arrangements could be completed.

The provision made for casualty evacuation from R.A.F. out-stations included ambulances, aircraft and fjord transport. Water transport was ample as there were two fjord steamers, each capable of carrying 70 stretchers and having in addition two tenders which could take 40 more cases. Another ship, a Norwegian ice-breaker, was fitted with stretcher gear, making it possible to accommodate six stretcher cases,

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\* See R.A.F. Volume I, Chapter 8, page 432.

20 further cases in bunks and 100 sitting patients. Two Walrus aircraft, one of them always stationed at Harstad, were available for air transport and for the use of the P.M.O. while home-based Sunderland flying boats provided additional transport.

*Messing.* R.A.F. catering was undertaken by the Army, active service rations being issued to the usual scale. Fresh vegetables were practically unobtainable, nor was it possible to procure eggs, butter or cheese locally in any but very small quantities. 'Comforts' parcels were received from the U.S.A. and a rum ration was issued occasionally. Diet was supplemented by ascorbic acid tablets which, however, did not always reach the outlying units owing to transport difficulties. There was a N.A.A.F.I. at Harstad, 100 yards from the billets in which the men were living, and another one was opened at Skaanland, both providing most welcome facilities for relaxation.

It was impossible for the P.M.O. to visit all the very distant out-stations owing to the shortness of the campaign and the obvious transport difficulties in such mountainous terrain, but visits were paid at various times to Skaanland, Bardufoss, Sjövegan and Sörreisa.

*Clothing.* Special arctic clothing was issued to all ranks on the outward journey. This comprised fleece-lined ankle-length coat, sleeveless leather jerkin, rubber ankle boots and special issues of stockings. The coats proved valuable and were generally worn, but the other equipment was seldom used. The bulkiness of the clothing proved a handicap to mechanics working on aircraft, while the impossibility of wearing gloves while carrying out intricate and delicate mechanical tasks out of doors created a problem which would have demanded very careful consideration by both the executive and the medical branch had the campaign lasted longer.

#### CONDITIONS AT MAIN CENTRES

*Harstad (including Merkur).* The port of Harstad lay on the western bank and at the outlet of a small fjord,  $1\frac{1}{2}$  miles long and half a mile broad and running north-south. It made an ideal anchorage and the water was sufficiently deep to allow disembarkation from a 5,000-ton ship direct on to the quay. The buildings were mainly of wood and comprised approximately 200 houses with a small shopping centre in the main street; there was a church and a large civil hospital accommodating between 200 and 300 patients. Metalled roads in the town gave way to country roads within half a mile. On arrival on May 11, R.A.F. personnel were accommodated in billets, arranged by the military authorities, which consisted of a barn housing cattle, some 3 miles out of the town; the airmen slept in the hay-loft. Subsequently the Headquarters offices and the officers' mess were established in a medium-sized eight-roomed house in the town and the airmen were

brought back from the barn and accommodated partly in the out-buildings of the church and partly in other small houses in the town. Headquarters and the officers' mess were then moved to a farmhouse on the outskirts, and use was also made of further houses in the town itself.

Work began at once on unloading stores from the quay and a party of 75 men was sent down to Skaanland to commence preparations for the reception of the Hurricane aircraft of No. 46 Squadron. The first bombing of Harstad (on the docks) occurred on May 14 and raids continued at intervals throughout the whole stay. Eventually adequate protection from air attack was obtained in a large cellar.

Medical arrangements were facilitated by the existence of the Military General Hospital and by the fact that the water supply in Harstad was potable. Chlorination by bleaching powder and ammonium chloride was, however, carried out pending arrival of the R.A.F. water carts. Hot baths were available from civilian sources and good use was made of them.

A small group of buildings on the side of the fjord opposite to Harstad comprises the village of Merkur where personnel of No. 11 Observer Screen and of the R.A.O.C. were stationed. There was ample billeting accommodation but in view of the proximity of a fish manure factory it was arranged that all non-essential personnel should be moved elsewhere. Cooking was done in the open by field kitchen, food being stored in tins. Sanitation consisted of water and earth closets to which repairs were required. The water supply from a nearby stream, though pure, was boiled as an extra precaution; the water in the billets was found to be heavily contaminated and unsuitable for drinking purposes.

*Sjövegan.* This was a small hamlet on the Sagfjord,  $3\frac{1}{2}$  miles from Salangen. It had a quay on which shelving was built, so that stores and lorries could be taken off from naval landing craft. The village lay partly overlooking the fjord and partly alongside the fjord itself.

Sjövegan formed the landing point for personnel and stores of the advance party of No. 263 Squadron, stores being transferred *via* Bardu to the aerodrome at Bardufoss. The first party arrived on May 11 and was billeted in small private houses each accommodating 8-15 men. Medical facilities were made available by the local chemist and the squadron M.O. made contact with the M.O. of the Polish troops in the vicinity. Personnel engaged in loading and unloading stores remained at Sjövegan for approximately three weeks, which allowed water-purification materials and containers to be obtained and bucket-type latrines to be erected; the soil was not deep enough to allow disposal by deep trenching so excreta was emptied into the fjord. The road from Sjövegan to Bardufoss was very bad owing to the melting snow

and eventually the village was evacuated except for a Care and Maintenance Party, Sörreisa then being used as the landing point for communication between Harstad and Bardufoss.

Some air raids were experienced, but there were no casualties and little damage, most of the bombs falling into the fjord. A medical orderly accompanied each of the convoys across to Bardufoss, as the journey took anything up to fourteen hours.

*Skaanland.* Skaanland consists of a scattered collection of small houses, running north-west and south-east by the side of the fjord which separates the mainland from the Island of Hinno on which Harstad is situated. It lies almost due south of Harstad and is 16 miles from it as the crow flies. The fjord itself formed an important naval anchorage and there was a pier on a small peninsula, which was used for landing stores.

Skaanland was to have provided an aerodrome for the Hurricanes of No. 46 Squadron but the surface of the landing strip, despite all kinds of treatment, proved unsuitable and the squadron was transferred on May 27 to Bardufoss (*via* Sörreisa) whence it operated with No. 263 Squadron.

The advance party, including the M.O., was conveyed to Skaanland immediately after reaching Harstad, using small fjord motor fishing boats (nicknamed 'puffers' by the R.A.F. because of the sound they made). A considerable number of Army personnel were already billeted there, but adequate accommodation for the R.A.F. contingent was available in small wooden houses, near the landing strip and approximately one mile from the pier. Some 30 of these were taken over. The cookhouse was set up in the building which normally housed the school, a field kitchen being built outside, and petrol stoves, part of the squadron's mobile equipment, were used for heating purposes. Messing was, as at Harstad, from active service rations provided by the Army, but again no fresh vegetables were obtainable, though a little cod was caught in the fjord and a few magpies shot and eaten.

A small sick quarters had already been arranged by the R.A.M.C. and this was at first shared by the R.A.F. medical staff, until a more suitable house a mile farther north from the church was taken over with the assistance of an officer of the Norwegian Navy who lived in the village. From the moment of arrival until the move to Bardufoss work proceeded on the preparation of the landing ground and on the building of blast bays for dispersal behind the row of buildings facing the fjord.

Sanitation at Skaanland was primitive, consisting of lean-to sheds built at the back of the house and containing simple latrines with no arrangements for the disposal of excreta, which accumulated on the ground and was normally spread as manure in the vicinity of numerous

shallow wells which provided the only water supply. The latrines were cleaned up and disinfected as far as possible, excreta being disposed of by man-handling into the fjord, and, owing to the favourable tides, proving no nuisance. Bucket latrines were then arranged, using the same system of disposal, for the shallow nature of the soil made disposal by deep trenching out of the question. Urine buckets were also provided and, for the short time that personnel were at Skaanland, sanitary arrangements were satisfactory.

The water supply from the wells being highly suspect, chloramination was adopted and pending arrangement by the R.Es. of a permanent water supply (which did not materialise before the squadron left for Bardufoss), water for drinking purposes was boiled. A 500-gallon water cart was earmarked for Skaanland, but did not arrive in time.

A Mobile Bath Unit belonging to the Army was put at the disposal of the R.A.F. who would otherwise have had to rely, apart from improvisation, on two shower baths attached to the houses.

The small hospital, which was capable of accommodating 17 patients, was taken over on May 25, and the squadron mobilisation medical stores were moved in the same day. A Bedford ambulance had also been provided. This hospital fortunately had a good water supply, electric light and a kitchen complete with stove. On May 26, one of the now frequent air raids on the naval anchorage resulted in a near miss of the anti-aircraft cruiser H.M.S. *Curlew*. Four serious (various fractures and lacerations together with bright red staining thought to be due to the explosive) and ten minor casualties were sustained among naval personnel and these were taken by ambulance to the hospital for treatment; they were evacuated by destroyer that evening to 22 British General Hospital, Harstad, under the care of the Surgeon Lieutenant of the *Curlew*.

The same evening the squadron's Hurricanes which had flown off the aircraft carrier *Glorious* attempted to land at Skaanland, but accidents (without casualties) to two machines out of five caused the rest of the squadron to be diverted to Bardufoss.

On May 27, orders were given to pack all stores and except for a small detachment left behind until the final withdrawal on June 8, the squadron personnel, with their M.O., embarked on a lake steamer for Sörreisa which was reached late that night.

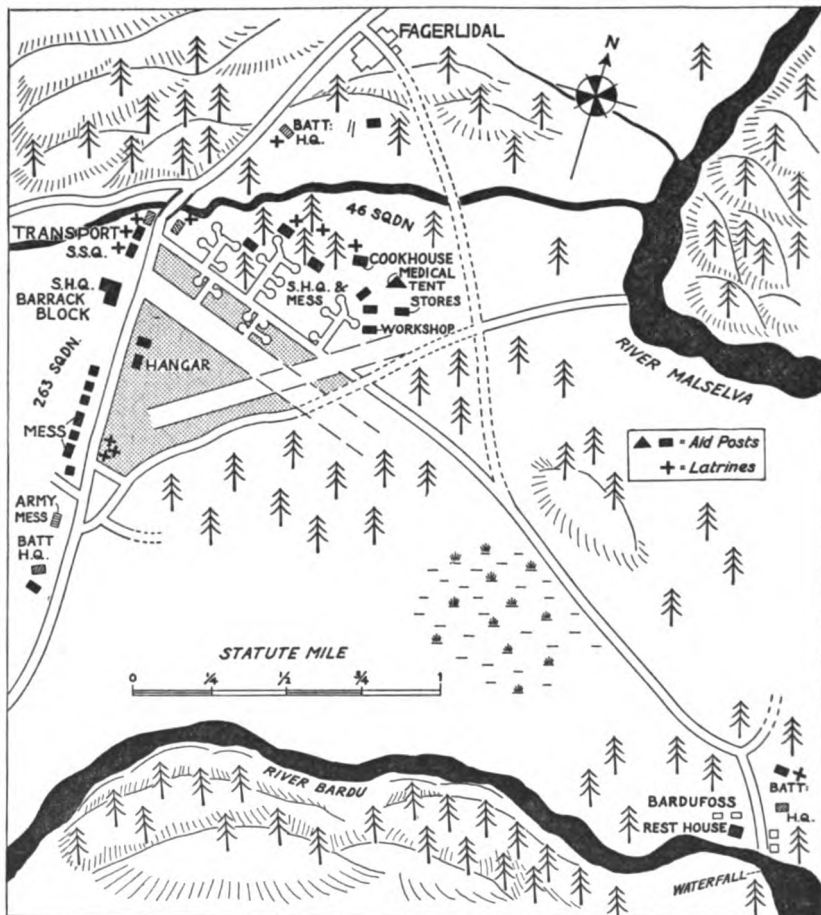
*Sörreisa*. Sörreisa is a small village on the Solbergfjord. Its jetty and its proximity to Bardufoss (by a fair road of about 20 miles) made it suitable for landing personnel and stores. It housed a port detachment of R.A.S.C. and D.I.D.\* and was used as an embarkation point during the evacuation of Bardufoss. On arrival from Skaanland personnel of

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\* Detail Issue Depot.



No. 46 Squadron unloaded their equipment and stores and moved them to a field about half a mile from the jetty. The M.O. loaded his equipment on to a lorry and proceeded at once to Bardufoss where the contents were unloaded in a wood near the edge of the aerodrome.



MAP 3. Bardufoss.

*Bardufoss.*\* In peace-time Bardufoss was a civil aerodrome situated inland some 12 miles east of Sørreisa in wooded country. When first visited by the M.O. of No. 263 Squadron on May 15, Army personnel were already installed and work was proceeding on the preparation of the aerodrome to receive the squadron's Gladiator aircraft. Work had begun on May 1. Blast-proof shelters were being constructed to accommodate the aircraft, while Norwegian civilians, at one time

\* See Map 3.

numbering 900 and working in gangs under the control of the R.Es., were levelling and removing snow and ice from the surface of the landing ground and extending the runway by clearing the wood to the east. Apart from the R.Es. the other military units consisted of anti-aircraft batteries, guns being placed surrounding the site and at other points, mainly on the western boundary.

A wooden barrack block previously used by the Norwegians and capable of sleeping 190 men, was fortunately available and there were a number of small houses which would provide messes and other accommodation for the personnel of No. 263 Squadron. In addition, tentage was available and many of the men lived under canvas and later in wigwams of their own construction in the woods. Use was also made of a few rooms at the side of the disused and partially demolished hangar on the western boundary of the landing ground. Eventually very satisfactory air-raid shelters, four to five feet deep and in some cases with double log walls supported by layers of laminated stone, were built at various points and exceptionally good protection from air attack was provided for all personnel on the station, camouflage being simplified by the plentiful supply of foliage from the trees. The shelters were drained to ground water level, 2 metres below the surface, and were of solid construction.

On arrival from Skaanland the personnel of No. 46 Squadron were accommodated in tents in the woods on the northern boundary of the aerodrome adjacent to the aircraft dispersal bays known as the 'clock-golf course'. The operational side of the squadron's activities was controlled by the Station Commander from the Norwegian barrack block, which also housed the personnel of No. 263 Squadron, but No. 46 Squadron had its own medical tent, stores, cookhouse and workshop in the site already mentioned and remained there during its eight days' stay.

Though the three-storeyed wooden barrack block had a water carriage system, arrangements for the station as a whole necessitated field sanitation. Shallow trench latrines with separate urinal soakage pits were therefore provided, despite the extreme hardness of the ground from frost. Later, Army bucket type latrines were obtained in adequate numbers and sewage disposal was undertaken by the Norwegian Army.

With the use of Army water carts, supplies of water for drinking and cooking purposes were made available to all R.A.F. and Army units on the station twice daily. A spare 500-gallon water cart was also obtained as a water store.

Very efficient medical arrangements designed by the medical officer of No. 263 Squadron were put into operation at an early date. These comprised a system of six first-aid posts, each containing beds and equipped as dressing stations, dispersed in various parts of the station,

and the training (necessitated by the absence of R.A.M.C. personnel) of 40 gunners from the batteries in the first principles of hæmostasis, immobilisation of injuries and stretcher bearing. Use was made of the existing telephone system so that the M.O. could be informed of casualties at once in his station sick quarters. The latter was a log cabin 30 ft.  $\times$  15 ft., close to the aerodrome and having, like the air-raid shelters, double walls and roof supported by stones and well guarded by trees. It was fitted with six bunks of the ship bunk type arranged end to end in two tiers; a battery supplied an electric light system devised by the medical officer, and a sterilisation-by-boiling system was also provided with suitable containers for storage of sterilised water. (See Fig. below.)

An Army ambulance and a motor cycle were available to enable the medical officer to visit out-stations. A still more ambitious hospital was in the process of construction near the waterfall  $1\frac{1}{2}$  miles to the south-east of the aerodrome, but this was not completed in the short time

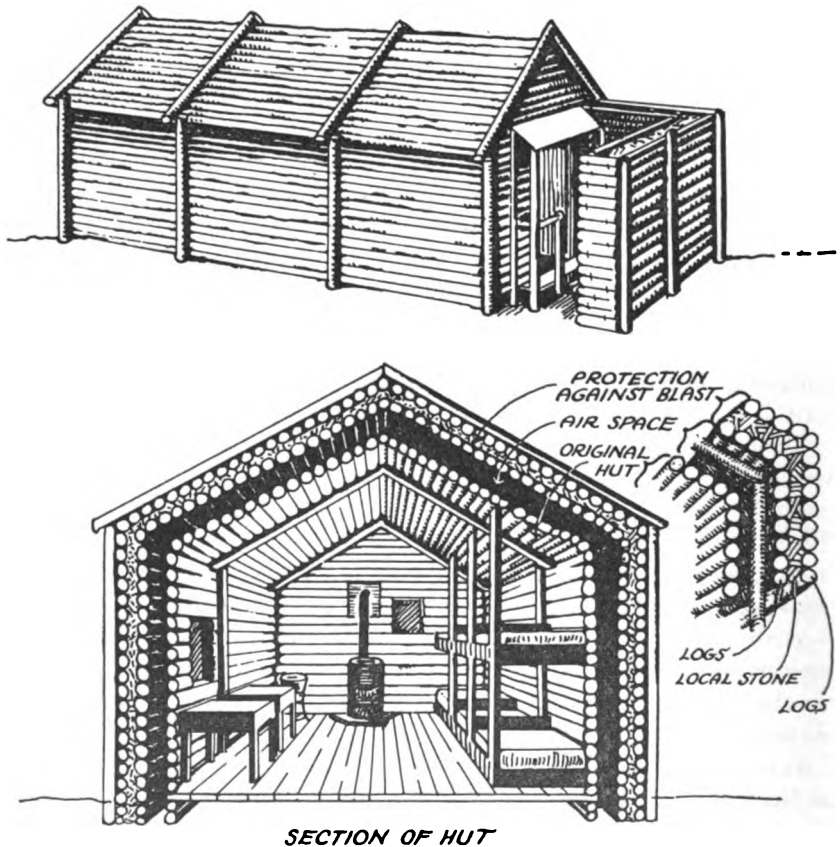


Fig. 1. Diagram showing the construction of R.A.F. Sick Quarters, Bardufoss.

that both squadrons were operating at Bardufoss. The adjacent 'Rest House' (actually two buildings), however, was made full use of by the many pilots who were sent there for a good night's rest and a half day's leave. Four pilots reported to the rest-house each evening, their Norwegian hosts cooking supper and breakfast for them.

There was remarkably little sickness on the station and though raids were not infrequent there were only two fatal casualties.

Medical personnel on the station consisted of the 2 squadron medical officers, 1 sergeant, 2 corporals and 7 aircraftman nursing orderlies. First-aid facilities were available for the Norwegian labourers and were appreciated.

Preparations for the evacuation of the station were begun on June 1, 1940.

#### WITHDRAWAL AND RETURN VOYAGE

Units of all forces were withdrawn during the five-day period June 3 to 8, evacuation being effected by 'puffers' and/or destroyers from four main areas: Harstad, Skaanland, Sørreisa and Salangsverket (near Sjøvegan). The destroyers transferred the personnel to transports lying some 60 miles off shore and it was possible to provide air protection for most of the parties. The evacuation from Bardufoss was carried out *via* Sørreisa, small parties leaving at intervals and assembling some distance from the station in the woods, where they were picked up by lorries and transferred to the coast. The remaining serviceable aircraft (Hurricanes and Gladiators) were flown on to the *Glorious* on June 7 and 8.

Apart from the disastrous loss of the aircraft carrier, the evacuation of the whole of the Air Component, N.W.E.F. was effected without casualty, and very few serviceable stores were left behind.

The P.M.O. and the two medical officers left in three different parties, so that medical provision was adequate for each phase throughout the five days of the movement.

#### HEALTH OF PERSONNEL

During the whole campaign general health was on the whole good; apart from the few fatalities and battle casualties, very little sickness occurred and there were no epidemics. Despite the great strain imposed on the pilots by the almost continual air operations (in this Arctic area the nights were very short), no serious fatigue was evident; this was no doubt due in part to the use of the rest-house at Bardufoss, the low casualty rate and the very fine fighting spirit shown by the pilots of both squadrons. The ground staff also showed a high standard of fitness, though morale under air attack was at first somewhat shaky; several cases of minor neurosis occurred in the older men and the majority of

the men were understandably frightened at the start. One statement made at the time speaks of 'a large proportion of all ranks being in a state of jitters, resulting in inability to think clearly, issue logical instructions or take energetic measures'. However, as soon as it was seen that the damage from air attack was small and that good protection was available, morale was immediately raised, though the constant stream of bad news over the wireless from home did not fail to have its effect. The general spirit of all ranks in the end was both resolute and confident.

#### MEDICAL EQUIPMENT

Apart from deficiencies in the chemicals and churns for the water cart and the inaccessibility of medical equipment on the outward voyage (both of which appear to have been due to the large quantity of material which had to be loaded and unloaded) medical stores problems call for little comment. Each squadron was equipped to Scale Z.1 of A.P. 132.\* On May 18, the P.M.O. suggested additions comprising a further issue to Scale Z.1 and an issue to Scale Z.4b which would be split if necessary, for the whole expedition. The proposal to employ Walrus Amphibian Aircraft for casualty evacuation from outlying districts caused Neil-Robertson stretchers to be recommended as additional equipment, but there is no record of these being used.

#### CASUALTIES

Casualties, apart from losses in the sinking of the *Glorious*, were remarkably few. In the Aandalsnes land operation only two (officer) casualties are recorded—both due to bomb injury and neither fatal. One was a case of a lacerated wound of temple with delayed symptoms of concussion accompanied by minor skull fracture, the other had blast damage to both ear drums.

In the Harstad expedition there were only four fatal battle casualties, and one fatal flying accident. Air raids, though not infrequent, accounted for but two deaths, and there was one fatal shooting accident. (Total deaths—eight.) Surviving battle casualties were five, four with gunshot wounds (two of them with fracture), and one with multiple cuts and bruises; there was also one flying injury (slight abrasions and burns). One naval officer attached to No. 263 Squadron was a battle casualty, but is not included in these figures. Non-fatal air-raid casualties totalled three (all lacerated wounds, one with fracture and one with joint penetration). Of other injuries (ordinary accidents) there was one sprained ankle and one case of synovitis, while ordinary sickness cases (over

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\* See R.A.F. Volume I, Chapter 8, page 432.

48 hours) amounted to seven (laryngitis, tracheitis, furunculosis, whitlow, synovitis, dyspepsia and scabies).

Losses from enemy action at sea (sinking of the *Glorious*) included the Commanding Officer of the Force, six officers from No. 46 Squadron and nine officers from No. 263 Squadron—total sixteen officers missing. Two sergeant pilots from No. 46 Squadron and one from No. 263 Squadron were also lost in this sinking. Thirty-six other ranks—mainly servicing personnel from Nos. 802 and 823 Squadrons, together with some headquarters staff from the *Glorious*—were also posted missing, five of them subsequently confirmed as killed and one as 'safe'—net total thirty-five other ranks missing or killed. (As the personnel of Headquarters *Glorious* and Nos. 802 and 823 Squadrons were not strictly part of the land operation these casualties are not included in the following table.) One officer was wounded at sea during the return voyage from Aandalsnes (shrapnel wound of leg). Two survivors (pilots) from the *Glorious* suffered from exposure neuritis, after being on a raft in the North Sea for two and a half days.

*R.A.F. Casualties—Norwegian Operations*

	Killed or died			Wounded or sick			Total casualties		
	Off.	O.R.	Totals	Off.	O.R.	Totals	Off.	O.R.	Totals
Battle casualties .	4	—	4	5*	—	5	9	—	9
Flying accidents .	1	—	1	1	—	1	2	—	2
Air-raid casualties	—	2	2	2†	3	5	2	5	7
Enemy action at sea	16‡	3‡	19	3§	—	3	19	3	22
Other injuries .	—	1	1	—	2	2	—	3	3
Disease .	—	—	—	2	5	7	2	5	7
<b>Totals</b>	<b>21</b>	<b>6</b>	<b>27</b>	<b>13</b>	<b>10</b>	<b>23</b>	<b>34</b>	<b>16</b>	<b>50</b>

\* Includes casualties among personnel of special duty flight operating over Norway from home base on May 5, 1940, who came under R.A.M.C. care at Bodö.

† Aandalsnes operation.

‡ Missing.

§ Includes 2 exposure neuritis cases.

|| Shooting accident.

Total strength on June 4, 1940: 73 officers, 940 other ranks (see 'General Medical Arrangements').

Of the casualties occurring in Norway, six were admitted to 9 Ambulance Train at Bodö and evacuated by sea to 22 British General Hospital, Harstad, which also admitted cases direct from the units at Bardufoss and elsewhere. Evacuation to the United Kingdom was thence by Sunderland flying boat and hospital ships. On arrival in the United Kingdom cases were admitted to Naval, Military and Civil Hospitals prior to granting of sick leave, transfer to R.A.F. Hospitals, and boarding. All wounded flying personnel subsequently regained full flying category. Admissions and transfers are shown overleaf:

**A. Admissions to 22 British General Hospital:**

May 1940. Seven officers and seven aircraftmen.

**B. Transfers:****1. To Hospital Ship *Aba*:**

May 30, 1940: Two corporals and one aircraftman.

**2. To United Kingdom by Flying Boat:\***

May 31, 1940: Five officers.

**3. To Hospital Ship *Atlantis*:**

June 3, 1940: One officer and one aircraftman.

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\* This was the only example of air evacuation of casualties during the campaign. A Sunderland Flying Boat arrived at Harstad bringing stores and spares on the day stated and arrangements were made by the P.M.O. for its captain to fly back five battle casualties then in 22 British General Hospital, Harstad. The patients were taken to the quay on ordinary stretchers, loaded on to a launch and so to the flying boat. The journey was uneventful and no difficulty was experienced in unloading on arrival in the United Kingdom. Oxygen was not available during transit, but fortunately neither the height at which the aircraft was flown, nor the condition of the patients, demanded it.

# CHAPTER 3

## MIDDLE EAST CAMPAIGN

### Libya and Tunisia: 1940-1943

#### INTRODUCTION

**I**N THIS MEDICAL NARRATIVE of the Middle East Campaign, it is only necessary to give a short account of the main phases of the series of operations which precipitated the downfall of the Italian Empire and led to the eventual expulsion of the Axis forces from North Africa. On this account will be based the story of the part played by the Medical Branch of the Royal Air Force in providing medical cover for the combatant forces, but primarily for the Air Force formations to which medical units were attached.

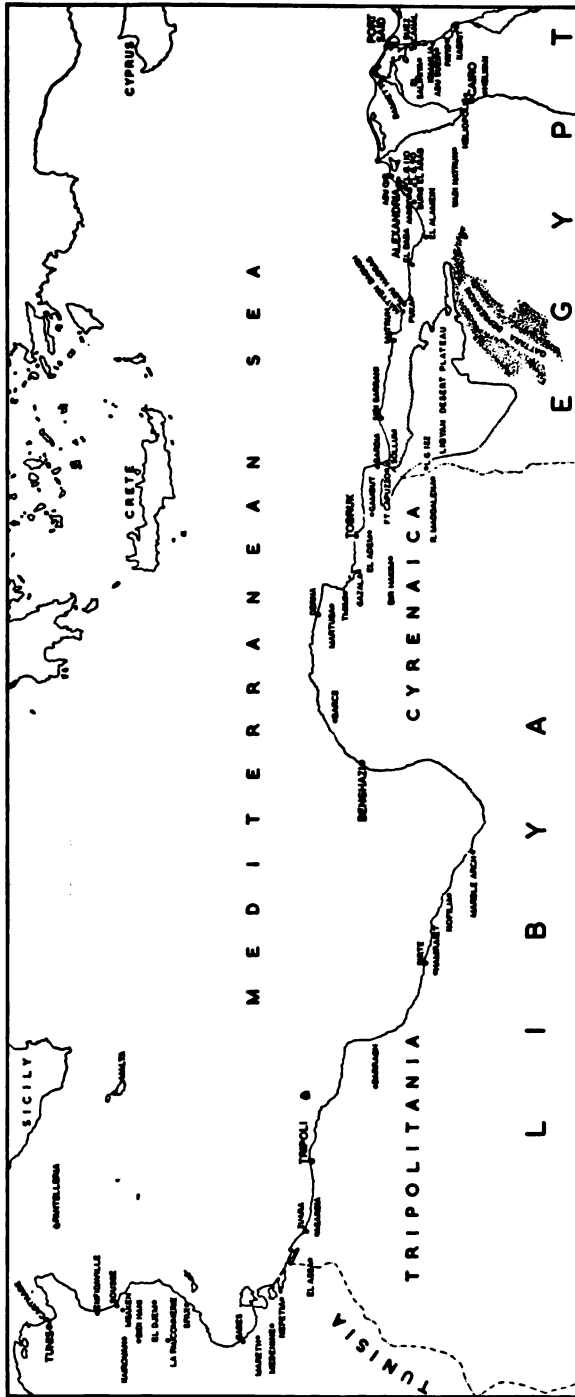
Operations commenced with the initial Italian advance into Egypt which was halted and scattered by the counter-offensive under General Wavell at the end of 1940, and carried his Forces 600 miles westwards to Benghazi and beyond. Shortly after this the Germans appeared in Africa, stiffening Italian resistance, while some of our strength was diverted to sustain the Greeks. The spring and summer of 1941 saw an Axis advance to the Egyptian frontier and the loss of Greece and Crete,\* for which the successful campaign in Italian East Africa and Iraq afforded some compensation. Next followed in November 1941, the offensive under General Auchinleck which relieved Tobruk and carried the Allies beyond Benghazi for the second time. But there the Axis forces rallied, fought back and by the summer of 1942 were within 60 miles of Alexandria. The loss of Tobruk and the threat to the whole Middle East position caused grave anxiety, but the defensive positions at El Alamein were held and in October 1942 the enemy was dealt a blow from which he never recovered. The final victorious advance westwards was sustained until May 1943, when, with the First Army closing from the west, Tunis was captured and the Axis occupation of the North African territory was brought to an end.

The initial aim of the Royal Air Force was to strike hard at the opposing Italian forces on the ground and in the air. This audacious offensive against vastly superior numbers and a force prepared for war was immediately successful and materially assisted General Wavell's attack. This made abundantly clear the tremendous advantage of full Army/Air Force co-operation and henceforward every effort was made to achieve the maximum mobility in the disposition of air forces so that

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\* See Chapter 4.





MAP 1. General area of operations in Egypt, Libya and Tunisia.

the closest possible support could be given throughout all the fluctuations of the ground battles.

As the changing local conditions in each successive phase of the campaign became apparent R.A.F. tactics were altered to suit the situation. Thus at some stages the enemy's aerodromes were the main objective; at others his supply areas were bombed and sometimes his sea communications across the Mediterranean; bases and harbours received the brunt of the attack as also did his armoured columns.

Throughout these ever-changing activities, the Medical Branch of the Royal Air Force had to maintain facilities for the care of the sick and injured and for the well-being of all R.A.F. personnel, particularly aircrew, from the most forward unit in the field through all lines of communication back to the base areas. The methods by which R.A.F. medical units—squadron medical inspection rooms, mobile field hospitals and general hospitals—adapted themselves to meet all eventualities are discussed in this narrative.

Map 1 illustrates the area of operations dealt with in this chapter.

#### CLIMATE AND TOPOGRAPHY

The climate and vegetation of Egypt is predominantly dependent upon the River Nile and the Mediterranean Sea. Egypt is for the most part an extremely flat country; it is relieved here and there by undulating hills. The surface is sandy with wide areas, mainly in the Western Desert, composed of rock and gravel supporting scrub growth. In the region drained and irrigated by the Nile is found alluvial soil which responds readily to cultivation.

The modifying effect of the Mediterranean Sea and the Nile make living in adjacent areas pleasant, warm in summer but cool in winter. Leaving the area influenced by sea and river and going eastwards towards the Suez Canal or westwards into the desert, one enters the barren sandywastes, where summers are most oppressive for the white man and where dust and sandstorms provide additional hardships. The diurnal range of temperature—up to as much as 70° F. in many areas—is another material factor.

Rainfall is most abundant in the period November to April, during which time torrential rain storms are frequent; but evaporation is so rapid that five or six hours of sunshine following a rain storm is usually sufficient to dry the superficial soil. The table overleaf records some relevant meteorological data for parts of Egypt in 1941.

#### CONDITIONS BEFORE THE WAR

##### R. A. F. ESTABLISHMENT

The normal Royal Air Force establishment in Egypt in the year 1938 consisted of the following stations:

## Some Meteorological Data for 1941 in Egypt

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
	Mean daily max. °F. .	70.5	74.9	74.4	84.4	97.8	93.8	96.8	94.8	87.8	83.8	80.8	66.5	Average 83.9
	Rel. humidity per cent. 0600 hours G.M.T. .	61	66	66	61	49	65	71	78	67	69	67	69	Average 66
	Rainfall (M.M.) .	—	3.6	6.7	—	—	—	—	—	—	—	—	1.7	Total 12.0
	Mean daily max. °F. .	70.9	75.3	73.9	83.8	96.1	94.3	98.4	97.6	89.4	83.9	81.1	67.2	Average 84.3
	Rel. humidity per cent.	77	77	70	65	55	65	70	72	67	78	72	79	Average 71
	Rainfall (M.M.) .	—	21.9	24.1	—	—	—	—	—	—	—	—	—	Total 46.0
Heliopolis (Delta area)														
Ismailia (Canal Zone)														

R.A.F. Station	Heliopolis	}	Operational Squadrons	
"	"			Ismailia
"	"			Helwan
"	"			Abu Sueir
"	"	Aboukir	Flying Training School	
			Stores Depot and Experimental Station	

In addition numerous desert landing grounds west of Cairo had been prepared in 1938 as the operational range of bomber aircraft at that time would not permit the bombing of objectives in Italian Territory from their bases in the Delta. On the outbreak of war immediate action was taken to construct six new permanent stations in the Canal Zone, this action having been previously delayed by prolonged negotiations with the Egyptian Government.

The strength of the Royal Air Force in Egypt at this time was 5,683 and from this small nucleus, reinforced first from Palestine, Transjordan, Persia, Iraq and Aden, and later from the United Kingdom, offensive tentacles stretched westwards along the North African coast, to Greece, Crete and the Dodecanese.

#### MEDICAL ESTABLISHMENT

Medical administration and the provision of medical attention for the five pre-war permanent Royal Air Force stations in Egypt was carried out by twelve Service medical officers, a wing commander (Senior Medical Officer) and one or two junior medical officers being established on most stations. In addition to his station medical duties the Senior Medical Officer at Heliopolis presided over the Headquarters Medical Board located there. A Command Medical Board was formed in May 1941. During the expansion of the Royal Air Force which followed, medical administration of new stations and units formed in the vicinity of the permanent stations was undertaken by the S.M.Os. of the latter. Ultimate responsibility for administration and policy in respect of stations in Egypt as well as those Royal Air Force establishments in Palestine, Transjordan, Persia, Iraq, Aden and the Sudan rested with the Principal Medical Officer, Headquarters, Royal Air Force, Middle East, who held the rank of group captain. Also on the staff of Command Headquarters was one wing commander (Deputy Principal Medical Officer, Hygiene) and two junior medical officers, one of whom was held in reserve for replacement in the event of sickness among other medical officers within the Command. Non-commissioned medical personnel on each station consisted of one sergeant, three corporals and five aircraftman nursing orderlies, with the addition of one flight sergeant at Command Headquarters and Heliopolis.

#### ACCOMMODATION

All the permanent R.A.F. stations in Egypt were constructed in 1918 and consisted of well-ventilated brick buildings situated on the

periphery of aerodromes. To combat heat and glare they were built of sufficient thickness to resist conduction and possessed surrounding verandahs, while interior electric fans were fitted on all domestic sites. Ablutions and other sanitary arrangements were of a high standard, all conservancy except that at Helwan being waterborne to the local municipal sewage farms. Full and varied recreational facilities existed on all stations, while abundant social amenities were available.

All station sick quarters were fully equipped and were capable of giving in-patient treatment. Serious cases or patients requiring protracted or specialist treatment were admitted to military base hospitals situated in Cairo, Ismailia and Alexandria. In view of the small numbers comprising the Royal Air Force at this stage, the provision of separate hospitals had not been deemed necessary, Army hospitals being utilised to cover R.A.F. personnel. Again, the extent of the Royal Air Force Medical Service in Egypt did not warrant the formation of a R.A.F. medical equipment depot, and all necessary stores were supplied through Army sources. Full dental facilities were available at Royal Air Force Stations Heliopolis and Aboukir, while dental officers made periodic visits to Ismailia and Abu Sueir where skeleton equipment was held.

#### TRAINING UNDER FIELD CONDITIONS

During the period between 1938 and the outbreak of war against Italy continual redeployment of operational units took place within the Middle East. Thus fighter and bomber squadrons performed short tours of duty at the newly formed desert landing ground between Cairo and Mersa Matruh. On such tours all medical personnel accompanied their units, each squadron having a medical officer, one corporal and two aircraftman nursing orderlies, and being equipped with one ambulance. During the tour the medical personnel, in addition to attending to sick or injured, supervised all sanitary and hygienic measures adopted under field conditions. Having completed this tour the squadron would return to its main permanent station in Egypt to be replaced by a different unit. This initial training under field conditions gave all ranks a valuable foretaste of conditions later experienced in war.

#### WAR DECLARED AGAINST GERMANY

##### EXPANSION ON MOBILISATION

Following the outbreak of war against Germany mobilisation began in the Middle East and further units moved to their allotted war stations. Expansion was slow as the man-power commitments of the Armed Forces in the United Kingdom were given greater priority. In the event of war being declared between Britain and Italy, the primary tasks of the British Forces in Egypt were to be:

- (i) To protect the Delta and Suez Canal, and
- (ii) To attack the opposing forces in Libya as early as possible.

Reorganisation of the Royal Air Force therefore followed. Units were transferred from other formations in the Middle East to Egypt, new units were formed, and established units expanded. Again those units not directly concerned with active operations were withdrawn from advanced positions and moved to the Suez Canal area, which eventually became an extensive base arsenal and training ground.

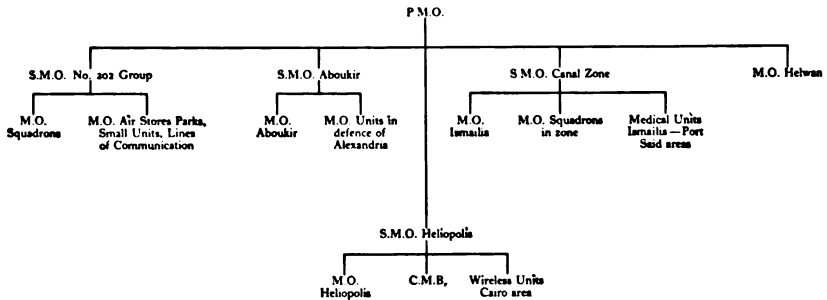
Headquarters, R.A.F. Middle East, was at first housed in Villa Victoria, Shawabri Pasha, Cairo, but this building was unable to accommodate the growing staff and further moves were made until finally it reached its permanent location in a modern block of flats situated in the garden city of Cairo. Decentralisation was progressively carried out to facilitate administration, the R.A.F. Forces in Egypt being divided into groups and zones. Increased medical authority was delegated to the Senior Medical Officers of particular areas.

No. 202 Group was formed at Heliopolis in September 1939, for operational control of air forces in the Western Desert. Its fighter and bomber squadrons were sent forward to the desert landing grounds and were directly administered by No. 253 Wing located at Maaten Baggush. At first the Senior Medical Officer, No. 202 Group, combined the duties of Senior Medical Officer with those of President of the Medical Board at Heliopolis, visiting the squadrons in the forward areas by air. In view of the imminence of war with Italy, Headquarters No. 202 Group moved forward to Maaten Baggush and absorbed Headquarters No. 253 Wing. A small tented station sick quarters was maintained at No. 202 Group Headquarters, medical equipment was full Z.1 scale and the staff at first consisted of three corporals (later one sergeant and two corporals), and two aircraftman nursing orderlies. Some months later the Group split into an operational headquarters situated at Maaten Baggush and an administrative headquarters at Abu Haggag, becoming re-united in January 1941 for the first advance. Hospital cases were evacuated by road or rail to field ambulances situated at Mersa Matruh or El Daba and thence by ambulance train to base hospitals in the Delta. No. 252 Wing formed at Shufahanya on the western outskirts of Alexandria for the direct control of the fighter squadrons defending the docks and port installations in Alexandria. Later, No. 256 Wing also formed there, and the two wings moved to Seagull Camp one mile west of Shufahanya. No. 201 Group was formed in September 1939 for coastal duties in the Middle East, developing from No. 101 Wing which had arrived earlier in the troopship *Dumana*. Station sick quarters with all personnel and medical stores were at first on board the troopship but were later brought ashore and located in a small permanent building near No. 201 Group

Headquarters, which was at this time situated in the German Boat Club buildings in Alexandria.

Arrangements in the Suez Canal Zone during this period underwent extensive changes. Abu Sueir became a large maintenance unit and acted as a reinforcement pool. The Senior Medical Officer, Canal Zone, had his office at this station and supervised the whole area from Damietta to Suez. New stations were rapidly appearing at Kabrit, Geneifa, Shallufa, Shandur and Fayid. Permanent station sick quarters with complete medical staffs were established at Abu Sueir and Ismailia only; later, as construction progressed, semi-permanent sick quarters equipped to scale A.I were erected at all new stations.

#### MEDICAL 'ORDER OF BATTLE' ON OUTBREAK OF WAR



#### OUTBREAK OF WAR AGAINST ITALY

At five minutes past midnight on June 11, 1940, war was declared against Italy. The Royal Air Force immediately took the initiative by attacking enemy aircraft and bases from aerodromes in the Western Desert. The following squadrons were at that time at war stations in the desert:

<i>Squadron</i>	<i>Aircraft</i>
No. 33 (F)	Gladiators
No. 55 (B)	Blenheims
No. 45 (B)	Blenheims
No. 113 (B)	Blenheims
No. 112 (F)	Gladiators
No. 208 (A.C.)	Lysanders

In addition these units were supported by stores parks and other ancillary formations. Following General Wavell's advance, however, Headquarters, No. 202 Group was disbanded and renamed Air Headquarters, Cyrenaica, located at Barce. In April 1941, the retreat led to the disbandment of A.H.Q. Cyrenaica and the formation of Headquarters, No. 204 Group at Maaten Baggush.

## FURTHER EXPANSION

During the first two years of active operations further fusion of units took place and new formations came into being. These changes were necessary owing to the progressive expansion and to the ever-enlarging area of occupation, and became so numerous that a clear picture is not readily obtained until the year 1941.

No. 204 Group Headquarters consisted of an advanced and rear headquarters, which administered the squadrons on the forward and base landing grounds respectively. This group was forerunner of, and in October 1941 became, advanced and rear Air Headquarters, Royal Air Force, Western Desert, later well known as H.Q. Desert Air Force. This division of the headquarters staff facilitated operational control by advanced headquarters in that it was not trammelled by the detailed administrative responsibility, this remaining at the rear headquarters.

No. 205 Group Headquarters assumed control from No. 257 Wing of all operational squadrons based in the Canal Zone, and eventually provided the heavy bomber striking force.

No. 206 Group Headquarters was initially formed within the framework of Command Headquarters, but later separated and controlled all maintenance units within the Middle East Command.

To facilitate the administration of the many and varied units within the boundaries of Egypt, No. 202 Group was reconstructed as Air Headquarters, Egypt in December 1941 to administer all Air Force personnel stationed there.\*

Middle East Command was thus reorganised throughout on similar lines to the organisation of the Royal Air Force in the United Kingdom—i.e. separate operational, training and maintenance groups. In addition, it was obviously necessary to equip all operational formations on a fully mobile basis.

As a result of this expansion further demands were made on the already overtaxed medical branch to provide additional staffs and equipment for new units. Acceleration of promotion to fill the new senior ranks may have provided compensation for the increase in work. By December 1941, the establishment of medical officers within Middle East Command had increased to:

- 1 Air Commodore†
  - 4 Group Captains
  - 12 Wing Commanders
  - 16 Squadron Leaders
  - 148 Flight Lieutenants or Flying Officers (including 2 Polish)
  - 27 Dental Officers and
  - 45 members of Princess Mary's R.A.F. Nursing Service.
- (plus a further 20 medical officers who were in transit to the M.E.)

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\* Title changed to A.H.Q. Air Defence, Eastern Mediterranean, March 18, 1943.

† Establishment for P.M.O. upgraded to Air Vice-Marshal in May 1942.



## SERVICE CONDITIONS IN THE FIELD

## UNIT SICK QUARTERS

Squadron or unit sick quarters normally consisted of a ridge tent capable of accommodating two beds and a second ridge tent to serve as treatment and consulting room. These arrangements were usually sufficient for the amount of medical work to be done, but were totally inadequate in the event of minor local epidemics of dysentery or similar diseases. Occasionally during air operations it was necessary for a particular squadron to act independently as two flights, each from different landing grounds. In such circumstances the advance medical staff would consist of a corporal and one nursing orderly, the medical officer with the second nursing orderly remaining at base. This procedure was reversed when a greater proportion of medical work occurred in the forward area. In such cases medical equipment had to be apportioned according to needs, and inroads were made into the Z.1 scale to adapt it to an easily portable form for emergency requirements. Many were the methods of improvisation used to produce or duplicate a useful instrument.

The type of warfare in the Western Desert made it imperative that most units should be converted into an independently mobile state, so that changes of location could be carried out expeditiously and therefore without disruption of air operations. Shortage of transport delayed this transition and it was not until late in 1942 that squadron and unit sick quarters were converted into mobile medical inspection rooms. The construction of these mobile M.I. rooms presented some difficulty, as even after their establishment had been approved no official aid was given, apart from the provision of one three-ton truck for each unit. Much of the necessary improvisation was left to the individual medical officer and his staff and by the use of tarpaulin, plywood and much ingenuity, modest consulting rooms were constructed, with couch, desk, panniers and armamentaria readily but securely to hand. Plates V and VI illustrate an improvised field laboratory. The great advantages were ability to treat on the move, immediately before and after a move, and ability to treat and examine patients in comparative medical rectitude, when the alternative was a small ridge tent at the mercy of the weather. Further, the arrangement greatly facilitated the packing of medical equipment on the numerous changes of location and enabled the ambulance to be used as such and not as the common transporter of medical stores.

During the month of February 1942, it was decided to group squadrons into wings of four squadrons each and to appoint to each wing a Senior Medical Officer of squadron leader rank. This overcame a disadvantage which was experienced in the advance to Benghazi in December 1941, when it was found impossible, owing to the lengthening

lines of communication, for the Senior Medical Officer, Advanced Air Headquarters, to maintain contact with all units.

With the growing tendency, for operational purposes, to locate a wing headquarters and its operating squadrons at a single airfield, a re-arrangement of medical provisions took place. Under these conditions it was not considered justifiable for each individual squadron sick quarters to maintain facilities for in-patient treatment; instead, the existing wing sick quarters were enlarged and adequately equipped for the reception of short term cases, while unit medical inspection rooms remained in existence for the daily sick parade and treatment of out-patients.

One of the greatest assets of the newly formed wing sick quarters was the fact that it relieved the load on the mobile field hospitals and thus facilitated the retention of personnel in the sphere of operations; by working in conjunction with the M.F.Hs. it allowed the latter to transfer patients, when a diagnosis had been made, for continuation or final treatment in the wing sick quarters, thereby freeing beds in the mobile field hospital. At the same time the wing sick quarters acted as casualty air evacuation centres and successfully evacuated thousands of patients. As regards the establishment of these units, the medical officer staff was adequate, but nursing orderlies and tradesmen were insufficient owing to the extra duties involved in the air evacuation of casualties. It was recommended that the medical officers on the establishment of the wing sick quarters should include M.Os. experienced in general surgery and medicine; this would do away with the necessity for covering a wing on the move by the 'A' party (surgical team) of a M.F.H. For the remainder of the staff one medical officer with a special interest in hygiene and sanitation as well as a 'Flying Personnel Medical Officer' was suggested.

Fortunately the supply of medical equipment for a 40-bed wing sick quarters did not cause undue anxiety as most wings procured the greater part of their essential equipment from enemy sources! (Plates VII to X show the use of valuable enemy equipment.)

#### TRAINING

During the static periods advantage was taken of the temporarily decreased activity to pass as many unit medical officers as possible through a short course including instruction on sanitation, hygiene, neuropsychiatry, surgery, medicine and the physiology of flying. This course was held at Almaza but it was felt that it would have been better appreciated had its venue been a more congenial locality such as the R.A.F. Hospital, Cairo.

It was considered that unit medical officers were not paying sufficient attention to the training of nursing orderlies and that there was

consequently a preponderance of junior N.C.Os. who were inadequately equipped to carry out the duties expected of them and the attention of all unit medical officers was directed to this omission. However, the rotational posting of nursing orderlies to medical receiving stations and to the hospital at Cairo without loss of continuity of key personnel did much to ensure maximum efficiency.

#### MEDICAL STORES

Medical stores and equipment continued to be obtained from Army sources. Demands were at first submitted six-monthly but the seven months' time lag between the demanding and the receipt of stores made it difficult to estimate requirements with any degree of accuracy and often resulted in a severe underestimation, while if a consignment was mislaid in transit an unnecessarily heavy loss resulted; accordingly, the Army procedure of monthly demands was later adopted by Royal Air Force medical units.

With the expansion great inroads were made into medical stores, especially when new units formed locally or when replacement aircraft arrived without scale C.1\* medical equipment. The replacement of non-expendable items caused further anxiety as the Army authorities were reluctant to supply, stating that the Royal Air Force had not allowed for these when estimating their reserves. Agreement was eventually reached whereby the Army supplied those items which were required urgently, provided that they were returned from R.A.F. sources in due course. Specialised medical equipment used for the examination of aircrew personnel, and therefore peculiar to the Royal Air Force, continued to be obtained direct from the United Kingdom. To ease the supply position a reserve of medical stores was built up at Royal Air Force Station, Aboukir, which in 1942 became a medical equipment depot. As the advance carried units farther west of Cairo, the long lines of communication made the supply problem more difficult. In December 1942, this was partly overcome by each medical receiving station carrying a surplus quantity of medical stores for the supply of those units within the area it covered; a corporal dispenser and an additional 3-ton truck were allocated to each medical receiving station and the latter became, as it were, an area medical stores depot whose quartermaster was responsible for meeting the reasonable demands of all Royal Air Force units in the area. Saving in transport was marked and it was possible to arrange fair distribution of stores in relation to need and supply. With the speed and distance of the final advance the adequate provision of medical supplies to units would have been almost, if not quite, impossible, without a system of this kind.

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\* See R.A.F. Volume I, Chapter 8, page 435.

## ACCOMMODATION

Life in the Western Desert restricted the amenities that had been enjoyed by all ranks while stationed in the Delta. Lack of labour and building materials hindered the provision of comfort on unit or squadron basis. All living and office accommodation was in ridge tents, while cookhouses and messes were made of prefabricated sectional hutting. Where units operated on a mobile basis the transportation of hutting was impracticable and greater use was made of tentage.\* Captured enemy vehicles or trailers, when suitable, were quickly transformed into workshops or briefing and intelligence rooms. With this change to mobility the advantage of many makeshift luxuries was lost on removal to another site, as carrying space was extremely limited.

## WATER SUPPLIES

The provision of an adequate water supply in the Desert was extremely difficult, in view of its scarcity and poor quality. Each unit was provided with a Fordson Sussex Electrolytically Controlled Dosing (E.C.D.) water tender. Numerous troubles were soon experienced with this vehicle:

- (i) The dosing panel was not sufficiently robust for Desert use, for glass tubes and bakelite fittings broke easily and could not be readily replaced.
- (ii) The filters were unable to deal with fine silt without frequent dismantling and cleaning.
- (iii) Water was seldom found in the Desert above 50/60 ft. and the pump was unable to raise water from this depth.

As an alternative measure filtered sterilised water was obtained from Army water points; for carriage of this supply a simple tank on a suitable chassis would have been more valuable than the specialist vehicle. At times during the advance in the Desert personnel had to subsist on water supplies which had a saline content of 170 parts per 100,000, this being ascribed to the excessive use of the few existing wells. At other times the majority of personnel in a unit would be suddenly stricken by an acute attack of enteritis due to the high magnesium sulphate content of the water supply; this was partly overcome by the addition of lime. Water rations during active periods in the Western Desert were never more than  $\frac{3}{4}$  gallon, usually half a gallon, and for periods of two to three days as little as two pints per day per man. Apart from personal discomfort no deleterious effects resulted from this scarcity except for a small increase in minor skin complaints.

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\* The quality of tentage issued at first was poor and its age and the application of camouflage paint soon resulted in rotting, so that minimal protection was afforded.

## FOOD SUPPLIES

All Service food rations were issued in bulk from Army sources (Detail Issue Depots) and the calorie value and balance of the ration scale was theoretically quite satisfactory. Owing, however, to transport difficulties and to periodic unavailability of certain commodities, it was not always possible to maintain a balanced diet. Occasional shortages of green vegetables, fresh potatoes and bread were noticed, becoming more acute during periods of mobile operations, when biscuits and canned meat were issued with monotonous regularity. Unit medical officers closely supervised the intake of rations and informed their headquarters whenever a prolonged deficiency of a particular foodstuff occurred. Efforts were then made to adjust any marked deficiency by the substitution of synthetic food factors (vitamins). For example, an insufficiency of green vegetables was counterbalanced by the issue to all ranks of vitamin C, in the form of ascorbic acid tablets. The success of this and similar measures was indicated during the North African campaign by the absence among Royal Air Force personnel of any deficiency disease resulting from an inadequate diet.\*

At some units it was occasionally possible to increase and vary the diet by the local purchase of fresh eggs, fruit and vegetables, the additional cost being borne by mess subscription. Airmen also made their own individual efforts to augment their ration, showing their usual ingenuity in doing so.

The preparation and presentation of cooked meals was not always of a high standard, owing to the lack of equipment or staff or to the inexperience of cooks, newly arrived in the Command, in the art of Desert cooking. In an effort to raise this standard, the medical authorities issued memoranda indicating and stressing the importance of the correct methods of cooking. In 1942 investigations were carried out by a Royal Air Force ophthalmic specialist and a nutritional expert as to the adequacy of the diet in the various units. Their findings may be summarised as follows:

- (i) The standard of cooking, under the conditions present, was satisfactory.
- (ii) Full ration scales were not always issued, resulting in a decrease in the calorie scale laid down, with consequent desire for a larger diet.
- (iii) A sub-clinical deficiency of the vitamins A and B existed among Royal Air Force personnel.
- (iv) There was an inadequate daily intake of vitamin C per man.

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\* The only case of hypovitaminosis which occurred in the Command in 1942 was in an officer who, after 3 months at Abadan on the Persian Gulf, developed mild pellagra with superadded symptoms of vitamin B deficiency.

The investigators therefore recommended that the rations should be augmented with such commodities as red palm oil, dried carrots and apricots, peanuts, vitamin B, and ascorbic acid tablets. In addition, it was suggested that in the event of a shortage of certain foodstuffs, items of similar calorie value should be issued in lieu.

It had long been recognised that poor dark adaptation and varying degrees of night blindness occurred in poorly nourished subjects. Deficiency of vitamin A was considered the main cause of this abnormality, but there were two indications in the campaign which gave support to the theory that other nutritional factors might be involved:

- (i) The administration of vitamin A to subjects in the Western Desert did not lead to the return of normal dark adaptation.
- (ii) Subjects on a particular station in the Sudan showed quite markedly poor adaptation in spite of the fact that liver—an excellent source of vitamin A—was being consumed in very large amounts, the equivalent of at least 10,000 international units per day per man.

During the visits to various units in the Western Desert it was most noticeable to these investigators that the standard of variety of diet in British units compared unfavourably with that in Dominion and American formations.

#### PRECAUTIONS IN PREPARATION OF FOOD

The Arab market gardener still uses the most primitive and unhygienic methods of raising his crops. He will water his ground from any available supply, and manure it with human excreta. As both are potential sources of such diseases as typhoid, bilharzia, dysentery and helminth infestations, strict precautionary measures were necessary before the consumption of purchased foodstuffs could be permitted. To obtain a measure of safety from infection, all thin-skinned fruit and vegetables which were eaten raw, had to be soaked in a weak solution of potassium permanganate or chloride of lime for thirty minutes, peeled if possible, and finally washed in clean water.

As a rule, local labour was not employed in the Western Desert during active campaigns, but stations in the more populous areas relied upon the natives to relieve the shortage of R.A.F. personnel. Although they were mostly employed in a menial capacity, some were engaged for cookhouse duties as cooks or food-handlers.\* The Arabs of Egypt, many of whom suffered from the chronic forms of numerous tropical diseases, are always potential carriers and their condition may be responsible for local epidemics. In order, therefore, to safeguard the

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\* Food-handlers consisted mainly of non-skilled native labourers employed for cleaning and peeling vegetables which were later boiled, steamed or disinfected. They were not permitted to touch prepared food immediately prior to consumption.

health of Royal Air Force personnel, stringent regulations were laid down governing the engagement and suspension of native labour. No unit was permitted to engage a cook or food-handler unless he had a clean bill of health, assessed on a negative result following examination for bowel infection, and until he had received full preventive inoculations. Furthermore, bilingual notices were displayed at the entrance to kitchens stating that all cookhouse personnel were required to wash their hands on entry; for this purpose, washing and disinfecting facilities were maintained near the entrance. Lastly, strict discipline was maintained in all cookhouses and a high degree of personal cleanliness was enforced.

#### CLOTHING

The clothing issue for personnel stationed in the Middle East was adequate for those located at permanent or semi-permanent stations in the Delta, but troops living under canvas in the Western Desert suffered personal hardships. Khaki drill, which was the official uniform for all ranks, provided insufficient protection during cold nights or in the winter. Battledress, not an issue at first, was occasionally obtained by personal approach and by a 'gentleman's agreement' from the local Army stores quartermaster.

The Sidcot and Irving flying suits which were issued to all aircrew personnel had certain limitations. They were totally unsuitable for summer wear owing to their excessive warmth, while the Irving jacket was too clumsy and uncomfortable for fighter aircraft. Their use was restricted to bomber aircrew on night operations or for personal warmth during non-flying duties in the winter months.

The issue of battledress to all ranks in 1941 overcame most of the clothing problems, the Army pattern being selected as less conspicuous in desert warfare than the Royal Air Force blue war service dress. However, as late as December 1942, airmen serving in the Desert were unable to obtain battledress, whereas personnel in base units were in possession of full issue and were able to call upon ample reserves. It was felt that a mobile force living under field conditions should have had first priority in clothing requirements and that such issues should have been withheld from the base units until the mobile force had been kitted to scale.

#### LAUNDRY FACILITIES

During the latter part of the campaign the majority of units in the Western Desert had a travelling native *dhobi*, a scheme which had fully justified itself in practice. Unfortunately geographical distance frequently resulted in the breakdown of these facilities and personnel were left to make their own arrangements. This system had no medical disadvantage provided that the Service issue of soap was adequate and

continuous; in the event of failure to maintain such supplies any disease arising from verminous states might well be attributable to Service conditions rather than to personal negligence. Laundering facilities were excellent on all stations in the Delta, but in the Desert the shortage of water and the meagre supply of soap rendered the maintenance of personal cleanliness most difficult at times. Under these conditions it was surprising that the number of personnel suffering from verminous states was comparatively low.

#### SANITATION AND HYGIENE

The acute shortage of Royal Air Force personnel at the outbreak of war made it imperative to maintain a high standard of health and well-being among the troops in order to conserve man-power. The elimination of existing disease and the introduction of stringent preventive measures to forestall fresh outbreaks were obviously essential if a satisfactory level of physical fitness was to be achieved. It was considered that the best results could only be obtained by emphasising the preventive aspects.

Success in preventing disease depends fundamentally upon the individual and united efforts of all personnel, who should not only be cognisant of the laws of health, and the reasons for such laws, but know also how to obey them. Unfortunately a large proportion of the Force either lacked this knowledge, or having it, failed to use it to good effect.

To bridge the resultant gap in the defence system of preventive medicine, continuous efforts were made to improve the standard of hygiene by means of instruction, supervision and the formation of unit sanitary squads. These were directly controlled by the unit commander who, assisted by the advice and criticism of his medical officer, was personally responsible for the health and welfare of the personnel under his command. Failure in some cases to appreciate or to fulfil this responsibility led to faulty or inadequate sanitary methods. At many units the medical officer took it upon his own shoulders to insist on the provision of essential hygienic equipment and the full compliance of all personnel with all sanitary regulations. As a reward for his enthusiasm he was frequently tagged as a qualified sanitary inspector!

Fouling of the Desert during occupation by the Armed Forces was mainly due to scattered decomposing food, indiscriminate defaecating and urinating. Apart from the unpleasant effect on the human senses, such conditions increased the probability of extensive dust and fly-borne contamination—the latter danger being increased by the frequent failure to replace or close the lids of latrines. Only by employing every appropriate device, and by the strenuous maintenance of a fly-proof chain was it possible to overcome these menaces. The disposal of waste products was by the most convenient method, that of deep burial.



After initial training and continual correction, the work of unit sanitary squads did much to minimise the shortcomings of neglectful personnel. The method of selecting a non-commissioned officer to supervise the workings of a squad was open to criticism. He was often chosen because he had failed to impress his commanding officer as efficient on other duties. Later, it was realised that the success of the sanitary methods of a unit greatly depended on the efforts of these N.C.Os. and selection was therefore made on a basis of trust and integrity. Improvement in the standard of sanitation was not achieved without an intensive and sustained campaign by the members of the medical service. Their lead came from the P.M.O. himself, who made Desert history by lecturing to the senior N.C.Os. (disciplinary) gathered together from their units for this express purpose, and whose hygiene inspection of units resulted in an exhausted set of officers and N.C.Os. vowing that they would maintain a higher standard rather than repeat the experience!

Methods of conservancy varied throughout the Command. Arrangements which were suitable for a permanent station were completely inappropriate for mobile units. Again the type of terrain influenced the means of disposal of waste, as rocky ground or a high water table would not permit the use of deep trench latrines or sullage pits. Most units in the Desert adopted the procedure whereby all waste was collected, carried and finally buried at least a mile from the perimeter of the camp.

The enemy's standard of sanitation soon became apparent on the occupation of captured aerodromes and buildings. It was most noticeable that this standard was below that of the Imperial troops, that of the Italians being particularly bad. An illustration was the fact that a German division from Crete was put into the Alamein Line in August 1942, but had to be withdrawn because of a dysentery epidemic, the disease being fly-borne. To use a location previously held by the enemy always entailed a vigorous clean-up before occupation, although it must be admitted that the Imperial troops themselves did not always leave the area in a spotless condition for their successors.

#### ANTI-MALARIA PRECAUTIONS

Endemic malaria was widespread in the Middle East Command area, and liable to become epidemic in the absence of adequate precautionary measures. The more dangerous areas included West Africa, the West African reinforcement route, the lower Nile Valley, the Northern Territories of Iraq, and the Levant and the Suez Canal Zone.

The siting of R.A.F. units in non-malarious areas would have been the obvious way to prevent infection but aerodromes must of necessity be located in wide expanses of flat country, and it is in such areas that

are found the natural water courses, lakes and swamps, the habitat of the breeding mosquito. Operational requirements mostly dictated the selection of site regardless of the risk of malaria.

During the years immediately preceding the outbreak of war, medical statistics had shown a continual rise in the number of persons suffering from malaria at Royal Air Force Stations, Ismailia and Abu Sueir. With the expansion of R.A.F. units in the Canal Zone, it was considered most important that full and immediate action should be taken to eliminate the infection of British troops by the malaria-carrying mosquito. According to the terms of the Treaty of Alliance with Egypt, 1936, it was understood by H.M. Government that the Egyptian Government would carry out all reasonable sanitary measures to counteract malaria in the areas adjacent to those in which British Forces were to be located. Discussions on this subject disclosed a reluctance on the part of the Egyptian officials to carry out the required works services. To overcome the various differences an Anti-Malaria Sub-Committee was formed in May 1937 representing the R.A.F., the Army and the Egyptian Government. Following prolonged negotiations by the sub-committee, the Egyptian Government eventually agreed to carry out extensive engineering work to eliminate all mosquito breeding places within five kilometres of the perimeter of each camp. This entailed the digging of drains to lead off stagnant water, the filling-in of all low places where water might collect and the removal of all natives not employed by the Services from the sites of new stations. Although the British representatives on the Anti-Malaria Sub-Committee had advocated the complete mosquito-proofing of all buildings used by personnel after nightfall, this point was defeated. However, recommendations were made by the sub-committee that all personnel engaged on construction work should be kept under continuous medical supervision, and that, if primary malaria of local origin occurred,\* mosquito-proofing should be provided for all buildings occupied after sundown. Plans of all buildings allowed for such modifications if they became necessary. Furthermore it was agreed that wet cultivation (rice) should be prohibited in the areas under consideration. At this stage representations by the D.G.M.S., R.A.F., ensured that all station sick quarters buildings would at all times be completely mosquito-proof.

The general policy of the Medical Branch in combating the incidence of malaria involved the protective medication of all personnel before arrival in a malarious region, the continuation of this treatment during their location there, and local measures to inhibit or kill the malaria-carrying mosquito.

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\* It was a well known fact that such cases did occur, but figures were never made available by the Egyptian authorities.

Protective medication was carried out by the administration of mepacrine 0.05 g. ( $\frac{1}{2}$  tablet) daily for the first week and 0.10 g. (1 tablet) for the second and third weeks. Continuation of this latter dose in an attenuated form was maintained while personnel were stationed in the danger area. A procedure known as 'sterilisation' was adopted when personnel were posted to a non-malarious area from hyperendemic regions such as West Africa. This involved a complete course of curative treatment and the continuation of mepacrine for the first eight weeks of sojourn in the non-malarious area. Because of the possibility of mepacrine producing toxic effects aircrew personnel received quinine in lieu.\*

Personal protective measures, when properly carried out, were perhaps the most effective of all the methods of prevention and, accordingly, orders were repeatedly issued regarding the dress to be worn after sundown; even so, there were many cases of non-compliance. It was noticeable that these personal measures only reached a high standard when troops became malaria-minded and realised the added comfort—i.e. freedom from mosquito bites—to be obtained by their adoption, while the best examples of adequate protection were seen in those who had suffered from malaria and therefore understood the seriousness of an infection.

The direct attack on the adult or larval mosquito was the biggest undertaking. Within the precincts of a camp this was the responsibility of the commanding officer. The control of the adjacent areas required the continuous efforts of a unit specially trained in anti-malaria measures. The establishment of a separate R.A.F. control organisation was urged, since Air Force units could not always be sited adjacent to the Army, and in any case the establishments of the latter did not provide for other commitments in addition to their own. Accordingly R.A.F. Anti-Malaria Control Units (A.M.C.U.) were first established in the Middle East in May 1942. These units were of two types, A and B, and were each capable of sub-dividing into three sections.

The establishments of the units were as follows:

<i>A.M.C.U.</i>	<i>Officers</i>	<i>Sgts.</i>	<i>Cpls.</i>	<i>A.Cs.</i>	<i>Civilians</i>
Type A	1 (F/O)	1	1	10	24
„ B	1 (F/O)	1	—	6	24

This establishment was increased in 1944 to:

<i>A.M.C.U.</i>	<i>Officers</i>	<i>Sgts.</i>	<i>Cpls.</i>	<i>A.Cs.</i>	<i>Civilians</i>
Type A	1	1	4	8	approximately 25 per section
„ B	1	1	2	4	

\* See 'Service Conditions in the Field—Malaria Control', in Part II of this chapter, page 162.

In mid-1942 the Middle East was allocated:

3 Control Units Type A, and  
9 " " " " B, giving a total of 36 working sections.

The distribution of A.M.C.U.s. was as follows:

Levant . . . .	3
Egypt . . . .	2
E. Africa . . . .	2
Iraq . . . .	3
Other theatres . . . .	2

Type B, A.M.C.U. proved uneconomical, as with its limited personnel it could only carry out work adjacent to 2-3 aerodromes, whereas type A could cope with 6-8. The addition of 2 corporals and 4 aircraftmen and the power to utilise a greater number of civilian labourers brought them into line with type A and proved far more satisfactory. The biggest difficulty in operating these units was the scarcity of suitable personnel, as the absence of any prospect of promotion deterred officers, while airman vacancies were seized upon as excellent outlets for the unemployed.

The field work of the A.M.C.U. consisted of clearing and canalising logging water, clearing the edges of static or slow-running water and spraying water surfaces with an oily or chemical mixture. The most common mixtures used were—engine oil diluted with 5 per cent. Octane fuel M.T.D. 224, or Paris green and dust. The spraying of large swampy areas was carried out by aircraft. For this purpose an aircraft with a slow cruising speed was essential, as only then could an accurate spray of insecticide be obtained. The Lysanders proved the most suitable aircraft. Various initial troubles occurred in producing a satisfactory sprayer but after many trials a manually controlled pattern was perfected in R.A.F. workshops. The best results were obtained with Paris green, 33½ per cent., when sprayed from 20 ft. at 110 m.p.h. with the dust control outlet fully open. In this way a strip 2 miles long, 20-30 yd. wide could be covered with 2 cwt. of Paris green.

The appearance of *Anopheles gambiae* as far north as Luxor and Aswan and the subsequent epidemic among the native population led to innuendoes from the Egyptian Ministry of Health that the mosquitoes had been introduced to Egypt by air. Representations were made by the Medical Branch, H.Q., R.A.F., M.E., through the British Embassy to the Egyptian Government stating that:

- (i) *Anopheles gambiae* had always been present in Egypt to a small extent but that the effect of the Aswan Dam and the exceptionally high flood water in 1942 led to an increase in the numbers.

- (ii) Any spread other than by normal flight was more likely to take place by road, rail or river traffic.

It is interesting to note that of 50 insects found by Egyptian Government inspectors in aircraft arriving at Almaza during the first ten months of 1942 only one mosquito—a culicine—was found!

#### YELLOW FEVER PRECAUTIONS

The endemic areas for yellow fever in Africa lie between latitude 14° north and the southern borders of the Belgian Congo and Tanganyika (latitude 11°–12° south). All personnel proceeding to stations within those boundaries were immunised before leaving the United Kingdom. Arrangements for their inoculation were rather difficult, as at first only two immunisation centres existed, namely, the Royal Air Force Institute of Pathology and the Wellcome Institute of Scientific Research. Furthermore, the vaccine was in short supply, and security measures required that all information regarding the nature of the inoculation should be withheld from the recipient.

As the West African reinforcement route lay within the above region, an order was issued in April 1942 that all personnel travelling to the Middle East *via* West Africa were to undergo active immunisation at least ten days before exposure. In May 1942 this order was extended to all officers and aircrew destined for the Middle East, whether or not they journeyed through the infected area; as they were liable to be posted at short notice to endemic areas within the Middle East, such immediate protection was deemed necessary. The Egyptian Public Health Authorities stressed that where these precautions were not carried out, full quarantine regulations would be enforced. Many cases leaked through, including an Air Officer in transit to India, and were detained for the necessary quarantine period.

Although the Interdepartmental Committee on Yellow Fever recommended that four years should be accepted as the maximum period of full protection afforded by inoculation, the Egyptian Government would only agree provided the vaccine was manufactured by the Rockefeller Institute or by a public health laboratory in the United States. If any other vaccine was used re-inoculation after two years was deemed necessary.

Yellow fever control measures were difficult to implement owing to the disinterested attitude of local executive officers. The establishment of Anti-Amaryl Stations and Squadrons\* at the main airfields on the transport routes was adopted as a solution. These units were provided to disinsectise aircraft in accordance with:

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\* An establishment of 20 Anti-Amaryl Squadrons was approved in December, 1944. The title Anti-Amaryl, however, was found confusing to the layman's mind, as it suggested a connexion with malaria and the name of the units was therefore changed to Yellow Fever Control Units.

- (i) The requirements of the Interdepartmental Committee that aircraft should be sprayed immediately before their last take-off in the endemic area and immediately after their first landing in a non-infected area.
- (ii) Sudan Government requirements that aircraft from parts of the endemic area outside the Sudan should be sprayed at the first landing in the Sudan.

As with so many of these arrangements, full effectiveness was at the mercy of disinterested people both inside and outside R.A.F. control. Indeed, there were occasions when aircrew and passengers combined to become obstructive. One unfortunate individual endeavouring to disinsectise a newly-arrived aircraft will, no doubt, still remember being rudely ordered out by an irate Allied captain of aircraft flourishing a loaded revolver. And no doubt he would have used it in his stupid unwillingness to allow the practice of preventive medicine.

In 1940, an epidemic of yellow fever occurred among inhabitants of the Sudan. Within seven months over 20,000 cases were recorded, of which more than 1,600 were fatal. Stringent precautions were taken, in accordance with the International Sanitary Convention, to prevent the spread of the disease into other districts in the Sudan or to Egypt. Through arrangements made by the Director-General of Medical Services, Royal Air Force, following a request from the Sudan Government, a British expert was flown out to assist in the control of the epidemic. Full protective inoculation was afforded to all troops stationed in the Sudan, and no cases were found among R.A.F. personnel.

By the year 1944, 60 per cent. of all R.A.F. personnel in the Middle East were inoculated against yellow fever, and a start was made on the immunisation of all natives employed on aerodromes in the endemic area, and at terminal airfields in the non-endemic area.

#### THE FLYING PERSONNEL RESEARCH COMMITTEE (F.P.R.C.)

Investigations carried out by the F.P.R.C. among operational units in the Middle East disclosed that the value of oxygen supplies in aircraft was not fully appreciated. Some aircraft carried insufficient oxygen bottles or none at all. This lack of appreciation was partly due to the low altitudes at which aircraft were flying at that time. Later, the advent of the German Air Force, and the resultant rise in combatant altitudes, engendered more respect for the properties of oxygen, and greater dependence was placed upon its use. The supply as a whole was adequate but it was considered that if operational requirements were much increased, the provision of additional mobile production plants would be necessary.

It was specially noticed by the investigators that of all the lecture subjects, that on the physiology of 'blacking-out' attracted most interest

and stimulated attention to such matters as fatigue and frostbite. Aircrew were particularly interested in flying clothing, as many pilots had experienced the extremes of climatic conditions within two or three days while on ferrying and transport duties. While thus engaged they had realised the inadequacy of the normal flying clothing, especially for the duties in Greece where cockpit temperatures of below 30° C. had frequently been recorded. The new flying helmet was enthusiastically received. Opinion regarding the Mark IV B. flying goggles varied. The majority maintained that whereas the ordinary polaroid sun spectacles, bought locally, satisfied requirements, the new flying goggles were too heavy and by their complexity caused undue trouble when covered with sand.

As a result of these investigations by the F.P.R.C. arrangements were made to post to the Middle East a regular medical officer who was also a qualified pilot, as Flying Personnel Medical Officer (F.P.M.O.) for the express purpose of supervising the well-being and efficiency of flying personnel. Provision of adequate flying clothing and oxygen supplies was soon promised, while steps were taken, in conjunction with the Consultant in Ophthalmology, to modify the existing flying goggles to meet requirements.

The first F.P.M.O. arrived in the Middle East in June 1941, and during his initial tour of operational units found a certain coolness of reception. This attitude had been adopted as the visit made by members of the F.P.R.C. had not resulted in the promised improvement of flying clothing. In the six months following the visit of the committee, everyday flying clothing was still in the shortest supply, while electrically heated flying suits had not as yet arrived in the Command.

As late as December 1941, the F.P.M.O. recorded that oxygen supplies in some aircraft were still inadequate or obsolete. Maryland aircraft (medium bombers) which operated up to 25,000 ft. had inadequate equipment for their operational requirements as indicated by the frequent reports of symptoms of lack of oxygen and frostbite among their crews. The standard oxygen system in these aircraft terminated in a wooden 'pipe-stem' mouthpiece. For speaking into the intercommunication microphone an oxygen mask was also carried, but when this was used it was necessary to remove the oxygen tube, causing anoxia and frequent black-outs. Squadron commanders stated that operations were so planned that they fitted in with the oxygen endurance of the aircraft but there was no safety margin. Changes of plans, always likely to arise during an operation, often resulted in flights at oxygen heights for periods well beyond the capacity of the supply. It was therefore not surprising that frequent cases of frostbite, due to faulty oxygen facilities and inadequate flying clothing, occurred among the crews—mainly rear gunners—of Maryland aircraft.

Throughout his tours the F.P.M.O. frequently commented upon the inadequate knowledge among operational crews of the practical uses of oxygen. This he attributed to the complete lack of information on the subject available to aircrew personnel while undergoing training, the situation being made worse by the failure of many flying instructors at the Operational Training Units to appreciate the value of this knowledge. In an effort to make aircrew realise its importance, the F.P.M.O. approached the Air Officer in charge of Training suggesting that education on this subject might be given to all trainees at Operational Training Unit level in the Middle East. To instruct flying personnel in the practical uses of oxygen when flying at great heights the F.P.M.O. approached the Air Ministry requesting that a mobile decompression chamber should be allocated to the Command, and that three specially selected nursing orderlies should be trained at the R.A.F. Physiological Laboratory, Farnborough, in the working and maintenance of this chamber prior to their posting to the Middle East. The value of giving unit medical officers initial training in the United Kingdom in the physiology of flying was fully realised at this stage, as most medical officers had been arriving in the Command without this intimate knowledge.

#### COMMAND MEDICAL BOARD

From time to time since 1928 medical boards had been held at Heliopolis in the station sick quarters and in 1940 and the early months of 1941 the Senior Medical Officer, No. 202 Group, was acting as President, convening boards on two or three days each week. A wing commander ophthalmologist was continually present for duty but the remaining members of the Board attended subject to availability and were constantly changing. In order to economise in time and travelling, boards on those suffering from minor ailments, which included the majority of officers and senior N.C.Os. on discharge from hospital, were carried out by Senior Medical Officers at their respective headquarters. Reviews and those cases requiring specialists' survey were, with few exceptions, boarded at Heliopolis.

The increasing size of the Command brought many more boarding problems and, in particular, the special intricacies of boarding aircrew made it clear that there was a need for a full-time medical board with specialist officers available to give expert opinions. In May 1941 a Command Medical Board (C.M.B.) was established and manned, its organisation being implemented along the lines laid down in Appendix 20 of A.P. 1269A (Appendices to Manual for Medical and Dental Officers of the Royal Air Force). It was eventually housed in two married families blocks which had the advantage of being able to accommodate the numerous cases travelling from distant units and needing temporary quarters.



Beginning as essentially a board for medical assessment of aircrew and invaliding to the United Kingdom this board soon came to function, in effect, as the Central Medical Establishment of Middle East Command. All types of boarding were carried out, including disability, return to the United Kingdom, local invaliding, fitness for commission and fitness for aircrew training.

In the early days it formed a convenient centre and the S.S.Q. at Heliopolis was available for the admission of officers and men who required investigation in order fully to establish their disability and its extent. At this time the need was acutely felt for a Royal Air Force hospital fully equipped and staffed for the specialist investigations and opinions essential to accurate board findings. In the absence of such a hospital it was necessary to rely on the findings of Army hospitals and it is no reflection on the latter or on their specialist staffs to point out that they were not in a position to master and appreciate the medical conditions peculiar to the R.A.F ; nor, with their more generous manning, did they always appreciate the urgent need to get flying and ground staff back on duty at the earliest possible moment.

Several conferences took place at the Board which were attended by the full medical staff and the Command consultants. At these conferences invaluable work was done in the creation and adoption of common standards of assessment and disposal, and administrative problems were met and solved by a harmonious team sharing experience and industry in joint endeavour. Very close liaison was established, and actively fostered, between the President of the Board and the Personnel Branch of Headquarters. In this way it was possible to convince the executive that the Medical Board had much more desire to be helpful than was suggested by the restrictions which its medical categories placed on the executive officers in the distribution of their forces. An immense amount of good came out of this close liaison. The Board could be reasonably sure that candidates would, in fact, be placed on the duties which it was felt were most likely to facilitate recovery and final disposal. At the same time the executive was assisted in its unenviable and formidable task of placing officers and men in the work most suited to their temperament, capability and effectiveness.

Several medical officers of the Allied Forces worked at the Board from time to time. In this way they gained particular experience in the medical standards and requirements of the flying crews whom they were to look after in the squadrons.

By July 1941, the staff consisted of:

- 1 Wing Commander
- 2 Squadron Leaders
- 2 Flight Lieutenants
- 1 Sergeant

- 1 Corporal
- 4 A/C Nursing Orderlies
- 1 Clerk G.D.
- 2 Civilian Typists

and two neuropsychiatrists (wing commander and squadron leader) from Headquarters, Middle East, consulting at the Board. This establishment was amended on October 10, 1942, to consist, in addition to the president and adjutant, of two ophthalmic specialists, another specialist combining surgical and ear, nose and throat duties, one neuropsychiatrist (aided by the Command Adviser in Neuropsychiatry) and two acting neuropsychiatrists. Two medical officers were available for general medical examinations. In the latter stages a qualified orthoptist (W.A.A.F. officer) was posted to the Board and also carried out part-time duty at the R.A.F. General Hospital, Cairo.

Attendances during the period under review were:

	<i>Board Examinations</i>	<i>Opinions or Consultations</i>
2nd half of 1941 . . .	2,830	3,276
1st " " 1942 . . .	3,066	3,837
2nd " " 1942 . . .	2,916	No record
1st " " 1943 . . .	2,593	" "

In addition, numerous visits to units in the field were carried out by individual specialists.

OBSERVATIONS ON CASES BOARDED

- (i) An outstanding feature was the necessity for invaliding home personnel with disabilities which should have prevented them from being sent overseas in the first place. Included among these were cases of:

- Gross visual defects
- Pulmonary tuberculosis
- Chronic psychoneurosis
- Osteo-arthritis
- Peptic ulcers and
- A case of loss of an eye with an infected socket.

One case had had three laparotomies, including a partial gastrectomy before entering the Service; he died in hospital while awaiting passage to the United Kingdom.

- (ii) A large percentage of the cases dealt with had an overwhelming desire to be transferred to Home Establishment which added greatly to the work of the Board by clouding medical histories and by exaggerating existing disabilities.
- (iii) In some cases satisfactory disposal was delayed because the Board could not agree with the dogmatic opinions (of which

patients were sometimes aware) expressed earlier by consultants and medical officers of other units.

- (iv) Cases occurred in which flying personnel had been grounded for medical reasons by their unit medical officer, but were not referred to the C.M.B. until six or eight weeks after their initial grounding. This was most undesirable in psychogenic cases, as the passage of time only served to fix the disability so firmly in the patient's mind that it rendered treatment and ultimate return to full duty more problematical and more difficult to effect. Successful results in such cases were obtained only after a prolonged period of treatment.
- (v) Before the R.A.F. Hospital was established in the Cairo area, difficulty was experienced in securing the correct disposal of neuropsychiatric cases which had been admitted to Army hospitals. Efforts were therefore made to overcome this difficulty by insisting that such cases should be disposed of by the C.M.B. This step was considered most essential in cases of head injury which were not solely of a neurological nature, but had in addition psychogenic symptoms which required delicate handling and a specialised knowledge of Air Force problems.
- (vi) Cases of macular degeneration largely restricted to the left eye occurred among personnel of a Commonwealth Air Force during 1941. Such cases also displayed symptoms of neurosis and loss of confidence, the condition corresponding to no known syndrome. The possibility of deliberate over-exposure to direct sun rays was considered but could not be substantiated. Cases of night blindness were uncommon and mainly hysterical in origin. Ocular muscle defects among trained pilots frequently showed disappointing and even harmful response to orthoptic treatment. Such cases proved on investigation to be allied to psychiatric disabilities requiring treatment and usually lowering of category.

#### INVESTIGATIONS

One of the members of the Board submitted an interim report of an investigation into alcoholic peripheral neuritis. This report indicated that a lack of vitamin B<sub>1</sub> consequent on inadequate dieting and absorption during alcoholic bouts was the largest factor in neurotic complications of chronic alcoholism. Unfortunately this investigation could not be completed owing to the lack of necessary reagents. Investigations were also made as to the practicability of using critical frequency of flicker to determine the speed of dark adaptation, but these were discontinued owing to technical difficulties. The Purkinje phenomena were then adopted and gave promise of a far less subjective means of testing than previous methods.

## SICKNESS IN THE COMMAND, 1939-42

First place in the list of prevailing illnesses in the Middle East was held by gastro-intestinal disorders. Isolated attacks of gastro-enteritis accompanied by profuse diarrhoea with passage of blood and mucus, lasting 24-48 hours, often occurred in the Desert. In many cases this sudden illness had little effect on the general well-being of the patient, while in others prostration was most marked. Such an attack was always considered inevitable among new arrivals, and frequently recurred on each change of location. Numerous full investigations failed to reveal any of the usual organisms of dysentery. Treatment was very varied as most medical officers adopted their own individual methods. The general trend was rest, dieting and mild purgation.\*

## DESERT SORES

These indolent ulcers were very common and increased in frequency towards the end of the Desert campaign. It was widely believed that the sore originated through devitalisation of the skin by excessive sunlight, with perhaps concomitant vitamin C deficiency. However, repeated investigation as to dietetic or vitamin deficiencies being predisposing factors were inconclusive, while bacteriological examinations were continually negative for K.L.B. and other specific organisms. In some cases the sores were found in association with infection caused by the *Microaerophilus streptococcus* described by Meleney. The incidence of these sores was highest in the rufous type of person whereas the more pigmented types appeared to have a relatively high immunity. (See also page 373.)

## EFFECTS OF HEAT

During 1940 nine cases of heat effects occurred. Two of these cases were hospitalised for 97 and 102 days respectively, but the average duration for the other seven was only five days. Ten cases were recorded in Port Sudan in 1941, necessitating the incorporation of a heatstroke centre in the station sick quarters. In addition, a large number of minor cases occurred totalling 45 days non-effectiveness. Heat exhaustion was common among new arrivals in the Sudan, but the incidence was appreciably lessened by ordering prophylactic saline drinks. After a period of a few months most personnel gradually became 'salted'. A new draft arriving in Iraq in the summer of 1942 experienced an epidemic, during the course of which 436 cases occurred with 13 deaths. Immediate investigations were carried out to determine the type of person most susceptible to heat effects and the critical temperature and meteorological conditions necessary before heat effects assume epidemic proportions.

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\* Investigations in the latter years of the war carried out on cases presenting similar clinical pictures showed the disease to be a chronic form of amoebiasis.

## FOOD POISONING

Twenty-four cases of food poisoning occurred during 1940 in the officers' mess at R.A.F. Station, Ismailia. The outbreak was attributed to tainted fish bought in the local market. One death occurred among the affected officers on the sixth day of the disease. The causative organism as isolated in the patients' stools was *Bacillus aertrycke*.

In September 1941, 31 personnel reported sick complaining of abdominal muscle cramp, diarrhoea and vomiting. Four severe cases were admitted to hospital. In this instance the poisoning was due to damaged tinned rations.

## DYSENTERY

In 1940, 181 cases were reported of which one sixth were amoebic in variety. During an outbreak at Port Sudan in September 1941, which continued until February 1942, 116 cases were recorded of which three were fatal. The infecting organisms were Shiga, Flexner and Sonne bacilli. Six cooks among the infected personnel were thought to be primarily responsible for the outbreak. Practically all these cases were from the same camp in which fly-proofing was inadequate and culinary arrangements were rather primitive. The incidence for 1942 showed only a small rise despite the influx of large drafts of non-immune personnel during the year.

## ENTERIC FEVER

In 1941, 45 cases with 11 deaths occurred throughout the Command. This incidence was not considered excessive in view of the impossibility of preventing personnel from purchasing foodstuffs and drinks from unauthorised vendors. The death rate was on a par with that experienced in peace-time, i.e. 25-33 per cent. In the following year 172 cases were reported with 23 deaths (13.4 per cent.). The incidence of proved typhoid fever in 1941 and 1942 was very much higher than in the Army, being respectively 5 and 3 times the rate for the latter. Food-handlers were incriminated in most cases. It was thought that the reduction of the initial inoculation dosage by half in the United Kingdom may have lessened the basic immunity of personnel drafted to the Command. The assumption that Royal Air Force camp hygiene was worse than that in the Army was discredited by the fact that the dysentery incidence, a good index, was strictly comparable between the two Services.

## MALARIA

In 1940 an increase in primary and recurrent malaria occurred within the Command (611 cases as compared with 329 in 1939\*). This

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\* Approximate figures—excluding West Africa.

increase was partly accounted for by an outbreak (58 cases) among the personnel of No. 237 Squadron when the unit was on active service in Kenya, and while it was in transit to Khartoum *via* the Nile Valley. Two cases of blackwater fever occurred among the infected personnel, one case proving fatal. In 1941, 1,714 cases occurred including 944 cases in West Africa (mainly due to the difficulty in obtaining screening material for domestic sites at Takoradi) and 205 cases in the Canal Zone. West Africa continued to have the highest incidence, that for the year 1942 amounting to 835.4 per 1,000 of strength.

#### INFECTIVE HEPATITIS

The year 1940 showed a slight increase in the number of cases as compared with 1939, but in 1941 this disease became rife throughout the Command. The incidence for the year 1942 was similar to that for 1941 with the majority of cases, 1,522 out of 1,946, occurring during the last four months. This seasonal trend was typical of the disease. Correlation of figures from the medical receiving stations for the month of December 1942, showed that this disease alone accounted for 27.9 per cent. of the total admissions. The beginning of 1943 saw the peak of the epidemic of infective hepatitis in North Africa. The weekly incidence in January was as high as 3.8 per 1,000, falling to 0.12 per 1,000 by the beginning of April.

It was generally considered that the disease was a virus infection affecting the parenchymatous cells of the liver after a prolonged incubation period of 3-5 weeks. Various theories were put forward to account for the disease; inadequate provision for the washing of feeding utensils was widely blamed, but most medical authorities considered that dust or fly-borne transmission of the virus from faeces to food was the principal medium of infection.

The majority of cases of infective hepatitis ran a typical course lasting usually about 14 days. The predominant feature, however, was the marked debility which followed, so that few patients returned to full duty within four weeks.

There was no doubt that a large number of cases of sub-clinical hepatitis did occur, which passed through a mild phase of anorexia and/or nausea.

Varying numbers of these patients showed only a slight icterus, insufficient, like the remainder of their symptoms, to warrant their reporting sick.

A number of personnel developed catarrhal jaundice subsequent to yellow fever inoculation. Following appropriate action by British and American manufacturers to make the vaccine icterogenic free, by killing the extraneous virus in the serum by heat before incorporating it in the vaccine, these cases diminished in number.

One case of leptospiral jaundice (Weil's disease) occurred in Aboukir in September 1941, the first case ever to be recorded in the Middle East among R.A.F. personnel.

#### TYPHUS FEVER

By 1942 epidemic louse-borne typhus fever had assumed alarming proportions among the civilians in Egypt. Over 22,000 cases with 5,000 deaths were recorded in that year, but the true case incidence was considered to be double that figure. Seven cases with three deaths occurred among the R.A.F. Five mobile sanitary units were established with the primary object of setting up delousing stations in areas where typhus became a grave risk to R.A.F. personnel.

#### RELAPSING FEVER

A few cases of relapsing fever occurred among personnel occupying the caves at Gambut in the Western Desert. The vector was probably *Ornithodoros savignyi*, a camel tick, which is commonly found in the Western Desert, especially buried in the sand at camel halts.

#### VENEREAL DISEASE

A decrease of 47 per 1,000 of strength took place between the years 1939 and 1940, although primary gonorrhoea showed a slight increase. In 1941 a total of 1,163 cases occurred. An attempt to lessen this incidence which, although high, was considerably less than that of the Army, resulted in a procedure whereby senior medical officers purchased condoms in bulk and issued them to units at cost price. Additional measures which helped to lower the incidence were extensive propaganda and the use of Army prophylactic centres. In Greece this practice resulted in a decrease in incidence of over 50 per cent., although it is probable that this decrease was also accounted for by the sudden withdrawal and evacuation, which kept troops fully occupied. In 1942, the incidence of venereal disease became astonishingly low. The continuing provision of rubber sheaths, then a free issue owing to the capture of many millions from the Italians, was the most likely factor. It was too early at this stage to assess the value of the closure of the controlled Berka brothel area in Cairo in August 1942. At least it could be said that the downward trend of venereal disease was not interrupted by this procedure, as was prophesied by the antagonists of the plan.

#### PSYCHOLOGICAL DISEASES IN FLYING PERSONNEL

In the 21-week period February 2 to June 27, 1942, 125 cases were referred to the neuropsychiatrists at Command Headquarters and at the Central Medical Board, Heliopolis. This figure does not include all cases of a neuropsychiatric nature as it is not possible to obtain accurate

figures of those cases dealt with directly by the squadron or station medical officers, by General Duties Branch officers, or by other specialists.

These 125 cases, of whom 42 per cent. were commissioned and 27 per cent. were married, were all among fully trained aircrew. Of the flying personnel who broke down on reaching an operational squadron 88 per cent. did so before actually flying on operations, this figure comprising chiefly men who should have been weeded out while undergoing flying training as temperamentally unsuitable.

Flying stress in the Middle East was higher than in other Commands, whereas predisposition was minimal. Half the total number of cases had no predisposition whatsoever.

Of all cases seen 28 per cent. were classified as lacking in confidence. This figure compared unfavourably with home commands, but in the latter the exposure to the extremes of flying stress was not so great. An aetiological factor both in stress and loss of confidence was the use in Middle East Command of operational aircraft which were frequently older in type and performance than elsewhere. Medium bombing was still being carried out in Bombays and Wellingtons and Army co-operation reconnaissance flights in unarmed Lysanders. At a time when Spitfires were in use in other commands the Middle East was congratulating itself on at last getting some Hurricanes Mark II.

The following statistical tables summarise the health of the Command during the campaign:

*Sickness in the Command 1939-1942*

Average Strength	1939	1940	1941	1942
	7,305	12,471	39,731	90,351
<b>Total Sickness</b>				
Number of cases . . . . .	6,662	14,105	62,744	120,826
Incidence per 1,000 of strength . . . . .	912	1,131	1,579	1,337
Average number of days' sickness per head	8.2	10.6	13.9	11.4
Number of sick daily per 1,000 of strength	22.3	29.2	38.1	31.3
<b>Sickness excluding cases of 48-hours and under</b>				
Number of cases . . . . .	3,851	8,337	29,574	58,629
Incidence per 1,000 of strength . . . . .	527	669	744	649
Average number of days' sickness per head	7.6	10.0	12.8	10.4
Number of sick daily per 1,000 of strength	20.8	27.3	35.0	28.6
<b>Invaliding to U.K.</b>				
Number of cases . . . . .	71	61	431	492
Incidence per 1,000 of strength . . . . .	9.7	4.9	10.8	5.4
<b>Deaths</b>				
Number of cases . . . . .	41	308	1,236	1,742
Incidence per 1,000 of strength . . . . .	5.6	24.7	31.1	19.3

N.B. These figures exclude cases occurring in West Africa and Iraq.



*Incidence of Common Communicable Diseases per 1,000  
of Strength*

Average strength	1939	1940	1941	1942
	7,305	12,471	39,731	90,351
<i>Dysentery</i>				
Clinical primary . . . . .	1·3	5·1	17·5	14·9
Bacillary primary . . . . .	4·7	11·6	26·2	22·7
Amoebic primary . . . . .	—	1·0*	0·3	2·8
Recurrent . . . . .	—	—	2·4	0·5
<i>Enteric Group</i>				
Typhoid fever . . . . .	0·2	0·1	1·4	1·6
Paratyphoid fever (A, B and C)	0·2	—	0·4	0·2
Clinical . . . . .	0·5	0·3	0·3	0·3
Enteritis . . . . .	39·4	50·4	69·8	26·2
<i>Malaria</i>				
Clinical . . . . .	2·5	16·8	13·8	6·3
Quartan . . . . .	—	—	—	0·2
Benign tertian . . . . .	14·2	15·6	13·3	20·4
Malignant tertian . . . . .	3·5	17·6	26·9	9·1
Recurrent . . . . .	2·5†	10·2†	6·4†	1·5
Infective hepatitis . . . . .	9·8	6·0	—	22·1
Influenza . . . . .	—	26·2	11·8	12·2
Pyrexia of unknown origin . . . . .	3·9	8·4	8·7	4·9
Phlebotomus fever . . . . .	20·5	24·6	48·9	42·2
Upper respiratory tract infections	100·1	95·4	96·8	85·5
Tuberculosis, all types . . . . .	1·1	1·1	1·1	1·8
Venereal diseases . . . . .	31·0	26·3	21·3	13·8
Other infections . . . . .	7·6	27·6	35·3	17·7
General injuries . . . . .	6·4	29·0	34·6	25·7
Local injuries . . . . .	54·9	51·5	48·0	40·9

\* Includes recurrent amoebiasis.

† Includes quartan primary.

*Deaths and Injuries occurring among Aircrew and Ground Crew  
Personnel in Middle East during 1939-1942*

Only deaths and injuries caused by *enemy action or flying accident* are included.

AIRCREW

Year	Burns		Missile wounds		Other injuries		Totals	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
1939	2	—	—	1	3	3	5	4
1940	9	5	11	19	179	33	199	57
1941	54	17	9	54	552	150	615	221
1942	68	30	11	87	957	220	1,036	337
Totals	133	52	31	161	1,691	406	1,855	619

## GROUND CREW

Year	Burns		Missile wounds		Other injuries		Totals	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
1939	—	—	—	—	2	6	2	6
1940	5	1	—	3	20	6	25	10
1941	11	2	—	6	20	16	31	24
1942	14	4	2	24	49	45	65	73
Totals	30	7	2	33	91	73	123	113

## NOTES:

1. It has not been possible to distinguish between enemy action and flying accident owing to overlapping of definitions in executive and medical branches.
2. The figures for burns and missile wounds should not be taken as giving a complete picture of all such cases, for many will have been recorded as 'Multiple Injuries' and therefore included under the 'Other Injuries' columns above.

## MEDICAL RECEIVING STATIONS, WESTERN DESERT

On May 9, 1943, a Middle East Administrative Instruction was issued to the effect that Nos. 21, 22, 24 and 25 Medical Receiving Stations (M.R.S.) were to be known henceforth as R.A.F. Mobile Field Hospitals (M.F.H.). This date marked an outstanding event in the history of the Royal Air Force Medical Service.

The M.R.S. had long been familiar to many R.A.F. operational units throughout the various phases of the Middle East campaigns. Their original conception before the war was to serve as clearing stations to a chain of operational units in the field, and to transport their casualties to railheads in the rear. But as the campaign in the Middle East unfolded, they soon developed into far greater organisations, and became fully equipped hospitals, mobile to keep pace with the swiftest moving R.A.F. units, able to cope with any type of casualty and prepared for every emergency.

They served functions specific to the R.A.F. Medical Service, beyond the capacity of Army medical units in the field. Not only were they the means by which aircrew casualties were restored to health in the atmosphere of their own medical service, no mean factor in dealing with patients often highly strung and restless to get back to their squadrons, but they were also able to return essential members of ground crews to their units in the shortest possible time. Thus it was often possible to effect a saving of many weeks or months which would have been lost if these R.A.F. patients had been transported through a chain of Army units from casualty clearing stations to base hospitals in the Canal Zone or the Levant or beyond.

Many patients were inevitably transferred from the M.R.S. back to base, but these were cases which involved prolonged convalescence, e.g. severe fractures, burns, chronic diseases or cases where rehabilitation

was required, and were therefore outside the scope of treatment provided by the M.R.S., whose function was to hold personnel whose period of non-effectiveness was likely to be of only short duration. The most striking tribute that could be paid to the M.R.S. lay in the high percentage of patients returned direct to their units after a minimum period of non-effectiveness. The number of patients returned direct to units following completion of treatment would have been even greater but for the need to evacuate some relatively short-term patients just prior to each move forward of the M.R.Ss. in attendance on the advancing fighter and bomber wings.

The following accounts deal with the individual M.R.Ss. in chronological order:

NO. 21 M.R.S.

*First Phase, June 1940–January 1941*

This unit, self-styled 'The old firm', was formed at Helwan on April 8, 1940, with 'sufficient equipment for six hospital beds and twenty stretchers' and was allotted its number on May 15, 1940. Two months were spent in assembling equipment, acquiring transport and training personnel. It first began to function under a commanding officer of squadron leader rank on June 17, a week after Italy's entry into the war, and pitched camp at Fuka. This site was selected as it filled the 'surgical gap' (95 miles) which existed between Mersa Matruh and El Daba.

No. 21 M.R.S. remained at Fuka for seven months until January 12, 1941, when the speed of General Wavell's advance necessitated its move into Cyrenaica. During these active months, the unit encountered many initial difficulties and gained valuable Desert experience. Conditions, however, were far from ideal. The operating theatre was dug in at first barely 4 feet below the surface, with a flooring of old wood and duck-boarding. The sterilising room was built with sandbags and roofed over with old sleepers. Fuka was, unfortunately, rarely free from sandstorms and during the months of June and August conditions were most trying. After each storm the sand lay piled against entrances and smothered instruments, drugs, patients and staff alike. By the end of July further equipment had arrived, and accommodation now consisted of sixteen beds, eight surgical and eight medical. In August there was a large increase in personnel, two additional officers and 45 airmen arriving from the United Kingdom.\* With these a notable expansion of activity followed, and during the month 61 cases were admitted of which less than 10 per cent. had to be evacuated to base hospital. Casualties and seriously ill patients were flown back to base (Heliopolis) in transport aircraft.

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\* Original complement was a commanding officer, two other officers and 27 airmen.

The activities of the M.R.S. grew so rapidly that in September a new site had to be found. A suitable one was located south of the Daba-Matruh road, near Fuka Railway Station. In view of past experience a small army of natives was employed to excavate the site and to dig in reception room, wards and operating theatre below the ground surface. The new site served admirably and despite the intense heat was found to be remarkably cool and more free from sand, and here the M.R.S. stayed until its onward move in January 1941. During this period the type of patient admitted varied greatly, an Italian prisoner-of-war being among the first to be treated. Army units in the vicinity regularly sent their patients for admission or out-patient treatment. In October a striking incident occurred which illustrates the service of this M.R.S. On the night of 13/14 October, a train of native refugees fleeing to Alexandria was bombed by Italian aircraft while halted at Fuka Station. On receipt of the news a party from No. 21 M.R.S. went to their assistance, and found a scene of indescribable confusion. It was extremely difficult to determine the exact number of casualties and the work of extricating the wounded was greatly hampered by the continual circling of enemy aircraft in the vicinity. Over thirty victims, including women and children, were treated at the M.R.S. that night. At least two had multiple compound fractures, on which life-saving operations were commenced immediately. Both were given blood transfusions donated by volunteers from the R.A.F. This work elicited tributes not only from the A.O.C. but also from the Egyptian Ministry of Public Health.

In October, the number of admissions rose to 202, and 57 operations were performed. An interesting development was the formation of a mobile surgical team, complete with crash kit and full surgical equipment for transport by air to the scene of the accident.

In November 1940, the facilities available at No. 21 M.R.S. were extended by the construction of a resuscitation ward for the early treatment of shock in severely injured patients. Three teams of four nursing orderlies each, selected for their skill and enthusiasm, were specially trained in giving intravenous transfusions, and were always available at the resuscitation ward. This procedure was soon firmly established and became generally adopted as the routine treatment of severely injured cases.

### *Entry into Cyrenaica*

By September 16, 1940, Marshal Graziani's troops had advanced in their initial push as far as Sidi Barrani. On the night of 8/9 December, General Wavell launched his counter-offensive and within a week British troops had swept into Cyrenaica on the heels of the retreating Italian Army. By January 10, the main party of the M.R.S. had been

transferred to Sollum with full surgical equipment, tenders and ambulances. On the following day the operating theatre dealt with several air-raid casualties. The accommodation in Sollum proved unsuitable owing to the clouds of dust raised by traffic on the nearby main road and to fouling of the whole area by Italian troops and prisoners. A move was therefore made to the top of the escarpment, four miles west of Sollum. Here conditions were not much better, for tents were blown down by severe gales and sandstorms, the water supply was brackish and food supplies were limited. Within two weeks, however, the M.R.S. was again on the move and by January 25 it occupied the Rest House 15 miles east of Tobruk. Once again, on February 12, orders to move forward were received, and an advance party proceeded to Benghazi where a prospective site, with excellent facilities, was found in an Italian bank. However, on the same date the move was cancelled, and the advance party returned to Tobruk. A few days later a signal arrived instructing the unit to return to Helwan for refitting. Camp was struck at Tobruk on March 1, and by the 3rd the whole unit had returned to base at Helwan.

During the five months from September 1940, to March 1941, several days of which were spent in transit, No. 21 M.R.S. admitted a total of 828 cases of whom over 60 per cent. were R.A.F. personnel. The average daily bedstate was 17, and the number of operations performed was 239. Eight deaths were recorded of whom three were Arab natives and two Italian prisoners-of-war with severe multiple injuries. Over 42 per cent. of the R.A.F. cases were discharged to their units, and this figure would have been higher if mass discharges to base hospitals had not been necessitated by the M.R.S.'s moves.

#### *Second Phase. April 1941–January 1942*

Early in April 1941, a small advance party of No. 21 M.R.S. occupied its old site at Fuka, fully equipped to work as a surgical unit. The work expanded rapidly especially on the medical side, which soon outstripped the surgical work, a state of affairs which became general in future operations. Further personnel and extra equipment were added and by mid-June the unit was functioning as a complete field hospital.

Because of the large number of Army personnel arriving for treatment, a R.A.M.C. field ambulance was sent to Fuka and took over most of the out-patient work, but Army cases continued to be admitted to the M.R.S. for surgical treatment. For the quarter ended June 1941, of a total of 816 admissions, over 60 per cent. were R.A.F. personnel, the remainder coming from Army and other units. The average daily bedstate had now increased to 36.

During the following four months until the main advance in November 1941, the work of the unit was well maintained, an average

of over 203 admissions per month being recorded of which R.A.F. personnel constituted 83 per cent. The daily bedstate was maintained at 30 and the number of operations averaged 50 per month.

This period was marked by heavy air raids carried out by Ju. 88s. During October, hits on Fuka railway station damaged the water supply, resulting in an acute shortage, and ignited a petrol dump. Of four cases of severe burns subsequently admitted to the M.R.S., one of whom died next morning, three were employees of the Egyptian State Railways.

### *Second Move into Cyrenaica*

On November 1 an advance party of No. 21 M.R.S. proceeded to Landing Ground 215 situated in the open desert, about fifty miles south of Sidi Barrani. Its stay was of brief duration, for on November 18 General Auchinleck launched his offensive and within two months Benghazi was once again in Allied hands. On November 21, No. 21 M.R.S. moved to a new location near Fort Maddalena, about 40 miles due south of Sollum. It was operational almost immediately and on the third day 27 patients were admitted. During the month of November, consequent upon frequent moves, the number of admissions fell to 157 (60 per cent. R.A.F., 40 per cent. Army) and the average daily bedstate to eleven at Landing Ground 110 and fifteen at Landing Ground 122. The total number of operations for the month was 34.

Early in December the M.R.S. was ordered to a new site near El Adem, the remaining patients having been evacuated by air to Heliopolis, and normal activity was resumed, although the number of admissions declined. Most of the casualties resulted from the handling of grenades or from walking into mine-fields. On January 14, the M.R.S. was ordered to base and after five days of ordeal buffeted by sandstorms and delayed by persistent breakdowns of transport, the convoy finally crawled into base at Helwan.

### *Third Phase. May 1942–May 1943*

During the next four months, a section of the staff of No. 21 M.R.S. was used to reinforce R.A.F. Hospital, Egypt, while the remainder of the M.R.S. was engaged in renewing its equipment and re-organising its changed personnel. Among the new equipment were three Army type expanding marquees each of which could accommodate up to 30 patients. On May 17, 1942, the unit left its base fully mobile, in a convoy of 24 vehicles, and arrived at its new site at El Daba the following day. Work increased in June during which month a total of 263 admissions was recorded. The percentages of R.A.F. and Army were reversed, for of that total only 41 per cent. were R.A.F. personnel. These figures were accounted for by the absence of a fully equipped Army medical

unit in the area, but the situation was partly relieved in July by the arrival of an Army field ambulance. The M.R.S., however, still continued to provide major surgical facilities for Army personnel. Throughout June the average daily bedstate was 21, while the total number of operations performed was 73.

On June 24 large numbers of R.A.F. units passed through El Daba retreating after the fall of Tobruk, and No. 21 M.R.S. began a partial pack-up anticipating a move to the rear. During this period the portable crash-kit and transfusion set proved their worth, when on the night of June 26 a train crash occurred near El Daba and eight seriously injured cases were brought in for operation. As Nos. 22 and 24 M.R.Ss. had already withdrawn, No. 21 remained alone to serve the forward fighter units. As the scene of fighting grew nearer, cases were quickly evacuated and admissions were limited to surgical emergencies.

When on June 29 orders came for immediate withdrawal to Amiriya, the actual time of departure was delayed by over two hours while an urgent operation for the removal of a bomb fragment from an abdomen was performed; Amiriya was reached that night, and the next day a new site was selected near Landing Ground 90, about twelve miles south of Amiriya. In this location No. 21 M.R.S. served the forward fighter units for the next four months.

During the static periods, a vast expansion of all R.A.F. units took place in the area, and when new fighter and bomber wings arrived the M.R.S. found itself dealing with a greatly increased number of patients. During the four months an average of 482 cases per month were admitted of whom 79 per cent. were R.A.F. personnel; of these over 50 per cent. were returned direct to their units or through No. 22 M.R.S. which served as the holding unit.

At this stage every effort was made to prevent R.A.F. casualties, especially aircrew, from being evacuated through Army lines of communication, as during the intensive preparation for the final attack man-power was vitally important. Of the R.A.F. casualties who were unavoidably evacuated to Army hospitals, the majority were afterwards extremely difficult to trace, and several weeks or months frequently elapsed before they were eventually able to return to their units. Cases of malaria or infective hepatitis which at one time accounted for 25 per cent. of the total admissions were sent to No. 22 M.R.S. which, stationed at Wadi Natrun as a holding unit, rendered most useful service. These cases which required longer treatment than could be given at the forward M.R.S., were thus saved from inclusion in the Army evacuation. Medical cases continued to predominate over surgical, while the relative incidence of operational wounds became very low. No fewer than 104

operations were carried out each month, 37 per cent. being of a major character.

Because of the relative nearness of Nos. 21, 22 and 24 M.R.Ss. to each other and to Air H.Qs. Western Desert it was possible to hold periodic conferences at which problems were considered and ideas exchanged. These conferences were regarded as of first importance in planning the particular part which each M.R.S. was to play in the forthcoming phase of the campaign. The Principal Medical Officer was able to meet his commanding officers, to put them in the picture as far as permissible with regard to operational intentions and medical requirements, to discuss and agree how best to meet the coming needs, and to plan both the intended rôle and movement of each unit and the possible alternative should events not occur according to plan and expectation. As was stated so neatly at the time, this planning prevented an 'ugly rush' of medical units up the Desert road and ensured that the forward and rear forces, the fighter and the bomber wings would receive adequate medical care from units best placed to assist them. It had, too, the immense advantage of welding the medical units into a united team aware of each other's importance and of the combined contribution they could make. At such times it was possible to temper the natural zeal of the unit which resulted in each M.R.S. straining in friendly rivalry to be in the thick of the forward battle. Frequent meetings were also held, attended by unit medical officers, at which matters of clinical interest were discussed. It was at this stage that each M.R.S. undertook to act as a sub-depot for the distribution of medical stores to R.A.F. units in the Western Desert.

Early in November came the news of the Eighth Army's break through at El Alamein. After a rapid pack-up No. 21 M.R.S. moved to El Daba on November 6 and thereafter moved speedily westwards with the advanced fighter units, keeping in close communication with the Air Transport Centre, in order to maintain full evacuation facilities. Mersa Matruh, Sollum, Gambut, Gazala, Martuba and Barce were occupied in succession and by December 1 the M.R.S. was installed at the Italian Colonial Hospital at Benghazi. The rear section remained here with No. 22 M.R.S. to form an enlarged holding unit, while the advance party moved on with the fighter units. By the end of the year the M.R.S. had travelled 1,200 miles, treating sick and wounded and arranging for their evacuation by air from the adjacent landing grounds.

The original plan of leap-frogging the M.R.Ss. in the event of an advance had to be abandoned owing to the rapidly changing situation and by this time No. 21 M.R.S., far in advance of Nos. 22 and 24 M.R.Ss., was considered an integral part of the advance fighter group.



It was found in practice that on arrival of the M.R.S. at any new location the majority of early admissions were of a surgical nature, such as mine casualties or wounds resulting from enemy action, medical cases being more in evidence after a few days. Having learned from experience that a M.R.S. could move more freely in sections than in one whole party, it became customary, on receipt of a movement order, for the surgical unit to move off at once, leaving at dawn for the new location. The medical section and rear party, having evacuated the remaining patients, including surgical cases, by air transport, would follow a day later, by which time the forward party, at the new site, was already receiving fresh patients.

At the end of 1942 the M.R.S. was located at 'Marble Arch' and in January and February sites were selected at Hamraiet, Darragh, Tripoli, El Assa, Zuara and Medenine near the Mareth Line. During the month of February the unit only operated on a 20-bed basis owing to the falling off of admissions and as the rear party had been left behind at Tripoli to assist in the opening up of No. 24 M.R.S. as a holding unit (R.A.F. Hospital, Tripoli).

Medenine was an unsatisfactory location for a M.R.S. Enemy air activity was constant and the air ambulances were not permitted to venture so far ahead. As a German counter-attack was expected the unit was ordered on March 2 to return to Nefetia, 25 miles to the rear.

The number of admissions during March rose to three times that of the previous month. Out of 197 admissions, no fewer than 59 per cent. were surgical, and of these 80 per cent. were battle injuries. The stay at Nefetia proved equally as hazardous as that at Medenine, for on ten successive nights enemy bombers were overhead and on March 15 bombs were dropped all around the M.R.S. The following day the successful attack on the Mareth Line commenced and on the 22nd the unit moved forward to its old site at Medenine. Here a strip of ground 900 yards long was laid out as a runway for air evacuation.

The next move forward took place on April 5 to Gabes; by April 11 La Fauconnerie was reached and on April 21 the unit was finally located at its ultimate point in the Tunisian campaign—Sidi Hani, between Kairouan and Masken. Here the unit remained for a month until May 13 when notification was received of its new designation—No. 21 Mobile Field Hospital.

No. 21 M.R.S., from a modest beginning as a unit with sufficient equipment for six hospital beds and 20 stretchers in reserve, had grown into a mobile hospital of 50 beds with 50 stretchers in reserve. Its personnel had increased from 14 to 80 and its vehicle strength from 6 to 27. During the three years of its existence No. 21 M.R.S.

had treated upwards of 6,000 personnel, excluding out-patients' attendance.

### *Statistical Supplement*

Figures for the sixteen-month period from August 1940 to December 1941 (March 1941 was spent at base) are given below. Analysis shows: the air force units served, the intake and disposal and clinical conditions treated.

*Units Served.* During the whole period No. 21 M.R.S. admitted cases at various times from fifty-one squadrons and three flights. These were made up of 37 R.A.F. and 4 Fleet Air Arm units and the remainder of Dominion and Allied Air Force units. The M.R.S. also accepted cases from two Headquarters, three Groups and seven Wings, while among ancillary units covered were six Maintenance Units and Repair and Salvage Units, three Stores Parks, a Supply and Transport Column, an Armoured Car Company, nine Air Ministry Experimental Stations and other Wireless Units and thirteen other miscellaneous units.

The total number of admissions from all units during the sixteen months was 1,732, excluding Army personnel.

*Disposal of Cases.* The disposal of these 1,732 cases was as follows:

Discharged to full duty . . . . .	698 (40.3 per cent.)
"    "    light duty . . . . .	3 (0.2 " )
"    "    unit S.Q. . . . .	193 (11.1 " )
"    "    another M.R.S. . . . .	13 (0.8 " )
Invalided . . . . .	4 (0.2 " )
Died . . . . .	11 (0.6 " )
Transferred to General and Base Hospitals, to C.C.S., Army Fd. Amb., Ambulance Train and Hospital Ship . . . . .	810 (46.8 per cent.)
	<hr/>
Total	1,732 (100 per cent.)

*Clinical Conditions Treated.* Injuries formed the minority of conditions treated, accounting for 318 of the 1,732 cases—less than one-fifth. After excluding the following group classified as 'local injuries' of

Head and Neck (including 14 of concussion) . . . . .	23
Upper extremity . . . . .	14
Lower " . . . . .	25
Trunk . . . . .	3
and the effects of old injury . . . . .	7
	<hr/>
Total	72
	<hr/>

the main injuries were as follows:

Gunshot wounds . . .	69
Fractures . . . . .	58
Burns . . . . .	41
Multiple injuries . . .	9
Frostbite (in aircrew) .	10
Minor injuries . . . .	38
Sprains . . . . .	13
Insect bites . . . . .	2
Shock . . . . .	1
Sunburn . . . . .	2
Exhaustion (exposure) .	3
	<hr/>
Total	246
	<hr/>

Septic conditions (boils, cellulitis, abscess, etc.) accounted for 116 cases, ear and nose for 50, and eye conditions for 18 cases. Chief among the medical conditions were:

Diseases of the digestive system . . . . .	232
Diseases of the respiratory system (including influenza, tonsillitis, etc.) . . . . .	271
Pyrexia of unknown origin (P.U.O.) and suspected infectious diseases . . . . .	64
Dysentery and enteritis . . . . .	138
Diseases of skin 97 } . . . . .	117
Desert sores 20 } . . . . .	
Sandfly fever . . . . .	65
Malaria . . . . .	28
Typhoid fever . . . . .	1
N.Y.D.(V.D.) and Gonorrhoea . . . . .	22
	<hr/>
Total	938
	<hr/>

The balance of approximately 300 cases come under miscellaneous disease headings of no special importance.

NO. 22 M.R.S.

*First Phase. October 1940–April 1941*

This unit was formed on May 15, 1940, at the Royal Air Force Medical Training Depot at Halton, Bucks, embarked for the Middle East on June 29 and reached Suez on August 23. After several weeks spent in assembling equipment and training personnel, it left Helwan on October 28 for service in the Sudan campaign.

The Italian Colonial Armies having occupied the frontier posts of Kassala and Gallabat were preparing for an advance northwards into

the Sudan. During October and November 1940, however, they were skilfully held at bay by the opposing British Forces and in January 1941, when British troops moved southwards into the Sudan to oppose them, their hoped-for reinforcements had still not arrived. On January 18 our attack developed, by February 2 Kassala, Agordat and Barentu were in our hands, and finally after long weeks of mountain warfare Keren capitulated on March 26.

After various halts at landing grounds in the Sudan No. 22 M.R.S. arrived at Agordat on March 6 and remained there for seven weeks while operations were proceeding against Keren about 30 miles away.

At Agordat No. 22 M.R.S. was attached to 3 (Indian) Casualty Clearing Station whose operating team moved farther forward during the battle for Keren. The unit was housed in the Italian Military Hospital and medical personnel in ridge tents in a nearby *wadi*. Convoys of casualties arrived daily by road and the medical staff were kept fully occupied, accommodation being available for over 200 cases. In the short period between March 6 and 29, no fewer than 771 British and 119 Italian wounded passed through the C.C.S. The majority, however, were not admitted but evacuated to Tessenei, as instructions had been received for the C.C.S. to remain as empty as possible in order to cope with any emergency.

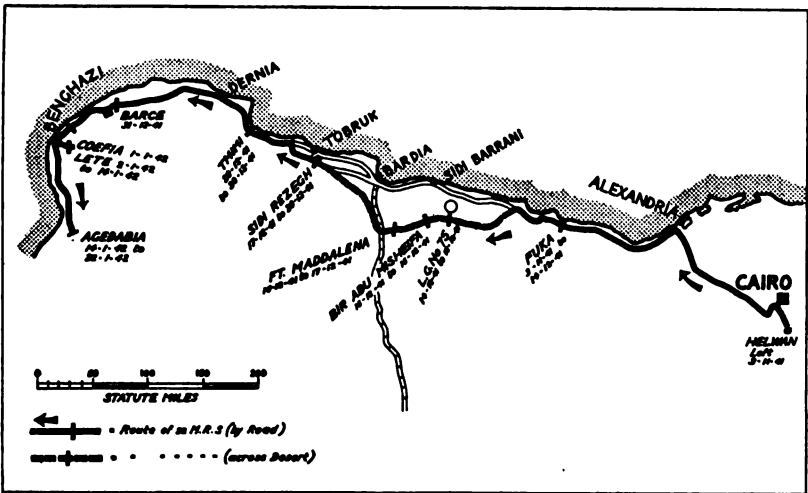
During the seven weeks' stay at Agordat over 300 admissions were recorded involving 60 major and 40 minor surgical operations. The X-ray apparatus proved invaluable, as no X-ray was available at the base hospital at Tessenei, and was employed in 70 cases. All the wards were well equipped and were staffed by personnel from 3 (Ind.) C.C.S. assisted by six nursing orderlies from No. 22 M.R.S. The administrative work was carried out by 3 (Ind.) C.C.S. although the surgical work was performed entirely by the staff of No. 22 M.R.S. which functioned as a small surgical section. During the whole of the campaign very few R.A.F. casualties were treated, fully 90 per cent. of the admissions being from Army units.

### *Second Phase. November 1941–July 1942*

In April the unit returned to Egypt and remained non-operational at Helwan for six months, during which time most of its personnel were transferred to other units. On the eve of the British offensive in November 1941, it became fully operational again. Its personnel were increased to full establishment from 24 to 74, while equipment and transport were brought up to scale for service in the field. On November 3 the unit left Helwan and on arrival at Fuka occupied the original site of No. 21 M.R.S.

The stay at Fuka lasted six weeks until December 14 when the M.R.S. moved into Cyrenaica, where various sites were occupied until

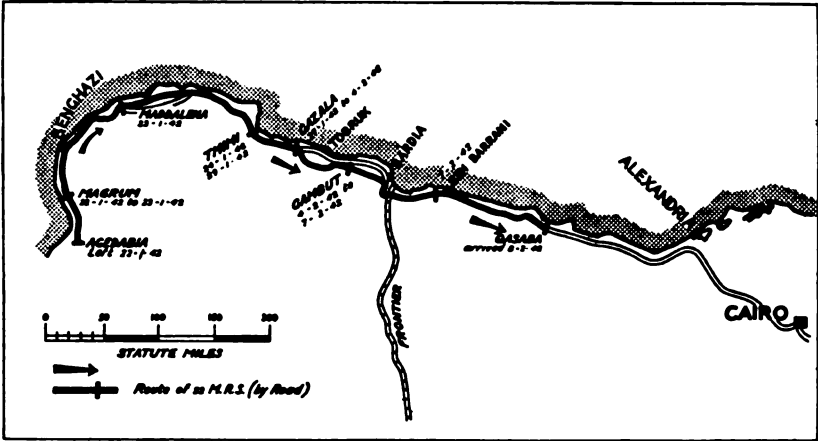
Barce was reached on December 31. In the 42 days of November and December during which the unit operated, a total of 133 patients were admitted and 32 major operations were performed. On January 14, Agedabia was reached, and in this location No. 22 M.R.S. was the most forward R.A.F. unit in Libya. On January 21 the main party left for Benghazi as conflicting reports of approaching enemy forces had been received. The surgical team remained behind to operate on twelve serious casualties requiring urgent attention, but on the following day the last of the party left with 20 patients an hour before enemy forces



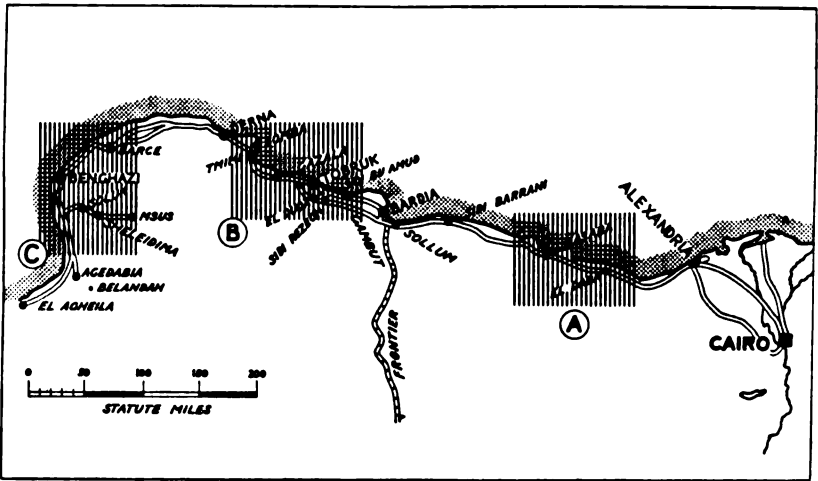
MAP 2. No. 22 M.R.S. Advance, November 3, 1941–January 22, 1942.

occupied the town. All the patients travelled well and were transferred to a Field Hospital at Benghazi in a satisfactory condition. As all communication with Air Headquarters, Libya, had been cut off, it was decided to return to Tmimi which was reached on January 24, but within a few days a further move was ordered, this time to Gazala. This was but a breathing space, as on February 4, the M.R.S. arrived at Gambut and on the 8th at Maaten Baggush. By this time Rommel's advance was halted, and the M.R.S. was ordered back to Gambut, arriving there on February 19. These moves of 22 M.R.S. are illustrated in Maps 2–8.

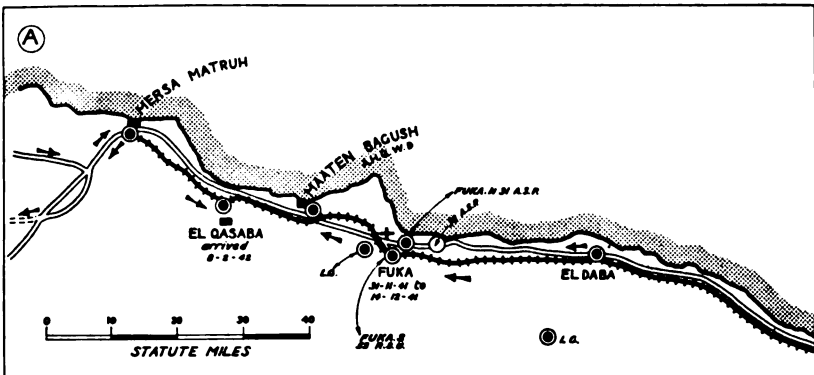
The next four months were spent at Gambut where the M.R.S. was situated in the forward area within six miles of fourteen R.A.F. squadrons and other ancillary units. It also served a large number of Army personnel in the vicinity, being the only medical unit of its kind between Bardia and Tobruk, a distance of 35 miles. On May 20,



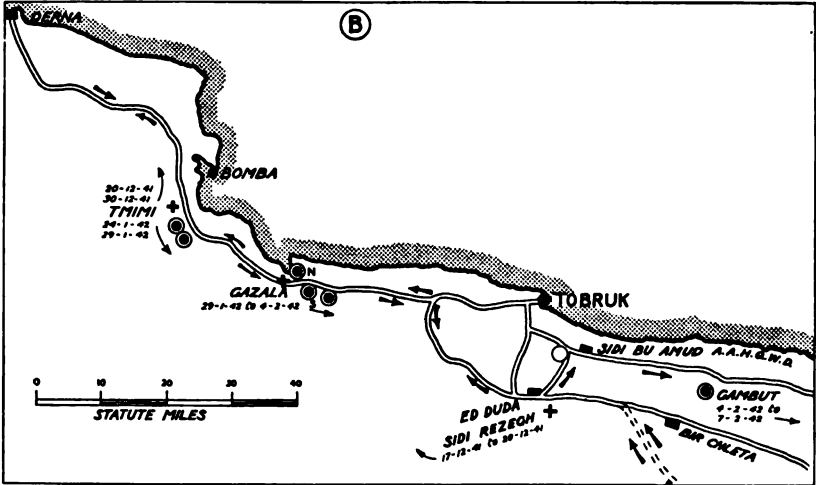
MAP 3. No. 22 M.R.S. Withdrawal, January 22, 1942–February 8, 1942.



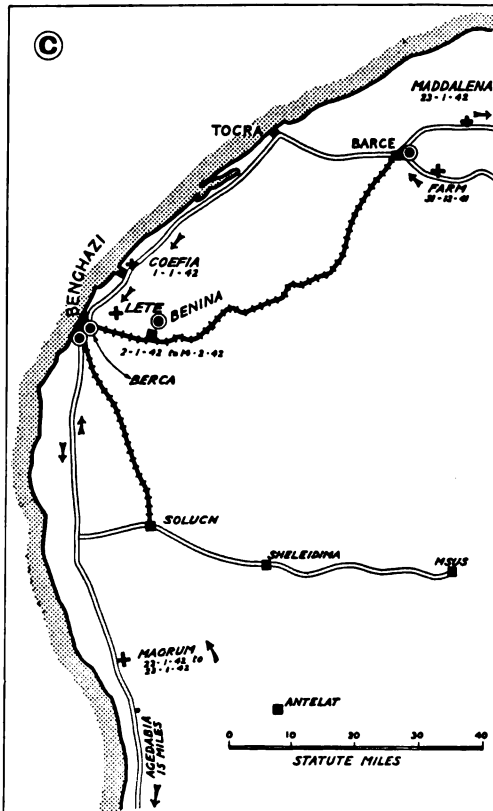
MAP 4. General map. No. 22 M.R.S. November 3, 1941–February 8, 1942.  
A, B, and C. See large scale maps.



MAP 5. No. 22 M.R.S. (A).



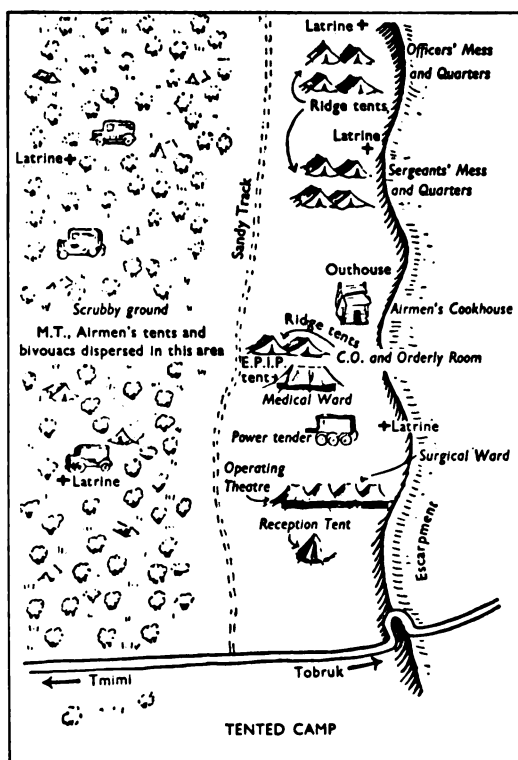
MAP 6. No. 22 M.R.S. (B).



MAP 7. No. 22 M.R.S. (C).

following the news of a heavy armoured battle in the Bir Hakim–Tobruk–El Adem area, immediate evacuation of all cases took place, in order to leave the full bed strength available for casualties.

On June 14, following the fall of Bir Hakim, orders came to move once more, this time to Landing Ground 75 about 30 miles south of



MAP 8. No. 22 M.R.S. in camp at Gazala.

Sidi Barrani. On June 24 the M.R.S. was withdrawn to Maaten Bag-gush and four days later to Amiriya where it encamped in the vicinity of No. 21 M.R.S. By July 5, following instructions, the unit returned to Helwan to refit.

For the period November 1941 to July 1942 the total admissions numbered 973 of which 63 per cent. were R.A.F. The total number of surgical operations performed was 321, of which 142 were of a major character.

#### *As 'Holding' M.R.S. October 1942–May 1943*

With the German line at El Alamein and the prospect of an intense winter campaign ahead, No. 22 M.R.S. was completely re-formed and re-equipped to serve as a 'holding' unit. The intention was to use it



in the rear of Nos. 21 and 24 M.R.Ss. for the reception of any of their cases requiring a moderately long period of hospitalisation, but not sufficiently ill to necessitate invaliding to base. It was thus hoped to conserve essential man-power in operational units by avoiding many weeks of non-effectiveness in numerous medical cases such as acute gastro-enteritis, infective hepatitis, non-specific dysenteries and benign tertian malaria. In the surgical wards, too, ample scope was found for the treatment of burns, sprains, simple fractures, desert sores and numerous types of sepsis. Statistics show that this scheme was extremely successful. In October, of 218 admissions, fully 50 per cent. of which were transfers from Nos. 21 and 24 M.R.Ss., 78 per cent. were returned direct to their units. In November, of 244 R.A.F. admissions the figure was 77 per cent. while in December with 442 admissions it rose to 87 per cent.

On October 4, 1942, No. 22 M.R.S. was established in the vicinity of Rear Air Headquarters, Western Desert, at Wadi Natrun on an 80-bed basis, soon afterwards increased to 100 beds. Accommodation was well-planned in the form of four ward units, each of 20 beds, in large hospital marquees, which were later extended to accommodate 30 patients each.

On November 5, No. 22 M.R.S. moved to Amiriya, 40 miles north, just east of the Cairo-Alexandria road. After a stay of two weeks a further move was then made to El Adem, 423 miles west. By November 25 an advance party of the unit was in possession of the Italian Colonial Hospital at Benghazi while its rear unit was at Tmimi Roadhouse. During the next three months No. 22 M.R.S. functioned in conjunction with the rear party of No. 21 M.R.S. as a holding hospital at Benghazi. The combined bedstate of this hospital was initially 125 but rose rapidly to 350. It served all casualties received from the forward areas, and acted as a clearing station for cases to be transported by ship—of the latter, 455 passed through during the month of December. (The history of this hospital is described later, under the heading R.A.F. Hospital, Benghazi.)

No. 22 M.R.S. ceased to function as a static hospital at Benghazi on March 5, 1943, when an advance party of 60 beds left to re-form as a field unit in the Misurata area. The main party which followed on March 28 was soon functioning at Gardabia, and during the month of April recorded 131 admissions, of whom 75 per cent. were discharged back to their units. During May the numbers fell to 99, nearly all of these being returned fit for duty. Meanwhile the section at Misurata was serving a large heavy bomber Group (No. 205) and other R.A.F. units in the area, and on May 9 the title was changed to No. 22 Mobile Field Hospital. A short while afterwards, No. 22 M.F.H. with No. 205 Group moved northwards into the Kairouan area of Tunisia near the site previously occupied by No. 21 M.R.S.

## NO. 24 M.R.S.

One and a half years after the constitution of Nos. 21 and 22 M.R.Ss., No. 24 M.R.S. was formed at Headquarters, Medical Training Establishment, Harrogate, on November 3, 1941. The complete unit of 6 officers and 55 airmen embarked for the Middle East on November 15 and reached Suez on January 11, 1942. After reaching Helwan the unit was non-operational for five months owing to delay in the arrival of its stores and equipment, and many of its personnel were meanwhile detached to other units. On June 13, 1942, No. 24 M.R.S. moved westwards and on the following day reached Fuka. The old site previously occupied by Nos. 21 and 22 M.R.Ss. was by now unsuitable, being completely sanded in, and a new site was chosen, at which by June 20 the unit was fully operational. As at this time the news of Rommel's advance was grave, the M.R.S. returned on June 26 to Wadi Natrun where it worked on a skeleton basis until July 17. At these two locations over a period of 21 operational days, the unit admitted a total of 125 cases, and gained its initial experience of Desert conditions.

On July 17 the next move took place to Burg El Arab where the M.R.S. functioned for four months and during this period admitted over 638 in-patients, performed 160 operations and dealt with 1,700 cases as out-patients, nearly 65 per cent. of the latter being from Army units.

With the advance of the Eighth Army into Cyrenaica No. 24 M.R.S. was moved forward to Maaten Baggush on November 9 and on the 10th to Gerawla where it remained for ten days. Here, when the leap-frogging plan was abandoned, the unit fell back behind its colleagues, and was assigned to serve the rear force of Royal Air Force units. At this time the remains of a German Field Hospital were found near Mersa Matruh. Among the salvaged equipment were four large ward marquees, which were quickly put into use in place of some of those of R.A.F. issue, over which they had several advantages. These included the absence of guy ropes, reducing the total number required from 60 (R.A.F. standard pattern) to 20, excellent lighting and ventilation due to the mica windows in wooden frames, easy erection, and better wearing qualities of the heavier materials. (*See Plates IX and X.*)

On November 23, 1942, No. 24 M.R.S. moved forward again, arriving the following day at Gambut where it remained for two months. During December over 260 patients were admitted of whom 78 per cent. were Royal Air Force personnel. The number of operations was 66, and over 300 out-patients were treated. Royal Air Force personnel who were expected to be fit for duty within six to eight weeks were evacuated by air to No. 22 M.R.S., the 'holding' unit at the Colonial Hospital at Benghazi, while others were sent by air to base. Army cases were evacuated to the casualty clearing station at Tobruk.

On January 21, 1943, the unit moved forward again and reached Benghazi on the 24th. Instructions were then received that No. 24 M.R.S. was to proceed to Tripoli where it would act as the 'holding' unit, occupying the Italian Colonial Hospital (*see* Plate XI, R.A.F. Hospital, Tripoli).

#### NO. 25 M.R.S.

This unit formed at No. 2 P.D.C., Wilmslow, on August 10, 1942, and embarked for the Middle East on August 15, arriving at Port Tewfik on November 8. The next four weeks were spent at Helwan accumulating supplies and training personnel. As the final advance was soon under way, no time could be lost by awaiting the arrival of stores from the United Kingdom, so with the limited supplies already available the M.R.S. left Helwan on December 6 and arrived at Tmimi Roadhouse on the 9th, where it remained until December 16, arriving eventually at Agedabia on the 18th.

At Agedabia the M.R.S. was located about  $1\frac{1}{2}$  miles south of the town on the coastal side of the main road. Most cases received were of a medical nature, infective hepatitis being predominant. Christmas was spent under adverse conditions, as for six days sandstorms, gales and rain were continuous. On Boxing Day a message was dropped by aircraft indicating that the M.R.S. was to move to 'Marble Arch' by December 28. The whole of the next day the unit struggled to extricate itself from ankle-deep mud, but on the following day had reached 'Marble Arch' and by the 29th was operating on a new site near Nofilia landing ground.

In the early days of 1943 the unit experienced the worst gales since its formation, with continuous storms for three days severing all communications. On January 11 the M.R.S. moved to a landing ground near Sirte, where it remained for four weeks. During the period at Nofilia and Sirte, 127 cases were admitted and 38 operations performed. On January 20, a light section moved forward to Hamraiet East.

By February 9 the unit was on the move again, this time to Bir Dufan where the bedstate remained at 35. Serious cases were evacuated by air to No. 24 M.R.S. now operating the hospital at Tripoli, evacuation being facilitated by the marking out of a small landing ground adjacent to the unit. The Australian Air Ambulances\* were thus enabled to complete loading and take off within half an hour. While at Bir Dufan 98 patients were admitted and 16 operations performed. The majority of R.A.F. patients were returned direct to their units or by air transport to No. 24 M.R.S.

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\* *See* Section 'Air Evacuation of Casualties' in this Chapter, and also Volume I, Chapter 10, of this History.

On March 5, 1943, the unit moved to El Assa village, remaining there until April 4. Here for a while it acted as a holding unit receiving casualties from No. 21 M.R.S. and two Eighth Army casualty clearing stations. Admissions rose to 125 including personnel of the R.A.F., S.A.A.F., and U.S.A.A.F., equipment being sufficient to allow expansion to 150 beds if necessary.

After April 4, various moves took place to Medenine, occupying the old site of No. 21 M.R.S., to Triaga near Sfax, and eventually to La Hencha where the unit covered the light bomber wings in the Sfax-El Djem area.

During this period over 200 patients were admitted and 50 major operations were performed. The majority of cases were medical but a large number of severe casualties from road accidents were also admitted, accounting for three deaths. One extremely severe case of haemorrhagic smallpox occurred with a fatal result.

On May 13 a light section of the M.R.S. moved to Carthage, near Tunis, to take charge of a German field hospital housed in a convent school. This hospital contained over 450 German wounded under the care of their own medical officer, with a British Army guard. The sanitation was hopelessly inadequate, the wards badly overcrowded, and sepsis was rife among the grossly crowded patients. Supervision was exercised over the transfer of these patients to prisoner-of-war camps and care was taken to prevent the damaging of medical equipment, which included R.A.F. medical stores captured at Tobruk. The advance party remained at Carthage until the end of May, at which time some 250 patients were still awaiting transfer.

By the end of June, following instructions, No. 25 M.R.S. had moved southwards to the Ben Gardane area. Here it continued to function following the conclusion of the North African campaign, under the new designation of No. 25 Mobile Field Hospital.

#### R.A.F. GENERAL HOSPITALS, MIDDLE EAST COMMAND

##### NO. 5 R.A.F. GENERAL HOSPITAL (EGYPT)\*

In September 1941, the Air Officer in charge of Administration, Middle East, requested the D.G.M.S., R.A.F. to consider the possibility of forming a Royal Air Force general hospital in Cairo. The Director-General considered such a step inadvisable and suggested that arrangements should be made with the D.D.M.S., Army to allocate wards in the military hospitals for use by the Royal Air Force. Medical staff would be provided within the Command establishment but members

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\* While hospitals retained a geographical nomenclature there was always a tendency to regard them as static units long after the local need for them to be so situated had passed. In view, therefore, of the probability of mobile warfare it was decided to give R.A.F. hospitals a numerical rather than a geographical nomenclature, the precise location being determined by the local situation.

of the Princess Mary's Royal Air Force Nursing Service would be posted from the United Kingdom. The D.D.M.S. was unwilling to agree to this proposal because of the acute shortage of beds and stated that he would welcome the formation of a Royal Air Force hospital which would relieve congestion in Army establishments. The Principal Medical Officer, Middle East, also reiterated his earlier requests, stating that with the great increase in the Command R.A.F. aircrew personnel were already being treated in fifty different hospitals. Patients were often in the hands of medical officers who—with no disrespect to them—had insufficient knowledge of the conditions peculiar to flying, of the standards of fitness required for the many special types of duty and especially of the flying and ground conditions causing or aggravating these illnesses and likely to prejudice effective return to duty. Particularly was this so with regard to the neuropsychiatric disturbances related to flying.

As already mentioned it was necessary to investigate many of the disabilities presented to the Command Medical Board, for otherwise it was impossible to reach a satisfactory diagnosis, prognosis and recommendation for disposal.

While the fact that it was desirable for R.A.F. personnel to be treated by members of the same Service could not be allowed to outweigh operational requirements and the economic inter-Service manning dispositions, it is undoubtedly true that, all other things being equal, such an arrangement was of immense value to morale.

Eventually the necessary approval was given on November 25, 1941, and the formation of Royal Air Force Hospital, Egypt, for the treatment of officers and aircrew only, was authorised in Middle East Order No. 398.

A suitable building was found at Demerdache near Abbassia, a north-eastern suburb of Cairo. This building was designed as a maternity hospital and children's welfare centre, and was still in the process of completion when taken over by the R.A.F. Prior to the commencement of building the site had comprised a mixture of slum and graveyard, and for some time after R.A.F. occupation it was surrounded, except on the east side, by partially demolished buildings and ground broken by recent interments. This area, up to the walls of the hospital itself, was being used as a public latrine by the villagers of Demerdache until a surrounding fence was completed in April. A large area of public gardens separating the eastern side of the hospital from the main Cairo-Heliopolis road was enclosed for the benefit of the hospital and by the end of the year had been laid out in lawns and bowling greens. (See Plates XII and XIII.)

Owing to shortage of local accommodation, the staff were dispersed over a wide area. Officers lived in private flats or *pensions* in Heliopolis,

nursing sisters and N.C.Os. were billeted in buildings about half a mile from the hospital, and airmen had a complete building adjacent to those occupied by the N.C.Os.

The war establishment as laid down consisted of:

1 Group Captain . . .	Officer Commanding
2 Wing Commanders . . .	Senior specialists
7 Squadron Leaders . . .	for duties such as pathologist, radiologist, anaesthetist, etc.
3 Flight Lieutenants . . .	for general medical duties
1 Flying Officer . . .	Adjutant
35 Nursing Sisters . . .	(P.M.R.A.F.N.S.)
19 Senior N.C.Os.	
31 Junior N.C.Os. and 104 Aircraftmen of whom 30 were nursing orderlies.	

Apart from the commanding officer, the matron and the quartermaster (who were provided from units within Middle East establishment), the complete staff of medical and other personnel was posted direct from the United Kingdom and arrived on March 9-10.

The preparation of the hospital was begun as soon as the quartermaster arrived, and with the assistance of the matron and personnel from No. 24 M.R.S. (not then in operation), most of the ground work was completed before the arrival of the full staff.

As it was unlikely that the medical equipment would arrive from the United Kingdom for about three to four months, it was decided to obtain as much as possible from local R.A.F. and Army sources, in order to expedite the admission of patients. Barrack equipment was collected from maintenance units in many parts of the Command and sufficient surgical and medical equipment to enable the hospital to work in a limited manner was obtained from Army sources. Medical equipment eventually arrived from the United Kingdom between August 30 and October 13.

The theatre was opened on March 15 for any emergency work that it might be called upon to do, and an X-ray plant borrowed from No. 21 M.R.S. (not then in operation) was installed on March 29. By March 30, 119 beds were equipped and the hospital was declared ready to receive any type of case (except major orthopaedic, chest, V.D. and mental patients), among officers and aircrew only. The first patient was admitted on March 31. In the following months, because of the slow rate of admission, non-flying personnel were admitted between April 24 and June 29, by which time the flow of officers and aircrew was sufficient to keep all departments busy. Some non-aircrew personnel were still admitted after June 29, however, as a result of P.M.O., M.E's., ruling that all patients (except infectious, V.D., mental and those earmarked for special hospitals) arriving in

Cairo by air from the Western Desert would be admitted to the R.A.F. Hospital, Egypt. Any necessary sorting would be done at the hospital and cases needing special surgery (i.e. chest surgery) would be passed on to the hospital having the appropriate specialist facilities.

On July 1, in view of the sudden deterioration of the military situation in the Western Desert, it became necessary to clear as many beds as possible and of the 247 patients in hospital 123 were discharged that day and 33 the following day. On July 3 two medical officers and ten medical orderlies were despatched with 39 patients by train to the Rest Camp at Tel Aviv in Palestine, thus inaugurating No. 10 Airmen's Convalescent Depot (A.C.D.). At the same time the twelve R.A.F. ambulances in the Middle East pool of vehicles were attached to the hospital so that in the event of a sudden evacuation becoming necessary, as many stretcher cases as possible with a nursing sister in attendance could be cleared at short notice. In the meantime large supplies of blood were obtained, and the hospital was organised to admit battle casualties. Approximately one week later the situation improved and the hospital returned to its routine work.

During the first six months of 1943 the work of the hospital was continued in accordance with the main policy. Its primary function was to act as a base hospital for the reception of Air Force casualties among pilots and aircrew. The number of casualties actually received during the period was less than that estimated, this being largely due to the small number of aircraft available for evacuation of casualties from the Western Desert. In addition, a considerable number of personnel transferred by sea were admitted to Army hospitals near the port of disembarkation, and eventually, as the scene of operations moved westwards and R.A.F. hospitals were established at Benghazi and Tripoli, distance became a governing factor.

While Air Force personnel were admitted from neighbouring stations priority had always been given to flying as distinct from ground personnel. This resulted in a certain number of beds being kept in constant reserve as occasionally casualties arrived without warning. This apparent slight wastage in accommodation could not be avoided. Analysis showed that the number of aircrew personnel admitted was not sufficient to justify the hospital being reserved for them alone, while on the other hand, the accommodation was insufficient for all R.A.F. personnel. It should be mentioned that the term 'Air Force' was used to include flying personnel from Dominion and Allied forces as well as from the R.A.F.

The allotment of accommodation was in general satisfactory. Owing to the necessarily prolonged treatment of orthopaedic and certain other types of cases, the surgical bedstate remained more consistently near its peak than the medical. The latter varied with the incidence of certain

diseases and the number of minor illnesses requiring short hospitalisation.

The advisability of admitting members of the P.M.R.A.F.N.S. and W.A.A.F. officers was considered. The difficulty of segregating the necessary accommodation coupled with the existing limitations of the building were factors which decided against their admission. Nevertheless, some members of the Nursing Service suffering from minor ailments were admitted to the infectious diseases block during the colder months. This block was originally reserved for the isolation of doubtful cases of infectious diseases, but as it was extremely difficult of access for stretcher cases, and was furthermore situated on the roof, making it unbearable for patients in the hot weather, its usefulness for its original purpose was limited.

The disposal of cases varied according to the status, type and condition of each patient. Officers were discharged in accordance with normal procedure, those requiring further treatment returning after a period of convalescence. The final discharge in a number of cases was effected through the C.M.B. at Heliopolis. When airmen required convalescence or continuous treatment they were sent to No. 10 A.C.D. at Tel Aviv. During the latter months of 1943, as the convalescent depot expanded, with better facilities for continuation of treatment, more patients were sent at an earlier stage. This resulted in an increased turnover and the number of hospital admissions rose. Finally invalids for the United Kingdom considered fit for discharge from hospital were sent to a Personnel Transit Centre to await shipment.

The chief diseases treated in the hospital were as follows:

#### *Medical Cases (April 1942–June 1943)*

(a) *Malaria*. During the period under review 622 cases of malaria were admitted. The majority of these were of a malignant tertian character and occurred in personnel serving on the trans-Africa ferry route. A sharp decrease in the total admissions of cases of primary malaria followed the opening of the North African air route. Chronic malaria was the chief cause of chronic splenomegaly among Service personnel. An additional aid to diagnosis which proved to be of value was sternal marrow puncture. This was particularly useful in cases where the sporulation in the peripheral blood was so scanty as to be absent for practical purposes, and it made possible the grouping of an apparently heterogeneous collection of cases, viz. 'tropical neurasthenia', 'pyrexia of unknown origin' and vague ill health, under one pathology.

(b) *Infective Hepatitis*. This disease, which accounted for 273 cases, assumed mild epidemic proportions in November and December 1941 and abated after March 1942. Of the cases admitted after March



95 per cent. had received yellow fever inoculation in the United Kingdom 2 to 3 months previously. The possible aetiology of this outbreak has already been discussed.

(c) *Bacillary Dysentery*. Bacillary dysentery became a relatively mild illness owing to the almost specific effect of sulphapyridine and, later, of the even more effective drug, sulphaguanidine. In the first half of the period 146 cases were admitted.

(d) *Typhus Fever*. Three cases occurred with one death, all serums strongly agglutinated B. Proteus X-19.

(e) *Typhoid Fever*. A small number of well established cases were admitted and found to be due to a non-mobile organism which conformed in all other respects.

(f) *Desert Sores*. The relationship of this disability to vitamin C was not clearly established but a number of cases was found, by saturation tests, to be deficient in the vitamin. Hansin's method of saturation testing for assessing such deficiency was carried out on personnel from the Western Desert and Malta. In a group of 30 cases it was found that the average deficiency was 2-3 days when taking basic rations without extra messing. It was estimated that such a diet would not afford more than 10 mg. of vitamin C per day and that an issue of 25 mg. tablets daily to all personnel would raise their intake of vitamin C to approximately that recommended by the League of Nations (30 mg. per day).

### *Surgical Cases*

During the period 1,843 true surgical cases were admitted, approximately 12.5 per cent. being due to enemy action. It was noticed that a surge of general battle activity causing a heavy increase in Army casualties did not necessarily create a corresponding rise in the number of R.A.F. casualties admitted. Examination of the ratio of surgical to medical cases drew attention to the often forgotten fact that war produces much more disease than wounds or even injuries.

The majority of cases from the Western Desert had spent an average of ten days in either a M.R.S. or C.C.S. or other Army medical unit. Their condition on arrival was generally good, in spite of certain unnecessary hardships experienced in some cases. Examples of these were prolonged waiting at the point of emplaning and inadequate feeding arrangements while in transit. Two factors had a bearing on this. First, even at this stage it was not fully accepted that air evacuation was an operational necessity, as opposed to a courtesy; secondly, in war, if not always in peace, the principle must inevitably be for the patient to await the aircraft, not the aircraft the patient.

There were no groups of cases of special interest during the period except in respect of burns. During the latter period 42 cases were



PLATE V: A South African photographic trailer converted into a mobile pathology laboratory



PLATE VI: Interior of the laboratory showing the layout of the equipment

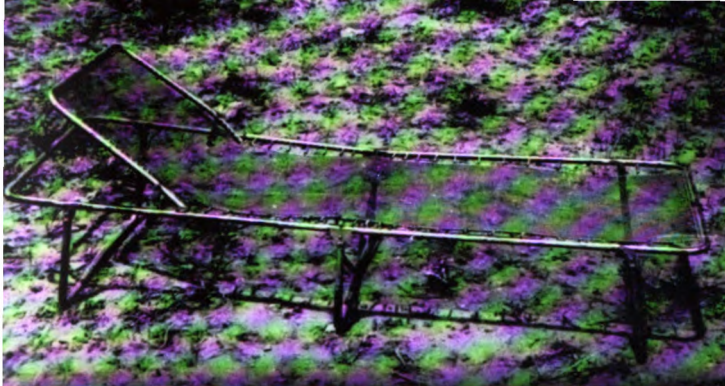


PLATE VII : German hospital bed. These were light and suitable for the climate



PLATE VIII : Captured Italian operating theatre and water trailer



PLATE IX : German Field Hospital. Ward tent



PLATE X : Entrance of German tent showing space between outer and inner walls and the absence of guy ropes



PLATE XI: No. 3  
R.A.F. Hospital,  
Tripoli, at which No.  
24 M.F.H. acted as a  
'holding unit'



PLATE XII: No. 5  
R.A.F. Hospital  
(Egypt)



PLATE XIII: A ward  
in No. 5 R.A.F.  
Hospital (Egypt)





PLATE XIV : Arrival  
of casualty at M.F.H.



PLATE XV : 'Holding  
unit'



PLATE XVI :  
Personnel of No. 1  
Australian Air  
Ambulance Unit  
loading casualties



PLATE XVII: D.H.  
86 Air ambulance



PLATE XVIII:  
Treatment during  
flight



PLATE XIX:  
Wreckage of a D.H. 86  
Air Ambulance shot  
down on December 8,  
1941



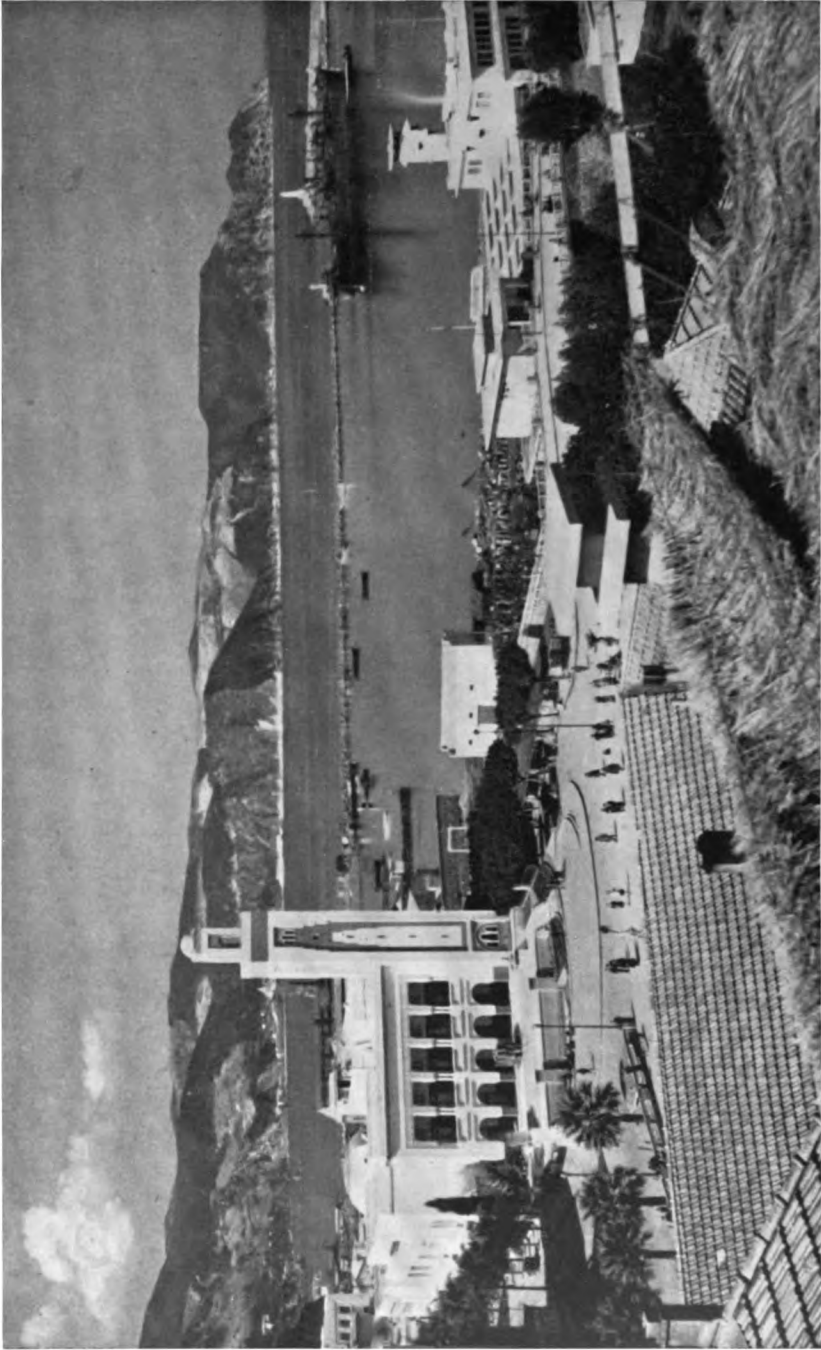


PLATE XX : No. 67 General Hospital, Philippeville



PLATE XXI : No. 1 Royal Air Force Hospital, Carthage





PLATE XXII : Orthopaedic Ward. No. 2 R.A.F. Hospital, Algiers

admitted of which 26 were classified as severe and 16 as slight. Analysis by trades showed that of the 26 severe cases 15 were ground staff against 11 flying personnel. The total of all cases was 28 ground staff and 14 flying personnel. This result is interesting when one allows for proportionate numbers and the greater susceptibility of flying crews to injuries from burns.

The distribution of burns was primarily that of the exposed areas and was so characteristic as to merit the name 'Middle East Burn'. The regions so involved were the face and neck, the forearms and the middle two-thirds of the thigh, that is, the entire areas not covered by tropical clothing.

The work of the various departments of the hospital from April 1942-June 1943 is summarised below:

	April- Dec. 1942	Jan.- June 1943
<b>Admissions</b>		
(a) Medical . . . . .	2,304	1,374
(b) Surgical . . . . .	993	1,137
<b>Total admissions</b>	<b>3,297</b>	<b>2,511</b>
<b>Medical Boards</b>		
(a) Medical cases . . . . .	668	304
Transferred to Home establishment on medical grounds	64	39
(b) Surgical cases . . . . .	261	171
Transferred to Home establishment on surgical grounds	72	39
<b>Operations</b>		
Major . . . . .	157	235
Minor . . . . .	368	258
Plaster . . . . .	154	300
<b>Totals</b>	<b>679</b>	<b>793</b>
<b>Anaesthetics</b>		
General . . . . .	258	386
Spinal . . . . .	35	63
Local . . . . .	107	105
<b>Totals</b>	<b>400</b>	<b>554</b>
<b>No. of cases X-rayed . . . . .</b>	<b>1,760</b>	<b>2,827</b>
<b>Laboratory Examinations . . . . .</b>	<b>14,617</b>	<b>14,348</b>
<b>Rehabilitation of Orthopaedic Cases</b>		
(a) No. of cases treated . . . . .	392	Not known
(b) No. of treatments . . . . .	4,357	„
<b>Dental</b>		
(a) Attendances . . . . .	1,330	1,188
(b) Admissions: Infectious . . . . .	35	} 58
Theatre cases . . . . .	31	
Maxillo-facial . . . . .	11	

**R.A.F. HOSPITAL, BENGHAZI (NOVEMBER 1942-JULY 1943)**

Although this hospital did not form as a separate unit until March 8, 1943, it is essential to give an account of the events which led up to its formation.

Benghazi fell to the British forces on November 22, 1942, but no appreciable number of troops entered the town until November 25. On that date an advance party of No. 22 M.R.S. arrived and inaugurated R.A.F. Hospital, Benghazi by hoisting their flag over the Italian Colonial Hospital. The main portion of this building was already occupied by native patients looked after by Italian Roman Catholic nuns, who were openly hostile to the R.A.F. and reluctant to release any additional accommodation apart from the isolation block. In order to clear up a difficult situation a staff officer from G.H.Q. inspected the hospital and ruled that the buildings on the west side of a line which became known as the Matheson line, should be reserved for civilian use, and that all buildings to the east should be handed over to the R.A.F. Property in the latter area, if it was not required by the R.A.F., was removed to the civilian side. As a result of this clear ruling the nuns were compelled to open all cupboards, pantries and side wards, most of which had been kept locked under various pretexts. It proved impossible, however, to shift the nuns themselves who continued to live in the main surgical block, some next to the main operating theatre, and others in the private patients' wing. The position of the commanding officer, forced as he was to share a building with enemy aliens who not only claimed property and locked doors, but also spread rumours, was most invidious.

The building occupied by the advance party was originally the isolation block and was composed of small, 2-6 bed wards accommodating 70 patients. About a fortnight later accommodation for a further 150 patients was taken over in that part of the surgical block not occupied by the nuns. Two pavilions (40 beds each) in front of the main surgical block were also utilised, one as a medical store and administrative office, the other as a convalescent ward. (A further pavilion occupied by native patients was so heavily infested that demolition was necessary. As burning was considered too dangerous, and dismantling too laborious, a Crusader tank was used to effect the demolition!) On arrival at the isolation block the advance party discovered 18 English prisoners-of-war there, convalescing after such diverse illnesses as diphtheria and beriberi. It appeared that these two illnesses were common among prisoners-of-war although the main epidemic during the summer months was the enteric group, dysentery being particularly severe, while 300 cases of typhoid fever were reported to have occurred in the rest of the hospital.

Prior to occupation of the Colonial Hospital it had been agreed at a

conference with the A.D.M.S., 83 Sub-area (the local Army Administrative H.Q.) that if the R.A.F. occupied the hospital they would accommodate up to 200 Army patients in transit who were awaiting the arrival of a hospital ship. This arrangement was made because, although such accommodation was necessary for the 24 hours before evacuation, the D.D.M.S. Eighth Army was unwilling to place any Army medical units in the town because of the dangers of bombing and bad sanitation. It was originally intended that this, and the treatment of any emergencies brought to the R.A.F., would be the only commitments in respect of Army personnel, but at one stage, for a period of two-and-a-half months, No. 22 M.R.S. was the only major medical unit in the neighbourhood and admissions of Army patients, exclusive of those held for evacuation, often greatly exceeded the number of R.A.F. cases.

During the latter half of December, 1 Mobile Military Hospital and 200 Field Ambulance were situated 12 miles outside Benghazi. The former left the area in the first week of January and the latter two or three weeks later. The early formation of 58 British General Hospital to provide facilities for Army personnel and troop convoys would have eased the position but owing to the loss of all its medical equipment this hospital did not function until March 1943.

As the main water supply pump had been demolished by the Italians before evacuating the town, provision of an adequate water supply was the biggest problem. For the first month water was carried from points in water bowsers. After this there was a short period when water was pumped into the main tanks, but as no stop-cocks were provided the available supply at tap level was soon exhausted. Eventually the Royal Engineers were persuaded to install eight water points throughout the hospital. This led to a considerable saving in labour and provided minor luxuries for the nursing staff, although hot baths and water closets were still out of the question. The standard of sanitation was that usually found under field conditions. When water became available through the original plumbing, the conservancy system was used, but blockages were frequent owing to the small bore of the drains and the curious trapping devices. Considerable difficulty was experienced by the Royal Engineers when repairing drains, as through Italian lack of foresight no manholes or inspection covers had been provided in the drainage system. On March 22, 1943, the D.G.M.S., R.A.F. inspected the premises and expressed dissatisfaction with the hospital and its situation, but efforts to find more suitable accommodation failed. As these buildings and their amenities were the most suitable available, and as the hospital was at that time sited in the centre of the greatest concentration of R.A.F. forces, further search for an alternative location was discontinued.

On May 10, 58 British General Hospital which occupied adjacent hospital buildings was ordered to move and consequently transferred to the R.A.F. Hospital all patients unfit to be moved by road to 4 British General Hospital at Barce. It was obvious that the commitments of the R.A.F. hospital would be very much increased, and the local Army medical authority (A.D.M.S.) consented to hand over the buildings vacated by the Army hospital.

On March 28, 1943, No. 22 M.R.S. finally left Benghazi and R.A.F. Hospital, Benghazi, became a composite unit. On that date 148 beds were available but only 67 were occupied. The staff consisted of a commanding officer (wing commander, raised to group captain in June 1943\*), one squadron leader, five flight lieutenants, eight nursing sisters and 50 airmen out of an establishment of 86. By the end of June 1943, the staff was the commanding officer (group captain), one wing commander, three squadron leaders and eight flight lieutenants. Nursing sisters had increased to one matron and 14 sisters, and N.C.Os. and airmen totalled 121.

Ward maid work was carried out by local Senussi women whose technical shortcomings were compensated for by their complete honesty. The experiment of replacing them by male Arabs was unsuccessful.

The medical division was housed on the first floor of the main block and accommodated officers' ward, malaria and general wards. In addition 71 beds were located in the building formerly occupied by 58 British General Hospital, where patients suffering from dysentery, skin and infectious diseases were segregated. The surgical division with the operating theatre, resuscitation centre, burns centre and X-ray department occupied the ground floor of the main building together with the two adjacent pavilions for minor cases. E.N.T., ophthalmic and dental centres were also on this floor. Overflow accommodation in the event of the arrival of a large convoy for evacuation by hospital ship was available in four hospital marquees pitched in the grounds of the hospital.

Stores for the hospital were supplied originally by No. 22 M.R.S. and when that unit was withdrawn many deficiencies were experienced. These were overcome, however, by the discovery of a collection of German instruments in the hospital and by the receipt of a consignment of American Red Cross instruments. The finding of a German medical stores depot at Apollonia was of great assistance in respect of expendable items. Other expendable stores were obtained locally or demanded from the Middle East. The requirements of all R.A.F. units from Derna to 'Marble Arch', and those of Army units, after the

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\* With this upgrading in establishment, the commanding officer of the hospital was also made Senior Medical Officer of all R.A.F. forces stationed in Cyrenaica.

removal of 58 British General Hospital, were met by the R.A.F. Hospital. In all, eighty small units of the R.A.F. and of the Army were provided with medical stores each month.

### *Surgical Division*

No analysis of the type of work undertaken by this division is given in the hospital records. Brief notes indicate that the surgical bedstate was maintained at full capacity, and was kept from overflowing by the air evacuation of casualties from the aerodrome at Benina. The work resembled that found in any industrial town where numerous accidents of all descriptions occur. Much minor surgical work was carried out owing to local units, mainly Army, having no facilities for sick quarters treatment.

#### *Major Operations Performed during the Period*

April	.	26
May	.	40
June	.	35
		<hr/>
		101
		<hr/>

### *Medical Division*

At the beginning of the period under review the medical division consisted of 109 beds. Of this total a ward containing 10 beds was set aside for officers, and a further 19 beds were allocated for dysentery cases. On taking over the accommodation vacated by the Army hospital, an extra 70 or so beds were made available. This allowed the allocation of certain wards for specific infectious diseases, and made it possible to clear the corridors of beds. The total number of admissions to the medical division was 807, with an average of ten days' stay per man. These admissions were divided up as follows:

#### *R.A.F.*

Total Admissions	.	.	462
Average stay per man	.	.	11·17 days

#### *Royal Navy*

Total Admissions	.	.	27
Average stay per man	.	.	12·2 days

#### *Army*

Total Admissions	.	.	318
Average stay per man	.	.	6·8 days

It will be noticed that the average length of stay per man for Army personnel was less than that of cases in the other two Services. This was due to the fact that the majority of Army cases, once over the acute stage of illness, were transferred to Army hospitals.

A summary of the various diseases treated and their relative incidence in the three Services is given on the next page.

	R.A.F.	R.N.	Army	Totals
<b>Diseases of Respiratory System</b>				
Bronchitis . . . . .	11	2	11	24
Lobar pneumonia . . . . .	—	1	2	3
Pleurisy . . . . .	4	—	4	8
Pulmonary tuberculosis . . . . .	3	—	3	6
<b>Diseases of C.N.S. including psychoneurosis .</b>				
	23	—	8	31
<b>Diseases of Alimentary System</b>				
Simple enteritis . . . . .	21	3	22	46
Peptic ulcer . . . . .	4	1	2	7
Dyspepsia with no evidence of ulceration . . . . .	10	1	4	15
Cholecystitis . . . . .	—	—	1	1
Toxic hepatitis . . . . .	—	—	1	1
Glycosuria . . . . .	2	—	—	2
Mucous colitis . . . . .	2	—	—	2
<b>Diseases of Naso-pharynx (including diphtheria)</b>				
	34	4	49	87
<b>Diseases of Skin . . . . .</b>				
	97	8	34	139*
<b>Parasitic Diseases</b>				
Malaria B.T. . . . .	55	—	38	93†
Malaria M.T. . . . .	5	—	—	5
Relapsing fever . . . . .	1	—	1	2
Schistosomiasis . . . . .	2	—	—	2
Lambda . . . . .	1	—	—	1
Helminthic diseases . . . . .	1	—	3	4
Amoebic dysentery . . . . .	7	—	1	8
<b>Infectious Diseases</b>				
Bacillary dysentery . . . . .	62	1	42	105
Infective hepatitis . . . . .	17	2	3	22
Typhoid group . . . . .	3	—	2	5
Mumps . . . . .	—	—	1	1
Smallpox . . . . .	—	—	1	1
<b>Other Fevers</b>				
P.U.O. . . . .	27	—	41	68
Sandfly fever . . . . .	14	1	10	25
Dengue . . . . .	2	—	—	2
Undulant fever . . . . .	—	—	1	1
<b>Rheumatism and allied disorders . . . . .</b>				
	20	2	7	29
<b>Venereal Disease . . . . .</b>				
	18	1	4	23

\* (70 per cent. Scabies).

† (65 per cent. relapses).

Total admissions and discharges and beds equipped for the period April–June 1943:

Month	Admissions	Discharges	Beds equipped
April	213	205	206
May	388	309	206
June	660	571	259
Totals	1,261	1,085	

Laboratory examinations carried out:

April	.	693
May	.	1,494
June	.	1,994
		4,181
Total		4,181

#### *Air Evacuation\**

Cases for evacuation by air were sent to Benina airfield where a company of 14 Field Ambulance acted as holding unit. The conditions under which patients waited, pending emplaning, were at first most unsatisfactory, shelter being provided by tarpaulins thrown over improvised frameworks, while all stretchers were on the ground. Conditions improved after a while when additional tentage became available but complaints were received that some seriously ill cases had to wait six or seven days before a plane was available for evacuation duties. 14 Fd. Amb. was succeeded by 200 Fd. Amb., but when the latter unit departed the air evacuation centre would have fallen into disuse but for the willingness of the station medical officer at Benina to give assistance. A small ward unit of No. 22 M.R.S. complete with tentage, beds, cooking facilities and all accessories was put at the disposal of the station medical officer. This scheme was marked by a great improvement in procedure. Apart from patients evacuated from the R.A.F. Hospital, cases from the Army hospital at Barce were staged at the R.A.F. Hospital on the night preceding emplaning and proceeded to Benina with the remainder of the cases on the following night. During April, May and June 1943 the numbers evacuated by air were 40, 35 and 211 respectively.

#### *Conclusion*

R.A.F. Hospital, Benghazi, although capable of acting as a general hospital, could only do so under field conditions. This was due to

- (i) The distance from the main supply base and the consequent difficulty in equipping to the scale of a permanent R.A.F. General Hospital.
- (ii) The inadequate supplies of suitable foodstuffs for special diets, as fresh vegetables, meat, eggs and chickens were frequently extremely scarce or non-existent.
- (iii) Difficulty in obtaining works services.

Nevertheless, it was considered at that time that the facilities available were adequate for the existing requirements, and that in view of the continual efflux of both Army and R.A.F. personnel from the area and

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\* See also section 'Air Evacuation of Casualties'.



the likelihood of the complete evacuation of the North African coast, the necessity for a general hospital in the Benghazi area would soon cease to exist.

#### R.A.F. HOSPITAL, TRIPOLI (NO. 3 R.A.F. HOSPITAL)

At the beginning of 1943, No. 24 M.R.S. was sited at Gambut under the operational control of Rear Air Headquarters, Western Desert. On January 21 the main body of the unit moved from Gambut, leaving behind a 20-bed ward and resuscitation centre to cater for an American bomber squadron at Gambut, pending the arrival of an American hospital. Tripoli was reached on January 28, and the M.R.S. parked on the race course adjacent to the Italian military hospital which was taken over and opened on February 6. The rear party joined the main unit on February 9.

The M.R.S. staff was augmented in April and May by the arrival of eight nursing sisters and in August by six additional medical officers and a medical quartermaster, the M.R.S. continuing to form the nucleus of the hospital until December 28, 1943, when it returned to the Delta.

A great deal of preliminary work was necessary before the hospital could be made ready to receive casualties. The buildings were in a filthy condition, damaged by frequent bombing attacks, and stripped of all doors, windows and fittings by the indiscriminate looting of natives. Many deficiencies were evident, as the main buildings were old converted military barracks, with drainage, latrines and washing facilities totally inadequate for a hospital. The central hospital block, however, was well built, and certain of the annexes were of modern design. Within a few days the expansion of No. 24 M.R.S. from a 40-bed state to a 200-bed unit was well advanced, and large quantities of equipment were already on their way from the Middle East. During the active period of February, 292 admissions were recorded, over 55 per cent. of them surgical cases. The following month saw a further expansion, 341 cases being admitted with an average daily bedstate of 155.

The value of the M.R.S. as a holding unit at a forward base was the great assistance given to the large number of R.A.F. units in the area, as cases could be retained and successfully treated over a considerable period. By May 1943 the hospital was working on a 240-bed basis, with plans projected for a steady increase to 300, and ultimately 400, beds.

#### AIR EVACUATION OF CASUALTIES

##### POLICY\*

The struggle to supply the Middle East with operational types of aircraft strained all resources to such an extent that the idea of providing

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\* See also R.A.F. Volume I, Chapter 10.

special aircraft for the evacuation of casualties could not at first be entertained. An air ambulance unit could only be maintained and staffed at the expense of other operational units already overtaxed. The Army medical authorities made repeated requests both to Middle East Headquarters and to the War Office for the allotment of ambulance aircraft, stressing the potential casualty rate, and the extreme length of the lines of evacuation. As their requirements could not be satisfied within Service resources, the struggle was carried into the diplomatic field, and in October 1940, Mr. Eden approached Lord Halifax as to the likelihood of the American Red Cross providing a squadron. This suggestion was considered impracticable as the War Office had already refused gifts to Army medical establishments on the grounds that acceptance might be interpreted as a violation of American neutrality. The alternative whereby the American Red Cross could donate air ambulances to the British Red Cross was frustrated by the lack of suitable aircraft in the U.S.A. at this time.

Various private and public benefactors then entered the field offering to provide air ambulances. All these offers were refused or referred back for later consideration, as it was not the money factor which determined whether or not such aircraft should be constructed; the urgent need for operational aircraft absorbed all the available output of the industry and in view of the gravity of the situation was given first priority. Tentative suggestions were even made implying that the private funds offered would be used to better purpose in providing Spitfires and Hurricanes. In March 1941, the Australian Government indicated their willingness to provide, staff and maintain an Air Ambulance Unit consisting of three converted D.H.86 aircraft. This offer was accepted by the Air Council. In the meantime the R.A.F. and South African Air Force had converted a few suitable aircraft, and by November 1941, eight to ten air ambulances were available for duty in the Middle East.

#### LOCAL ARRANGEMENTS

As initial policy had determined that no ambulance aircraft would be available and that use was to be made of bomber-transport aircraft when not engaged on other duties, no definite central organisation was possible in the early stages. In 1940 and early 1941 individual medical officers made their own *ad hoc* arrangements for the evacuation of casualties. Bomber-transport aircraft returning from sorties in the Western Desert and refuelling at forward airfields were largely used. The transition from informality to organisation was largely due to the initiative and vision of the P.M.O., Western Desert and his staff, who from the outset had recommended the use of air transports returning empty as the only practical solution to the problem of mass evacuation.

They added the proviso that patients must be kept in medical 'holding units' near the forward aerodromes ready for loading into aircraft because only thus could the quick turn round of freight planes be ensured and the danger of interference with their primary function of supplying stores to fighter wings and the Army in the field be avoided.

On November 16, 1941, No. 1 Australian Air Ambulance Unit arrived in the Western Desert just 48 hours before the opening of the winter offensive. This unit had been formed in March 1941 but had been retained in Palestine because there were no R.A.A.F. personnel serving at that time in the Desert.

The supply of transport aircraft was already so meagre that it was felt impossible to convert more to air ambulances, since aircraft carrying Red Cross markings could not be used except for the transport of casualties. In the early stages the air ambulances worked alongside the transport aircraft but towards the end of 1942 they were used almost entirely in the forward areas as forward shuttle aircraft.

#### AIR EVACUATION—EL ALAMEIN BATTLE

When the British Forces were in the Alamein line a shuttle air transport service from the Advanced Air Transport Centre at Amiriya to Heliopolis *via* Wadi Natrun was operated daily. Later, when air superiority was achieved, the Advanced Air Transport Centre was sited at Burg El Arab, as air transport aircraft were only allowed to operate behind the fighter aerodromes. It was essential to link up the medical receiving stations, each of which was capable of acting as a holding unit, with returning transport aircraft, and therefore for some weeks prior to the battle No. 24 M.R.S. was located approximately one mile from the Advanced Air Transport Centre at Burg El Arab; No. 21 M.R.S. was a similar distance from the Rear Air Transport Centre at Amiriya, while No. 22 M.R.S. was at Wadi Natrun. Thus the three M.R.Ss. were linked with air transport and with the base hospital *via* Heliopolis.

The air ambulances operated a forward shuttle service from the Advanced Air Transport Centre in the areas forward of the fighter aerodromes, and only informed base when cases of a serious nature needing immediate base hospital treatment occurred or when evacuating Australian casualties to the Australian General Hospital at Buseili.

This system worked extremely well before the battle. When the Eighth Army moved forward the Air Transport Centre and the air ambulances were again linked. As distances became greater there was an increasing demand for stores to be carried by air. This demand was met by increasing the number of Air Transport aircraft and thereby affording greater opportunities for the evacuation of casualties. At this stage, in order to cope with the increasing numbers evacuated, it was

found necessary, owing to a shortage of R.A.F. medical personnel, to request D.D.M.S. Eighth Army to locate a field ambulance unit\* at the Air Transport aerodrome to act as a medical holding unit. During all moves the Air Transport Centre was placed as near as possible to the main Army lines of communication and to either a M.R.S. or an Army C.C.S.; furthermore, in all changes of location the Air Transport Centre was accompanied by No. 1 Australian Air Ambulance Unit, the Casualty Air Evacuation Centre (C.A.E.C.), and the 'Blood Bank'.†

As the battle progressed the air ambulances continued to evacuate from the forward areas provided that they were permitted to land by the operational group concerned. An important point in the organisation was the control of all movements of air ambulances by the Group Air Staff. The success of the utilisation of transport aircraft was shown by the fact that during part of the campaign over 200 casualties were evacuated per day to base, a distance of over 700 miles, in these aircraft alone.

As the lines of communication increased certain aerodromes (staging posts) were used as refuelling points for returning aircraft. A medical receiving station acting as an intermediate C.A.E.C. was therefore situated in close proximity. When the front line was west of Benghazi these staging posts were covered by:

- No. 21 M.R.S. at Benghazi
- No. 22 M.R.S. at El Adem, and
- No. 24 M.R.S. at Gambut.

Following the experience gained in this, the first major organisation for evacuation of casualties during mobile warfare, the following principles for the successful organisation of casualty air evacuation were laid down by the P.M.O., R.A.F. Western Desert:

- (i) That all air transport aircraft returning empty should evacuate casualties as a matter of duty, not of courtesy.
- (ii) That all transport aircraft whether civil or R.A.F. should be fitted to take stretchers, and that all stretchers should be standardised. (In the early stages three different patterns were in existence, viz. American, British general service and Australian.)
- (iii) That transport aircraft should land at aerodromes from which air transport squadrons serving the forward area operate.
- (iv) That the formation of a casualty air evacuation centre suitably equipped to feed, treat and accommodate casualties awaiting air lift is essential.
- (v) That air evacuation aerodromes should be sited as near as possible to main roads, and that the medical authorities should

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\* 14 Field Ambulance, forerunner of the Casualty Air Evacuation Centre.

† Part of the Army Blood Transfusion Service for supplying the forward areas. See Volume II, Plate XLVI.

be consulted as to whether any proposed Air Transport landing ground is suitable for air evacuation.

- (vi) That telephone communications should exist between the C.A.E.C. and the aerodromes concerned.

Inter-communication between units concerned in the air evacuation presented some difficulties. The original system of communication by a despatch rider involved too great a time lag. Later a scheme was devised which facilitated the correlation of demands and assessment of all priorities from the forward areas. All medical units requesting air evacuation informed D.D.M.S. Eighth Army by wireless link. This information was passed by telephone to P.M.O., R.A.F. Western Desert, who informed the C.O. of the Air Ambulance Unit. The latter then arranged his programme according to the availability of aircraft, informing the units concerned of his movements.

Plates XIV–XVIII illustrate the casualty air evacuation scheme.

#### EVACUATION FROM AN ADVANCED MAIN DRESSING STATION

The scope of air evacuation was shown during the battle of the Mareth Line when the plan envisaged an enflanking movement by the New Zealand Corps through country impassable to road transport. It was considered that the only method of evacuation was by air transport. The New Zealand medical units concerned and New Zealand engineers therefore undertook to construct two landing strips adjacent to their main dressing stations. Within twenty-four hours of a signalled request for medical stores and air evacuation facilities, a South African Lodestar visited the landing strip on two occasions, flying in medical stores and returning with casualties. During the days that followed over 700 cases were evacuated to base hospitals *via* the C.A.E.C. at the Air Transport Centre by air ambulances and transport aircraft. The success of this evacuation was primarily due to air superiority which was well secured at this stage. No losses in any aircraft occurred during this operation.

It was generally agreed that enemy aircraft respected the Red Cross emblem on air ambulances, but on December 8, 1941, a D.H.86 was attacked while taking off from a forward landing ground (Plate XIX). No patients were being carried at the time but a sergeant nursing orderly was wounded. No Red Cross was displayed on the upper surface of this aircraft. Two other air ambulances were attacked at the same time, in one case a burst of machine-gun bullets piercing the Red Cross emblems on the side of the fuselage. The medical authorities at this stage realised that the Red Cross could not be a sure protection, while such marking meant that the aircraft could not be used for carrying bombs and petrol, etc., on the forward run. However, as the majority of this flight had been provided with Red Crosses, the aircraft remained so marked until they all became unserviceable.

Unfortunately no detailed records are available of the number of patients evacuated by air during the whole period of the Desert campaign. Incidental reports show that between January and June 1942, a total of 717 cases were evacuated from the Desert to base hospitals. Analysis shows that of this total 628 were Army and 89 R.A.F. personnel. Battle injuries accounted for 475 and sickness for 242, while 579 were classified as stretcher patients and 138 as sitting.

For the period November 1, 1942, to January 31, 1943, over 6,000 cases were evacuated in the same region and of these 1 in 8 was a R.A.F. casualty. The grand total evacuated by air during the campaign ending with the fall of Tunis approximated 12,000.

## **North-West Africa (Operation 'Torch')**

### **1942-1943**

#### INTRODUCTION

The final stage of the offensive to oust the Axis from North Africa began with the landing of the combined Allied Forces along the coast of North-West Africa. The prime objective of this force, after it had overcome the initial resistance to the assault, was to push eastwards through Algeria into Tunisia and occupy Bizerta and Tunis. This thrust, made simultaneously with the final advance from El Alamein in the east, was intended to culminate in the overthrow of all Axis forces between the two armies.

Unfortunately this initial objective was not immediately achieved, for the struggle developed into a war of supplies in which the Germans and Italians had the advantage. By the end of December 1942, therefore, a stalemate had been reached, with the Axis firmly established in Tunisia and continuing to reinforce its garrison. In the next few months each side jockeyed continuously for a better position from which to launch a major offensive. During this period the main focus of attention was on the struggle for possession of Medjez el Bab and on the German attack in the south near Kasserine to avoid being trapped by the encircling forces of the First and Eighth Armies, which by this time had obtained a superiority in men and materials.

The duties of the R.A.F. forces taking part in this offensive involved the protection of land forces and shipping routes both of which were scattered over wide areas. At the onset of the campaign the German Air Force enjoyed air superiority and reacted violently to our attack with consequent strain on our resources and limitation of the R.A.F. rôle. As air superiority was gained, however, the second or 'softening up' process prepared for the ground operations which successfully concluded the campaign.

The medical problems of this campaign were most acute during the early days of the offensive, when owing to the rapid advance eastwards the provision of adequate facilities presented some difficulties; thereafter with the general tendency towards stabilisation of the front and easing of the supply problem medical organisation proceeded along well-established lines.

Map 9 shows the area of operations in this phase of the campaign.

#### ADMINISTRATIVE ORGANISATION

##### ESTABLISHMENT OF NO. 333 GROUP

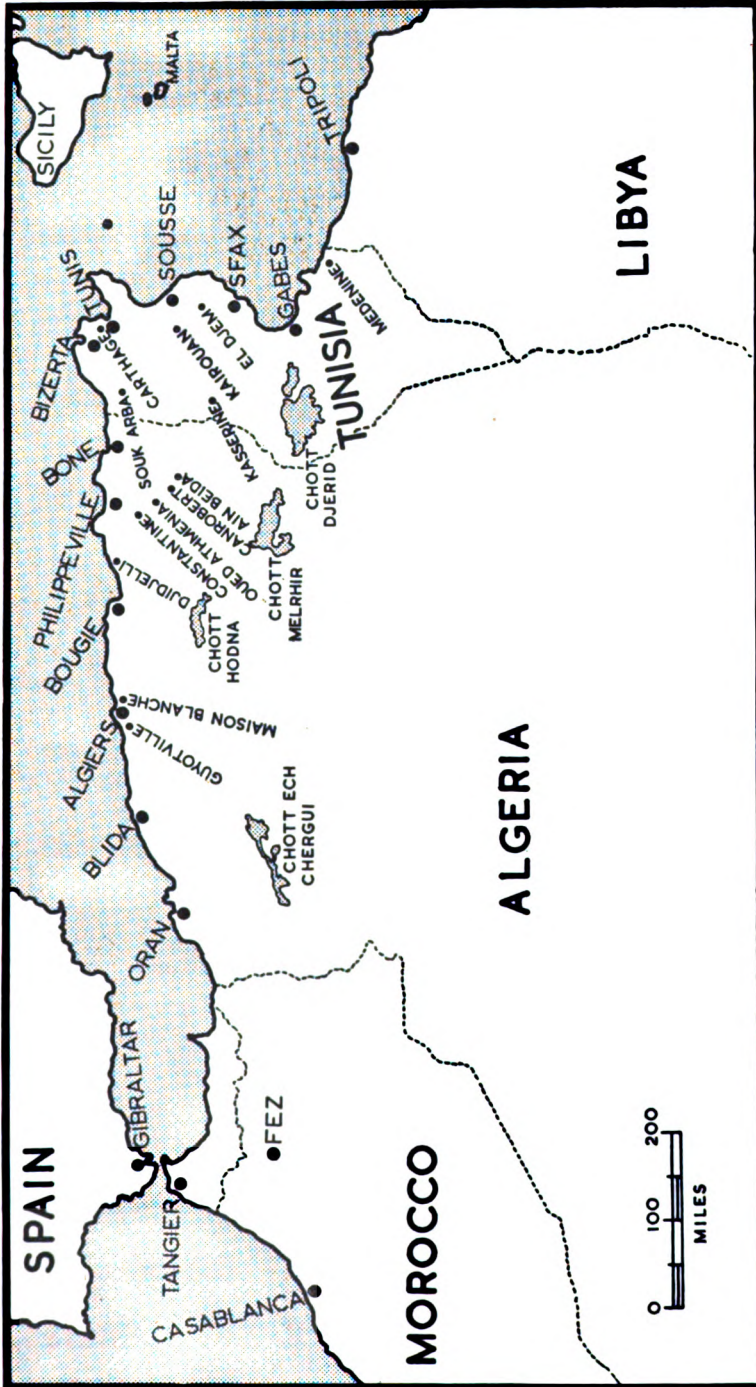
Early in August 1942, the Headquarters of the Allied Expeditionary Force for Operation 'Torch' was established in Norfolk House, St. James's Street, London. The immediate objective of this headquarters, known as No. 333 Group, was to formulate a detailed plan for the invasion of the North African coastline. Planning commenced on August 10 and the provisional date of the assault was decided as October 7, 1942. Strategical planning difficulties delayed the adoption of the general plan for simultaneous attack on Casablanca, Oran and Algiers until late September. This in turn reacted on detailed planning and rendered it necessary to defer the assault until November 1942.

##### CO-OPERATION BETWEEN THE THREE SERVICES

All possible measures were taken to maintain secrecy concerning the coming invasion, so as to make full use of the surprise element. Personnel at Norfolk House were placed in three categories. To those in the highest category all information was made known, others less important were given the details of the area but not the date of invasion, while the remainder were merely informed that an overseas operation was being undertaken. The Army D.M.S. was responsible for the overall medical plan, but the medical authorities of the Services concerned, the Senior British Naval Medical Officer, the P.M.O. of the R.A.F. Component and the Chief Surgeon Twelfth Air Force, U.S.A. were given wide latitude in making arrangements and in mutual discussion.

The late arrival of the P.M.O.—he was posted on September 21, 1942—created difficulties, especially until his security grading was cleared and approved, and for the first few weeks it was galling for him to see all papers, maps, etc., being hurriedly pushed into drawers whenever he entered an office to consult with staff officers on subjects with which he was closely concerned.

None the less the D.M.S. made it his special care to overcome these handicaps and, while remaining within the bonds of secrecy, gave the P.M.O. a general outline of the medical plan. The P.M.O. in return detailed his resources and indicated his intended method of putting them into effect.



MAP 9. The area of operations in this campaign.



## R.A.F. FORCES INVOLVED

The total number of R.A.F. personnel involved amounted to 16,885. This figure comprised, apart from Air Headquarters and 4 base administrative units and 1 equipment maintenance unit, 6 wing headquarters controlling 23 squadrons and their respective air stores parks, repair and salvage units and mobile signals servicing units. Ground defence units consisted of 5 squadrons and 5 flights of the R.A.F. Regiment and 3 servicing commando units. In addition, 40 miscellaneous wireless and radar formations were included to maintain communications and to man the raid warning system.

The R.A.F. operational units involved in the initial stages were:

## Air Headquarters:

- No. 242 Group Headquarters
- No. 322 (Fighter) Wing Headquarters
  - No. 81 Spitfire Squadron
  - " 154   "   "
  - " 242   "   "
  - " 225 Hurribomber\* Squadron
- No. 323 (Fighter) Wing Headquarters
  - No. 43 Hurribomber Squadron
  - " 253   "   "
  - " 4 Photographic Reconnaissance Unit
- No. 324 (Fighter) Wing Headquarters
  - No. 72 Spitfire Squadron
  - " 93   "   "
  - " 111   "   "
  - " 152   "   "
  - " 255 Beaufighter Squadron
- No. 325 (Fighter) Wing Headquarters
  - No. 232 Spitfire Squadron
  - " 243   "   "
  - " 32 Hurribomber Squadron
  - " 87   "   "
  - " 241   "   "
  - " 600 Beaufighter   "
- No. 326 (Light Bomber) Wing Headquarters
  - No. 13 Bisley Squadron
  - " 18   "   "
  - " 114   "   "
  - " 614   "   "
- No. 328 (General Reconnaissance) Wing Headquarters
  - No. 608 Hudson Squadron
  - " 500   "   "
- No. 153 Beaufighter Squadron
- Nos. 142 and 150 Wellington Squadrons.

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\* Hurricane fighter aircraft specially adapted for carrying bombs in racks under the wings.

## DISPOSITION OF R.A.F. FORCES

The plan for the invasion laid down that aircraft were to fly in at the earliest possible moment and would, during the initial stages, be maintained by servicing commandos who were to be landed with the first assault forces. Ground crew and administrative staffs would then be conveyed by sea route, arriving when a bridgehead had been secured. The passage of convoys was uneventful, and all the ships reached Gibraltar unscathed, due to the efforts of Coastal Command, the routing of the convoys and the engagement of a U-boat pack by a convoy homeward bound from Sierra Leone.

The R.A.F. component was assembled at Gibraltar during the days immediately preceding D-day. Here aircraft and crews were made ready for the receipt of news that the land forces had occupied the main airfields at Maison Blanche and Blida. On November 8—D-day—the first wave of fighter aircraft (Nos. 43, 81, 154 and 242 Squadrons) flew into Maison Blanche, and were followed by further reinforcements (Nos. 72, 93, 111, 152, 225 and 255 Squadrons) during the period November 10–16. By this time the personnel of Air Headquarters and No. 242 Group (controlling operations) had arrived in Algiers and Nos. 322, 323 and 324 Fighter Wing H.Qs. at Maison Blanche. No. 326 Wing Headquarters which controlled the light bomber squadrons moved into Blida with its respective squadrons (Nos. 13, 18, 114 and 614) within the period November 11–18. The heavy bomber squadrons eventually arrived in the Command on December 18. Thus the majority of R.A.F. operational units were at first concentrated in the Maison Blanche–Blida area. Within 10 days of the assault, however, the forward Army elements were operating 400 miles east of Algiers out of range of air support, and re-disposition of the fighter units became necessary. By early December aerodromes in the Bone–Souk el Arba areas were occupied by Nos. 322 and 324 Wings respectively, while the light bomber formations moved forward to Canrobert. In the meantime (December 12, 1942) a further fighter wing (No. 325) had arrived in the Command and was located at Philippeville. By Christmas the area of R.A.F. activity was widespread, being greatest in the following regions:

Maison Blanche  
Blida  
Bone  
Souk el Arba  
Philippeville and Canrobert.

This dispatch of operational units ahead of schedule created certain problems, chief of which from the medical viewpoint were the great distances separating the units from the base area, with the consequent disorganisation of the pre-arranged medical plan and difficulties in

providing medical stores and equipment when the arrival of these items had lagged behind that of personnel.

By March 1943, the airfields in the most forward areas had been strengthened in order to afford maximum air support to the land forces. Further operational units were concentrated in the Souk el Arba region and additional airfields were constructed at Souk el Khemis, 10 miles north-east of Souk el Arba.

The ground component of all units was divided between two convoys, the first arriving at Algiers on November 13 and the second on November 22. Troops were then staged at a Transit Camp at Hussein Dey four to five miles east of Algiers pending disposal to the various regions where their aircrew counterparts were already operating. Small sections of technical personnel were rushed forward to the advanced areas—Bone and Souk el Arba—by coastal steamers, disembarking at Bone or Bougie. The major portion of ground personnel travelled by rail at a later date. By the first week in December all technical and administrative personnel had been united with their respective units.

#### ADMINISTRATIVE RE-ORGANISATION

In November 1942, Headquarters No. 333 Group received its new designation, Eastern Air Command, which represented the Royal Air Force in the North-West African theatre of war. On February 17, Eastern Air Command and the Twelfth U.S.A.A.F.—its American counterpart—became a composite unit known as Headquarters North-West African Air Force, a subsidiary command within the framework of Headquarters, Mediterranean Air Command. This latter Headquarters controlled air forces stationed in the North African theatre and their operations, and the operations of all other Mediterranean Air Forces (i.e. H.Q. Middle East and H.Q. Malta).

The subsidiary commands of Headquarters North-West African Air Force (N.W.A.A.F., later N.A.A.F.) consisted of:

- (i) N.W.A. Tactical Air Force (N.W.A.T.A.F.) which was originally No. 242 Group and the Twelfth U.S. Air Support Command. To these were added the Western Desert Air Force on February 22, 1943 and the N.W.A. Tactical Light Bomber Force which formed on April 20 of that year.
- (ii) N.W.A. Strategic Air Force (N.W.A.S.A.F.) which was previously represented by the Twelfth U.S. Bomber Command and the R.A.F. Medium Bomber Squadrons.
- (iii) N.W.A. Coastal Air Force (N.W.A.C.A.F.) consisting of R.A.F. and U.S.A.A.F. Fighter and General Reconnaissance Wings.
- (iv) N.W.A. Service Command (N.W.A.S.C.).
- (v) N.W.A. Training Command.
- (vi) N.W.A. Photographic Reconnaissance Wing.

Although in each of these subsidiary commands the operational organisation became unified, the medical organisation of the R.A.F. components remained a R.A.F. responsibility controlled by the Senior Medical Officer of the respective formation. Thus the P.M.O. of the Western Desert Air Force became in February the P.M.O. of N.W.A.T.A.F. Similarly the S.M.Os. of Nos. 242 and 218 Groups acted as the competent medical authorities to N.W.A.C.A.F. and N.W.A.S.C.

### MEDICAL ORGANISATION

#### MEDICAL ESTABLISHMENTS

The air components of the Allied Expeditionary Force were the Twelfth U.S. Air Support Command and its British counterpart—Eastern Air Command (E.A.C.). The Principal Medical Officer, E.A.C., held the rank of group captain, and was assisted at his headquarters by one wing commander. All units were allocated personnel on the basis of Middle East establishments. Wing headquarters had a senior medical officer (squadron leader) while operational units had established squadron medical officers (flight lieutenant or flying officer). In addition the large ground formations, air stores parks and repair and salvage units, were staffed with unit medical officers.

In the initial stages of the campaign the Principal Medical Officer was hindered in obtaining a complete survey of the situation by two factors. He had insufficient staff to carry on the necessary organisation at headquarters if he went forward, and, when he did find an opportunity, he was without transport to take him on his tour. The situation was further aggravated by the shortage of clerical staff. The establishment of one chief clerk (flight sergeant) for office duties was insufficient and threw added clerical labour on to the Principal Medical Officer. The headquarters staff was so small that the P.M.O. and D.P.M.O. were employed not only in supervision but in preparing returns (the first Form 38 to be rendered was in fact prepared and typed by the Principal Medical Officer himself), in issuing stores and generally deputising for clerks and clerks accounting. It was considered that the addition of one squadron leader, one corporal and two nursing orderlies would have relieved the situation.

In March 1943, the establishment of Air Headquarters was increased, and from that date consisted of:

- 1 Air Commodore
- 1 Group Captain
- 1 Wing Commander (Hygiene)
- 1 Wing Commander (Consultant in Tropical Medicine)
- 1 Wing Commander, F.P.M.O.
- 2 Medical Officers.

The post of Consultant in Tropical Medicine was upgraded to group captain in May 1943.

The replacement of a medical officer in the event of leave or sickness was not difficult to arrange, as the majority of units established with a M.O. were in close proximity. Nevertheless, the establishment of a pool of medical officers and nursing orderlies was considered most essential to meet the needs of new units formed locally and to provide medical personnel for units such as Servicing Commandos and the R.A.F. Regiment when operating in isolated areas. In February 1943, Air Ministry allocated a pool of four medical officers for such eventualities.

Further additions of medical officers to establishments within the Command were made in March 1943, when one flight lieutenant was appointed for service with air sea rescue units. These units were operating near Algiers, Bougie, Djidjelli, Philippeville and Bone, but no medical officers from existing units were sufficiently near to provide immediate attention when required.

At isolated units such as Air Ministry Experimental Stations, a nursing orderly (leading aircraftman) was responsible for advising the commanding officer on sanitation, for care of the minor sick, and if necessary for making arrangements to send such personnel to hospital.

Towards the end of the campaign great difficulty was experienced in providing medical personnel for units in the Command, particularly after the change over from the original E.A.C. to the complicated series of headquarters units forming the North-West African Air Force. New units were constantly being formed, new establishments were created and often a number of the original small units were combined to form a single large unit. In addition, sickness among medical personnel caused gaps in the medical establishments. In early June 1943, the Command was ten medical officers below establishment and A.O.Cs. were continually pressing for medical officers for new units which were proceeding on urgent operational missions. To meet immediate requirements the only solution was to rob one unit to meet a more urgent call from another. This entailed protests from all interested parties and, as communications were poor, delay and confusion resulted.

#### ARRIVAL OF MEDICAL STAFF

The medical plans for the invasion provided for the landing of Army medical officers in the advance party to be closely followed by field ambulances and casualty clearing stations. The medical care of the wounded behind the lines was to be carried out in the ships (Royal Navy and Merchant Marine) bringing the assault troops. Although arrangements had been made for the Army to provide medical attention

for Air Force personnel in the early days of the invasion, no detailed plans could be prepared, as it was not known whether the R.A.F. formations would be operating in the vicinity of Army units.

No R.A.F. medical officers, nursing orderlies or medical equipment were scheduled to land before the main party went ashore on November 13, and it was not possible to arrange otherwise. The P.M.O. and other staff officers were allotted a passage from the United Kingdom by air, but the party was delayed at Mount Batten and again in Gibraltar, eventually landing at Maison Blanche on November 13. On that date, too, almost half the R.A.F. medical officers arrived and quickly dispersed to their units. The remainder disembarked on November 22, by which time the operational units had been disposed over a wide area from Algiers to Souk el Arba and were obtaining medical attention, as arranged, from adjacent Army units.

French resistance to the seaborne landings was, as had been anticipated, weak, and its early collapse on the first day of the assault was followed within a few days by German attacks on the main aerodromes at Maison Blanche and Blida. Owing to the shortage of shipping space, which was one of the major problems of this seaborne invasion, medical personnel and their equipment travelled in different ships, the former in troopships and the latter in merchant vessels. Many medical officers were separated from their equipment for long periods, in some cases for as much as two months; this occasioned considerable difficulty when within 24 hours of landing some units experienced cases of minor illness and casualties due to enemy air raids. First-aid measures were difficult to effect without equipment and as the fluid nature of the position rendered it difficult to make contact with Army formations the disposal of casualties was at first a problem. By the end of December 1942, each wing had opened a wing sick quarters for the admission of short term cases occurring among headquarters and squadron personnel. Accommodation was varied, suitable buildings being requisitioned where available while the main forward aerodromes relied chiefly on tentage. Medical duties were divided among squadron medical officers, two being detailed for medical duty and two for hygiene and sanitation problems. Nursing orderlies were co-opted from squadrons to assist the wing headquarters personnel in the staffing of the sick quarters, and pending the arrival of the Scale Z.1 and barrack equipment, initial issues of stores were obtained through the co-operation of the local Adv. Depot Med. Stores (Army).

#### ESTABLISHMENT OF SICK QUARTERS

After the opening of the offensive, the majority of R.A.F. units continually changed their location as the campaign developed. Even as late as January 1943, in only a few instances were Wings stationary

and consequently no fixed scheme of medical administration and control was possible; plans were of necessity flexible to allow for any contingency. By the end of January, however, it was obvious that there would be certain definite areas of continuous activity to and from which R.A.F. units would move according to operational requirements. It therefore became clear that a resident S.M.O. and sick quarters staff would be needed in each of these areas with certain well-defined duties, viz.:

- (i) Liaison with local health authorities.
- (ii) Maintenance of contact with the Army's medical formations.
- (iii) Continuity of treatment and returns for the R.A.F.
- (iv) Supervision of the layout of latrines, field kitchens, etc., to a set formula.

Conditions in the most forward areas where the military situation was extremely fluid demanded only temporary arrangements, but areas of activity as described above were well-defined at Maison Blanche and Blida and to a lesser extent at Bone, Canrobert, Setif and Djidjelli. Medical arrangements at these places were as outlined in the following paragraphs:

*Maison Blanche.* The French had used a plaster and plywood building on the edge of the aerodrome as a small hospital and this building was taken over by the first R.A.F. forces to arrive, although the site was dangerously close to a certain German target. No time was lost in finding alternative accommodation and a farm house  $1\frac{1}{2}$  miles from the aerodrome, capable of accommodating 15–20 beds and additional stretcher cases in an emergency, was soon requisitioned, the sick quarters providing medical facilities for personnel of No. 323 Wing and No. 4 Photographic Reconnaissance Unit.

The original building, which became a medical inspection room by day and a casualty centre at night, was completely destroyed by an enemy raid on January 5.\* A new M.I. room was opened the next morning in a building some 300 yards farther from the aerodrome site, but still within the station boundary. For this centre one squadron leader as S.M.O., one flight lieutenant and a nursing staff of one flight sergeant, one corporal and four aircraftmen were recommended, the nucleus being made available from within the establishment of No. 232 Wing (one squadron leader, one sergeant, and two aircraftmen).

*Blida.* In this area in which personnel of No. 328 Wing were concentrated there was already a two-storey brick-built sick quarters which could easily accommodate 40 beds with room for expansion in an emergency. (This number of beds was considered necessary as the nearest Army medical unit was 40 miles distant.) In addition, facilities

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\* Two nursing orderlies lost their lives during this attack.

were available for a dental surgeon, dental workshop, dispensary, M.I. room and crash room. Although it was situated only 400 yards from the aerodrome there was no alternative but to accept the risk of badly-aimed bombs striking the building. There was, in the town of Blida, a civilian hospital which could have been taken over if necessary, but it was decided not to disturb the civil authorities unless it became absolutely essential. It was always part of the medical plan to stay outside the civil community whenever possible.

*Bone.* An emergency sick quarters capable of holding 20-30 patients was sited on the aerodrome adjacent to the operational buildings of No. 322 Wing, but it soon became obvious that the attention paid by the enemy to this aerodrome would render the use of these sick quarters too dangerous. A large house on the sea front capable of holding 15 beds and 5 stretcher cases was therefore occupied by the S.M.O. as a dispersed sick quarters, while the previous accommodation in the aerodrome was equipped to house a M.I. room and a first-aid post.

*Canrobert.* A brick building, situated  $1\frac{1}{2}$  miles from the airfield and built by the French as an Arab soup kitchen, was taken over as No. 326 Wing sick quarters. Accommodation existed for 20 beds. Medical inspection rooms were maintained on each of the four squadrons' dispersed sites. Later, when the Wing H.Q. moved forward to Ain Blida and two squadrons to Oulmene, a private house was requisitioned in Ain Blida as an auxiliary sick quarters. A French Army hospital was located near Ain Blida and could be called upon in an emergency but was only used in one instance. At the time of the move forward to Oulmene it was found that a small Arab village close to the airfield was experiencing a minor epidemic of typhus. The S.M.O. communicated with the local *Agha* (head-man) who expressed his willingness to have the entire Arab population moved to another village two miles away. Firing of the houses and straw was then carried out.

*Setif.* On January 13, 1943, the headquarters of No. 325 Wing moved from Philippeville to Setif on the Great Central Plain, about 80 miles inland from Bougie, and took over from No. 326 Wing the aerodrome 6 miles west of the town. On arrival no R.A.F. medical equipment had been received but the Army authorities were most co-operative and barrack equipment for 20 beds, drugs, dressings, etc., were quickly made available. Ten of the beds were established in the old aerodrome sick quarters which was quite satisfactory for the purpose and the remainder were set up in a school in the town, which was occupied by the Repair and Salvage Unit.

*Djidjelli.* On December 22, 1942, personnel of No. 87 Squadron moved from Philippeville to Taher aerodrome in the Djidjelli area where two sites were selected about one and a half miles from the aerodrome. A M.I. tent was erected on the railway platform outside



station headquarters which was housed at the railway station. Medical Z.I equipment had not arrived and the unit was dependent on a certain number of bandages and dressings collected from the 67 British General Hospital and a few drugs bought in chemists' shops in Philippeville. Its own supplies arrived on February 26. In April 1943, the M.I. room was moved into a 4-bay Nissen hut on No. 2 site which provided a considerable increase in space.

Arrangements were thus made for a static medical unit to operate in each of the main areas in which large concentrations of units existed, and though wings and squadrons did not interchange localities as often as was expected these regional sick quarters did excellent work in making possible the retention of cases which under Army policy would have been evacuated to base, and in providing medical attention for small units without medical establishments which were located in their neighbourhood. Establishments were filled, as at Maison Blanche, partly from medical personnel of the adjacent wing headquarters and partly from drafts arriving later from the United Kingdom.

#### PLANS FOR THE ESTABLISHMENT OF HOSPITALS AND MEDICAL RECEIVING STATIONS

In February 1943, the P.M.O., E.A.C., anticipating an increase in the incidence of casualties and disease among R.A.F. personnel, submitted to D.G.M.S. a request for the allocation to Eastern Air Command of a 600-bed hospital and two medical receiving stations. It was planned to locate the M.R.Ss. in the areas of greatest flying activity, one in the Valley Ghardimaou-Souk el Khemis region and the other in the Canrobert-Ain Blida region, while the general hospital would be situated in the base area, most probably at Blida. These formations would provide hospital services primarily for aircrew personnel with secondary consideration for any urgent surgical cases, and would in exceptional circumstances also cater for medical patients with the proviso that no personnel suffering from venereal or skin diseases or infectious fevers would be admitted.

It was also intended that the two M.R.Ss. should act as holding units for cases which required air transport to base but which were unsuitable for immediate evacuation. Patients suffering from minor injuries, who normally on admittance to Army medical units were evacuated through the various lines of communication to base hospitals, were to be held at the M.R.S. for treatment and early return to duty, thereby conserving man-power. It was recommended that the supply of specialised medical equipment should be the responsibility of the Air Ministry and that a medical stores staff should be incorporated into the establishment of the general hospital to supervise the issue of supplies and equipment to the medical receiving stations and sick

quarters. These arrangements, it was considered, would eliminate the existing unsatisfactory procedure whereby the R.A.F. was dependent upon the Army for the maintenance of its medical supplies.

The P.M.O.'s request for these additional medical units had the wholehearted support of the D.M.S. (Army), who considered them a means whereby congestion in his own already overcrowded establishments might be relieved.

In March 1943, authority was given for the formation of the R.A.F. Hospital and Nos. 30 and 31 M.R.Ss., N.W.A.A.F.,\* each M.R.S. to include within its establishment a mobile surgical team and two members of P.M.R.A.F.N.S.

Although personnel and staff arrived in North Africa during April 1943, these units did not function until after the cessation of hostilities in that area.

Consideration of the various methods of evacuation of patients gave rise to a request for twelve additional motor ambulances in order to improve existing conditions. Hitherto the supply of ambulances had been sufficient only to meet unit needs; the remaining methods of evacuation had been found unsatisfactory, because air transport was dependent upon the vagaries of the weather, while evacuation in French hospital trains, which were poorly equipped and extremely slow, had proved an unpleasant ordeal for patients.

#### LINES OF EVACUATION OF CASUALTIES

*Souk el Arba and Souk el Khemis.* No wing sick quarters was established at Souk el Arba until mid-December 1942, by which time sufficient staff and equipment had become available. Up to that date a first-aid post was established in a school building near the airfield. Cases with a non-effectiveness of over 48 hours were transferred to 159 Field Ambulance or later to 18 or 19 C.C.Ss. which were located six to eight miles away. After the move forward to Souk el Khemis in early 1943, 1, 18 and 19 C.C.Ss. continued to be used and later still 50, 70 and 71 British General Hospitals at Thibar. When possible every effort was made to retain patients in the area, but many cases, on admission to these hospitals, were immediately evacuated by ambulance train to Souk Ahras, Constantine and even to Algiers.

An endeavour was made to initiate a regular bi-weekly air evacuation service from Souk el Arba. Unfortunately this scheme did not function successfully, chiefly because poor lines of communication made it difficult to co-ordinate the time of arrival of casualties on the airfield with that of aircraft, for existing policy did not allow aircraft to wait for casualties.

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\* Eastern Air Command became North-West African Air Force on February 17, 1943. (Abbreviated to N.A.A.F. on July 21, 1943.)

*Canrobert.* Wing sick quarters were maintained at Canrobert, which also served the two squadrons operating from Ain Blida. Surgical cover was provided initially by 220 Field Ambulance (Fd. Amb.) and later by 31 British General Hospital situated at Oued Athmenia. Cases requiring base hospital treatment were evacuated by air to Algiers in returning mail aircraft.

*Philippeville.* Cases requiring treatment or investigation outside the scope of the Wing sick quarters were, in the early stages, admitted to 5 C.C.S. Later, such cases were accepted by 67 British General Hospital located three miles outside the town. From there transfers by rail were made to base hospitals in the Algiers area. (See Plate XX.)

*Bone.* Royal Air Force casualties in this area were comparatively heavy owing to repeated attacks by German aircraft. From November 18 onwards R.A.F. patients received hospital treatment at 5 British General Hospital. Bone was an intermediate stopping place in the attempted schedule of a scheme for evacuation between Souk el Arba and Algiers.

*Biskra.* This station, situated on the northern edge of the Sahara Desert, was mainly used as an American heavy bomber airfield. It also acted as an intermediate staging post for the aircraft reinforcement route to the Middle East. Royal Air Force personnel requiring hospital facilities were transferred to 31 British General Hospital and later to 50 British General Hospital. This latter hospital was transported by air from Algiers, the first complete general hospital to be transported by this means.

*Algiers and Blida.* During the assault period in-patient treatment was available in 159 Fd. Amb. and 8 Casualty Clearing Station (C.C.S.). Following consolidation these units were replaced by 94 British General Hospital, augmented later by 95 and 96 British General Hospitals. Later in 1943 R.A.F. personnel were admitted direct to No. 2 R.A.F. General Hospital, Maison Carrée.

Those casualties which were evacuated by air from the forward aerodromes were disembarked at Maison Blanche or Blida and admitted to the Base Hospital. Patients earmarked for invaliding to the United Kingdom were routed either by hospital ship or again by air transport. In the latter instance patients were staged at Gibraltar, the S.M.O. there being notified in advance as to numbers and types of casualties and of the time of arrival of aircraft.

*Tunis Area.* On the cessation of hostilities in North Africa, R.A.F. operational units regrouped and moved forward into Tunisia. Admissions in the Tunis area were made initially to 1 C.C.S., later to No. 30 M.F.H. Carthage, and later still to No. 1 R.A.F. General Hospital. Units located in the Hammamet, Kairouan and Ben Gardane areas were covered by the Desert Air Force M.F.Hs., which were located along the coast as far east as Tripoli.

As planned, the Army provided hospital services for the combined British Forces. Generally speaking this scheme worked most satisfactorily, and adequate and efficient attention was available in most areas, even though the lines of communications were in some instances rather long.

#### SERVICE CONDITIONS IN THE FIELD MEDICAL SUPPLIES

The medical stores and equipment allotted to units taking part in the campaign were of the standard mobilisation pattern, each large unit being equipped with Scale Z.1\* and an ambulance. To facilitate sorting and to ensure that each unit received the correct equipment, all stores were marked with a field unit serial number. This plan was not successful because the unloading of the ships on arrival at Algiers was not done in a straightforward manner. Ships that were partly unloaded sheered off and unloading continued elsewhere, with the result that when units came ashore only part of their equipment was available, the remainder being delayed for hours, perhaps even for days. If these units were required to proceed at once to the advanced areas they had two courses of action, either to go forward partly equipped or without stores of any description, or to go forward fully equipped with stores originally intended for other units. Ambulances, too, either remained in ships' holds for some considerable time, or were carried in different ships from those carrying the unit's stores. In the case of water trailers this breakdown in delivery was of great importance, since in no locality, other than in Algiers town, was the water regarded as safe for drinking. It was soon realised that great advantage would have been gained if a medical stores organisation had been landed with the first echelon. No. 324 Wing, which had advanced to Souk el Arba during the end of November, was without its own medical equipment for two months; the nearest Army hospital was situated 50 miles to the west, and the casualty clearing station situated in the vicinity was short of supplies and could do little to help, as the Army Medical Depot was 500 miles distant in Algiers. This fact argues also the need for a high priority for medical equipment.

The subsequent supply of medical stores after the initial stages of the campaign was obtained from Army sources and it was generally found that Army units were helpful within the limits of what they possessed and could spare. Occasional adverse criticisms were reported but these were mainly due to R.A.F. medical officers submitting excessive demands, in spite of instructions that items should be demanded only on a ten days' basis. Furthermore, it was the experience in this campaign that it was useless to indent for medical supplies and expect

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\* See R.A.F. Volume I, Chapter 8, page 432.

them to be delivered immediately. The only really successful method was for each medical officer to make a personal approach and fetch the items required himself. Practically nothing could be done by telephone as communications during the early stages were non-existent.

Early in 1943 it became evident that the establishment of a R.A.F. Medical Stores Depot was necessary, for difficulty was experienced in supplying the initial scale issue to units forming within the Command. Scale Z.1 mobilisation equipment was accordingly obtained from the United Kingdom and a medical store was established adjacent to the P.M.O.'s office in Algiers.\* Here, with the D.P.M.O. acting as Quartermaster, were kept dangerous drugs, instruments, stores in short supply and stocks of items constantly required by R.A.F. medical units which were never available from Army sources. Class 'C' stores in bulk were maintained at the Base Maintenance Depot one mile away. Occasionally fortuitous supplies came to hand as occurred when a convoy unable to reach Malta off-loaded medical supplies at Algiers, while on another occasion the D.P.M.O. managed to acquire stores which had been dumped on the docks and were in danger of deteriorating from exposure.

Later when N.W.A.A.F. Headquarters moved to Tunis a new procedure was introduced whereby the R.A.F. Hospitals established throughout the Command acted as medical supply depots to units within their covering area.

#### WATER SUPPLIES

Three methods of sterilising water were available in the Command. These were by

- (a) Water sterilising tablets.
- (b) Bell sterilisers.
- (c) Electrolytically Controlled Dosing (E.C.D.) 500-gallon/hour water trailers and L.150-gallon hand pumped trailers.

The value of the tablet system of sterilisation for small quantities (water bottles) was undoubted, its chief asset being the ease with which a safe supply could be made available in emergency. The Bell steriliser was an admirable means of supplying potable water from a nearby source. Unfortunately quite a few of these sterilisers arrived in the Command in a corroded condition, due to the rusting of the base of the metal container of the filter where as many as a dozen perforations were frequently found.† On active service major dependence is placed

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\* The medical stores staff established in May 1943 consisted of:  
 1 Flight Sergeant (Medical Dispenser)  
 1 Corporal and 2 Aircraftman Nursing Orderlies  
 1 Clerk G.D.  
 1 A.C.H./G.D.

† Information from the contractor concerned stated that the rusting was due to sterilisers of early manufacture having mild steel filters. Later supplies possessed stainless steel filters.

on some form of water tank mounted on a vehicle. Two types of mounting for this tank were available—the prime mover and the trailer. Although the prime mover was the vehicle of choice, being independent of the serviceability or availability of other transport, it was not supplied to R.A.F. units in North Africa; instead either the 500-gallon/hour E.C.D. trailer or the 150-gallon hand pumped trailer was provided.

Numerous adverse criticisms were reported concerning the E.C.D. trailer indicating its unsuitability for Service purposes. Among these were

- (a) The air-cooled engine (4 h.p.) was by no means reliable and required frequent attention for minor mechanical troubles.
- (b) The leather washers deteriorated in extremes of climate thereby reducing the effectiveness of the pump.
- (c) It was extremely heavy and unwieldy as a trailer, and could not be easily manoeuvred in narrow roads or on sharp turns.

In many instances the trailers which were allotted to the Command arrived in very bad condition. In some cases the small engine was badly rusted and failed to work until completely overhauled and cleaned; locks were not provided with keys and in consequence many hoses were missing; in other cases the chassis was damaged, in one instance beyond repair.

Although water tenders were laid down as standard equipment for units within the Command, E.C.D. trailers were universally supplied except in the case of the R.A.F. Regiment to whom a 'trailer, water carrying' of 150–180 gallons was issued. In 1942 the Mechanical Transport Committee, Air Ministry, decided to substitute tenders for trailers in all overseas Commands, and the design of a 350-gallon Bedford water tender, as introduced for the Army and employing the simple purification system of the 150-gallon trailer, was submitted to the Director of Hygiene and was accepted by him. Establishments were altered accordingly and orders were placed for this type against future requirements, but several months elapsed before consignments from this order were delivered. The North African expedition had therefore to be supplied with water vehicles that were available in store, or with those which could be withdrawn from other commands. As these were of the old pattern they accounted for the discrepancy in type between that laid down in the Air Ministry establishments for units in North Africa and that actually supplied.

The overall establishment of water-trailers in units within the Command appeared sufficient, but was in fact unsatisfactory. A squadron was allotted two trailers and a wing headquarters one. This number met all requirements during the early part of the campaign, but the situation very soon changed with the advent of numerous small units

which were attached to the headquarters, increasing its strength to three times that of a squadron. On re-deployment of the squadrons to other aerodromes, the wing headquarters remained with inadequate facilities to maintain water supplies. Such conditions occurred at R.A.F. Station, Blida, in August 1943, when there was one water trailer to supply the needs of one thousand persons. Again, many units with an establishment of as many as 120 personnel were not allocated a vehicle for water supply, as they were regarded as being lodger units on larger formations which would therefore supply their needs. In point of fact such units (Mobile Signals Servicing Units) were working on a detached basis, isolated from other R.A.F. units, and with no facilities for obtaining water supplies in bulk. It was occasionally possible to supply these isolated units from squadrons which shared the same aerodrome, but, as the squadrons themselves relied on their water vehicles to maintain their mobility, it was not always practicable for them to loan the trailer to another unit many miles away. Had a reserve pool of water vehicles, preferably 350-gallon water tenders, been available from which loans to units could have been made as need arose, many of the difficulties experienced in this connexion would have been eliminated.

All water supplies except that in the Algiers district were regarded with suspicion until attested and therefore most of the municipal sources were treated before their use by Service personnel was permitted. Alternative sources were frequently found at water-points constructed by the Army where purification was carried out at source. In all these instances the water trailers were used merely as water tanks on wheels, thereby eliminating the use of the elaborate and complicated chlorinating system which required the constant supervision of an airman fitter or a nursing orderly. Indeed after the first few weeks of the campaign most units abandoned their attempts to use the water trailers as a means of purification, and relied instead on the straightforward method of chlorination by hand.

#### LIVING CONDITIONS

It was generally agreed that living conditions in the field during the campaign were, as might well have been expected, most trying. The degree varied among units, and was greatly influenced by the season. Personnel in the base areas enjoyed the added comfort and amenities attached to large towns and cities, but isolation and its concomitant hardships were acutely felt among the advanced units.

In assaults of this kind time is needed to build up a force satisfactorily equipped for all the ordeals of active service in the field and the first two to three months of any campaign are inevitably difficult. But in this, the first assault undertaken by the R.A.F., many additional

situations arose and affected adversely the well-being of personnel. Aircrew who took part in the initial fly-in were separated from their kit for 2-3 weeks. A change of underclothing and minimal toilet requisites were the only personal belongings to hand. Tentage, bedding and cooking utensils were all lacking. Ablutionary facilities were most primitive and were used in some instances with no thought for the future. On arrival at Souk el Arba a squadron medical officer found the pilots sleeping on the ground, eighteen in one borrowed French tent, with unserviceable parachutes as their only bedding. Sleep was very disturbed, as unopposed night bombing was extremely frequent. Another squadron medical officer wrote: 'Aircrew were fighting and living under strenuous conditions. Runways were bad and crashes were frequent. No change of clothing was obtainable as they had flown in leaving all their kit behind. They were cooking their own meals, and sleeping crowded together in two small tents. Nights were disturbed by enemy bombing, yet dawn patrols had to be very alert, as enemy aircraft in superior numbers were always in the skies. The pilots were found some new clothes and boots on our arrival but there were no replacements for damp flying clothing or parachutes.'

The above account which is undoubtedly both factual and historically correct underlines certain aspects of the campaign from which practical lessons can be drawn. Firstly, in the initial planning it had not been visualised that our attacks would be so successful in all areas and the speed of our advance had thus been underestimated; this was undoubtedly the main factor in transport difficulties, both land and air, and obviously the necessity to push troops and war stores ahead was given priority over the moving of general and personal equipment. Secondly, the degree of personal comfort varied greatly between one formation and another, owing to the degree of adaptation shown by individuals. It is, however, true to state that if personnel, particularly aircrew, had been given a more comprehensive briefing on the elementary principles of camping they would have fared better and many of the hardships would have been greatly ameliorated.

Ground personnel, too, suffered through inadequate reception arrangements at Algiers. On disembarkation all personnel proceeded to Hussein Dey, four miles east of Algiers. Accommodation was in a canvas hangar or bivouac tents. Airmen retaining their kit bags fared better than officers who, instructed to dump all baggage on the docks after disembarkation, lacked bedding and a change of clothes. Winter rains soon forced the earlier squadrons into requisitioned buildings in Algiers which were occupied until deployment to various parts of the country. The lack of suitable transit camp facilities in the base area was acutely felt in the opening phase of the campaign.



With the arrival of ground personnel and the ever-increasing flow of unit stores, the standard of living conditions on the forward airfields rose markedly. Sufficient tentage now existed for adequate accommodation and messing, but where suitable billets were available they were quickly taken over. Units with such facilities were fortunate, as the North African winter of 1942-3 produced a heavy rainfall. Frequent floodings were reported from many locations, while the morass which became a typical feature of many airfields made the servicing of aircraft an ordeal. With the approach of spring and summer more reliance was placed on tentage and there was a gradual tendency to vacate farms and native areas around which units had tended to congregate during the winter months.

#### RATIONS

Three types of rations were issued during the early operations before normal rations were available.

- (i) *The emergency ration* was issued as a temporary measure to personnel who were out of reach of any other source of food and in order to save weight it was made as light as possible (8 oz.). The purpose of the ration was to ward off hunger and exhaustion for a period of about 24 hours but it did not purport to be a complete day's food. It was supplied in a small tin box about the size of a 2-oz. tobacco tin and contained a solid mixture of a chocolate type of food, concentrated to give the maximum amount of food value for weight carried. It was intended for use in an emergency and was not eaten unless instructions to do so were issued by an officer, when it could be chewed in small pieces or dissolved in hot water to make a sustaining drink.
- (ii) *The mess-tin ration* provided subsistence for the first 48 hours after landing. It consisted of tinned commodities of a sustaining nature packed in a form suitable for carrying in the two halves of a mess tin, together with a Tommy cooker, which contained enough solidified fuel to enable hot drinks to be made.
- (iii) *The composite ration pack* was composed entirely of tinned commodities packed in wooden cases containing 14 rations (i.e. food for 14 men for one day). This composite ration was supplied in nine different varieties of the daily ration scale and was intended for use during the first four to six weeks until such time as it was possible to issue fresh rations, involving baking bread and handling fresh meat through cold storage facilities. This ration was universally popular with all ranks. It was varied, appetising and liberal in amount. Cooks, and tyros too, found its preparation extremely simple and ideal for service in the field.

It was strongly recommended by the P.M.O. that, in spite of its extra cost, a small supply of this ration should be available in the Command following the change over to bulk rations. The latter were

excellent for well-staffed large units but when the unit was small and the cooks proportionately few in number and when, in addition, owing to operational needs relays of meals had to be provided, bulk rations failed and quantities were insufficient. It was not easy to divide bulk rations for several 'sittings', yet if all the ration was cooked at one time those whose duties kept them late received either cold or unappetizing meals. The P.M.O's. request, however, was not granted, partly on account of the disproportionate cost of composite rations compared with bulk issues and partly because of the need to build up large reserves of the former for future requirements.

The change over to bulk rations was received with mixed feelings. The composite ration had enjoyed such wide popularity that units were loath to lose it. On the other hand the inclusion of fresh meat, bread and potatoes in the bulk scale did make possible a more normal menu than that provided by the tinned composite scale.

The issue of bulk rations to the declared scale provided adequate and satisfying meals, but owing to shortages of items or difficulties in transportation the ration received frequently fell below scale. Similarly fresh fruit and vegetables, local produce supplied to units within their ration scale, were sometimes insufficiently ripe to be palatable or over ripe because of the interval between the dates of purchase and delivery. This inevitably resulted in complaints that the daily intake of vitamin C was inadequate, and the issue of ascorbic acid tablets to make good the deficiency was considered advisable.

#### *Supplementary Scales of Rations for Operational Aircrew*

Operational aircrew standing by in the early morning or late at night received a supplementary ration, as listed below, when snack meals, in addition to normal meals, were necessary:

Chocolate . . .	2 ozs.
Raisins . . .	2 ozs.
Tea . . .	$\frac{1}{8}$ oz.
Milk (Tinned) . . .	$\frac{3}{8}$ oz.
Sugar . . .	$\frac{1}{2}$ oz.

Similarly, aircrew engaged on operations in excess of four hours received the following scale of supplementary rations per man for each flight:

Chocolate . . .	4 ozs.
Raisins . . .	4 ozs.
Tea . . .	$\frac{1}{8}$ oz.
Milk (Tinned) . . .	$\frac{3}{8}$ oz.
Sugar . . .	$\frac{1}{2}$ oz.
Chewing Gum . . .	1 Pkt.
Glucocidin . . .	1 oz.
or	
Barley Sugar . . .	2 ozs.

In April 1943, ten catering officers were posted to the Command to ensure full co-operation between the R.A.F. and the R.A.S.C. They also introduced a standard catering policy and regularised flying and other special rations and the training of messing personnel in relation to local conditions.

### *Cooking Facilities*

The No. 6 Minor Formation Cookers sent with the expedition proved unsatisfactory owing to the high lead content petrol which was issued to the Command. The main difficulty lay in the rapid deposit of carbon around the thread and needle with consequent breakdown in the cooker's efficiency. The method of servicing appeared to be beyond the knowledge of most of the cooks and if no expert fitter was available for dismantling and cleaning the cooker little use was made of it.

Several Turley Williams cooking trailers were supplied to units but the operational value of these was questionable. With the composite ration there was little need for the trailer and as long as the bulk ration remained largely tinned this equipment was unsuitable. Again Service conditions demanded dispersal and mobility and in cases where the squadrons became partly detached, the trailer remained with the larger party. Difficulties similar to those in the minor formation stoves were experienced with the burners in the trailers and arose from the same causes.

Most cooks improvised equipment for cooking but their training had not extended far beyond the provision of kettle trenches. The R.A.S.C. issued a scale of timber for fuel but delivery and quantity were erratic. In no circumstances could Algeria be considered a well-wooded country. It was not until late in the campaign that heavy oil became available to the R.A.F., but when it did improvised oil and water burners became the mode.

### MALARIA CONTROL

Malaria was endemic throughout practically the whole of Algeria and Tunisia. In high areas (Setif and Constantine) and in some low-lying areas where, during the warmer months, there was little or no surface water (e.g. Kairouan), the incidence was negligible. In most flat areas near the coast, however, where rivers and lakes were never completely dry, the disease was highly endemic. In these areas, the temperature and humidity from the beginning of May until the middle or end of November were suitable for the development of plasmodia in mosquitoes and for the transmission of malaria. In the hills the season was shorter. Odd cases which occurred during the winter months were regarded as 'breaks through' of latent malaria or instances of infection from hibernating mosquitoes. In the plains two peak periods

of breeding were normally expected, the first in May before the accumulation of water from the spring rains had had time to evaporate, and the second in September or October after the first autumn rains. Except in the hills rain does not usually fall between mid-May and the end of September and occasional thundery rain occurring in September or even August is rapidly absorbed giving the mosquito no time to breed.

The sole carrier of importance was the *Anopheles maculipennis* var. *labranchiae*, and its ideal breeding places were stagnant or almost stagnant pools and swamps where some shade was present. Contrary to common belief its breeding propensities were not adversely affected by heavy contamination with sewage or a salinity up to 1.7 per cent. Imagos often survived the winter, remained infective and transmitted malaria out of season.

Only a very limited amount of civilian anti-malaria work had been carried out and during the war work previously completed or commenced was allowed to lapse. This work was confined almost entirely to the larger towns, as generally speaking the French population moved away from the dangerous areas during the malaria season leaving the natives to fend for themselves. The prospects for an 'unsalted' force, fighting through the malaria season under active service conditions, were not favourable. For the R.A.F. the outlook was, on the whole, better than for the Army since it was likely to be more static and therefore more favourably placed in respect of personnel protection, although on the other hand squadrons were liable to operate from flat, low-lying coastal plains with very little opportunity of site selection.

During the winter of 1942-3, a Malaria Advisory Board was created and met periodically at Allied Force H.Q. at Algiers. The Board was under the chairmanship of the Deputy Director of Hygiene (Army) and consisted of representatives of the British and U.S. Armies, the Royal Navy and the Royal Air Force. Representatives of the French civilian organisation and the French Army also attended several of the meetings. Whereas the organisation and planning evolved by the Board were satisfactory, its propaganda measures were open to criticism. This propaganda took the form of posters, broadcast talks, roadside placards and lectures, but it largely defeated its own ends in three respects, viz.:

- (i) It started, and therefore reached its peak, too early, so that by the time the danger season began the troops had lost their initial enthusiasm, and were rather tired of the whole matter, having been subjected for two months to cries of 'Wolf! Wolf!'.
- (ii) Far too much emphasis was laid on suppressive medication and far too little on personal protection by clothing and nets. It was considered that medication should have been a secondary measure of defence in personnel who failed to take full personal precautions.

- (iii) The impression was given that if a man took suppressive drugs regularly he would not get malaria—a large roadside poster near Tunis announced 'Take your tablets or die'. When men who conscientiously took their tablets developed malaria, the drug was immediately discredited.

In accordance with arrangements agreed beforehand between the two Services in respect of anti-malaria measures, the R.A.F. was responsible only for sites occupied by their forces and for areas within one mile radius of such sites. The Army was responsible for all other work and naturally possessed a much more elaborate organisation.

Personal anti-malaria measures were the same for all personnel in the Command except aircrew, who were issued with quinine in lieu of mepacrine.\* Non-compliance with orders was common and the disinterested attitude of executive officers did not help. Nets, although generally available throughout the Command, were a unit and not a personal issue; in consequence most personnel in transit travelled without them and many cases of malaria were attributed to this deficiency.

The necessity for suppressive medication for the whole force was undoubted and was strongly emphasised by the French. It was therefore decided to initiate such measures on April 22, 1943, and suggestions that certain personnel, units and areas should be exempted were rejected. No area in the theatre could have been classified positively as non-malarious and no individual or unit could be certain of his whereabouts from day to day. Moreover, it was thought that mepacrine should be taken for some days, or even weeks, before a suppressive blood level was reached. Except for flying personnel who were to have 5 gr. of quinine every day, mepacrine was taken by each individual in a dose of two 0.1 g. tablets every Monday and Thursday. Among those taking mepacrine or atebirin, the first two doses of two tablets on April 22 and 25 produced only isolated complaints of abdominal discomfort and slight looseness of the bowels—complaints common enough to be accepted philosophically and not attributed to the tablets. The third dose was taken on April 29. On the 30th reports poured in from far and wide, from British and American troops, from Army and Air Force, of nausea, vomiting, pyrexia up to 103° F., abdominal pains and diarrhoea in as many as 50 per cent. of personnel who had taken either mepacrine or atebirin. Symptoms commenced between 3 and 10 hours after taking the tablets (later in those who were resting) and lasted 12–24 hours. Following this period there were some days of lassitude and malaise. Overall, it is probable that in most units between 5 and 10

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\* When mepacrine (American atebirin) was introduced it was thought that this drug might precipitate anoxia and it was therefore withheld from flying personnel. Mepacrine was later proved to have no harmful effects in this respect.

per cent. were really ill, that a further 10–15 per cent. had symptoms severe enough to affect their efficiency and that a further 20–25 per cent. had mild complaints. Aircrew were unaffected. Some personnel who had taken their first two doses but missed the third (e.g. 400 airmen at Maison Blanche) remained well—although equally at risk as far as other possible causes were concerned.

On May 1 as a result of a meeting of the Advisory Board, it was decided to continue suppressive medication with a modified dose, and thus by persevering with the drug to produce tolerance. In spite of this ruling, however, there followed a sharp divergence of opinion between the R.A.F. and the Army as to the advisability of continuing with the drug. Although Army Orders insisted on the continuance of the drug in the modified dosage the R.A.F. P.M.O. decided to discontinue suppressive mepacrine in view of the following facts:

- (i) The final stages of the Tunisian campaign were in progress and it was imperative that for the following week or two every available aircraft should be kept airworthy (necessitating full complements of ground crews for servicing) to prevent a 'Dunkirk' by the Germans from Cap Bon.
- (ii) The malaria risk had then hardly commenced and was in no way comparable, as a cause of immediate non-effectiveness, to the mepacrine risk.

Consequently on May 2\* a signal was sent to all R.A.F. units permitting the discontinuance of mepacrine in areas not considered definitely malarious, the final decision resting with the local Senior Medical Officer.

Some Army units continued the mepacrine doses and found that perseverance with the drug ultimately resulted in tolerance. In the light of this experience, on May 22, by which date the malaria season had commenced and the Tunisian Campaign had terminated, suppressive medication was again given in all R.A.F. units.

#### SANITATION AND HYGIENE

The assumption that the construction and maintenance of all sanitary appliances were the responsibility of the Medical Branch was prevalent throughout the Command. This assumption was demonstrated in the initial stages of the campaign when, in the absence of unit medical officers, little or no attempt was made by executive and administrative officers to provide adequate facilities. On arrival medical officers were faced with a chaotic situation and their immediate task was to ensure that reasonable conditions were provided. Admittedly the lack of

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\* By May 5 the U.S. Army Air Corps and the First Army had also discontinued suppressive medication.

sanitary stores and equipment, the *tempo* of operations and strenuous Service conditions aggravated the position, but these factors did not excuse the extremely primitive ablutionary methods adopted or the complete disregard for the future.

Following visits to several airfields, forceful representations were made by the P.M.O. on November 29, 1943, to the Air Officer i/c Administration, East Africa Command, requesting that an Administrative Instruction be circulated to all units stressing the following points:

- (i) Responsibility for the cleanliness and sanitary measures on any R.A.F. station or camp rests with the Commanding Officer, and none other.
- (ii) The medical officer will assist his C.O. with advice on every point that comes within his province, i.e. every point affecting the health and well-being of the personnel and the ways and means of avoiding sickness and epidemics. But a M.O. does not dig or supervise the digging of latrines, wash places, refuse tips, etc.
- (iii) Every unit must detail a permanent sanitary squad, the composition of which will of course vary with the conditions under which the unit is living. The essential point is to have a strong and interested N.C.O. in charge. It will not pay to choose the Sanitary Squad from the "no goods" and under no circumstances should a spell on the squad be made, or come to be regarded as, a means of punishment. It cannot be too strongly emphasised that on the efforts of the squad will largely depend the health and comfort of the unit, and their zeal will be reflected in the general efficiency of the unit.
- (iv) Strict disciplinary measures should be enforced at once against all officers and other ranks who contravene the ordinary rules of camp sanitation and the practice of defaecating on ground or in shelter trenches and other odd corners and places other than those allotted for latrines, and the practice of urinating at will in and against camp shelters or against any building, vehicle etc., should be sharply punished, for this is the worst crime that can be committed on service in these parts, as it constitutes a direct threat to the health of the fighting forces.'

It was very evident that the conditions which existed in the early period were primarily due to the lack of training in the basic requirements of field service among officers and men of the force.

In very few instances were elaborate sanitary measures utilised among the force, particularly in the forward areas, where the ever-changing military situation and the difficulty of obtaining the necessary works services permitted only temporary arrangements.

Occasionally flush closets in a water-borne system were available but on the whole these proved unsatisfactory, owing to defective seats, drains and sewers, inadequate cesspools, or septic tanks when installed,

the absence of an adequate water supply and numerous other causes. It was frequently necessary to render these closets safe by sealing with concrete and to adopt the bucket latrine system. The latter system was most largely used by units in Algeria and Tunisia, the excreta being disposed of by incineration and/or burial beyond camp limits. On occasions deep trench latrines were used, but they were avoided where possible as the type of material available for construction made fly-proofing almost impossible. In one instance in Tunisia borehole latrines were constructed with the help of U.S. engineers and proved most successful.

At the beginning of 1943 and up to the close of the North African campaign there was only one sanitary assistant in N.A.A.F. Command; he was employed as technical assistant to the S.M.O. No. 242 Group.

No field hygiene units were allocated to the Command until after the fusion with the forces from the Middle East. The Army, who had an establishment of such units, was unable to assist owing to its own extensive commitments. The provision of at least two R.A.F. field hygiene units should be considered essential in a force deployed under active service conditions in country of this nature.

#### CONVALESCENT UNITS

Early in 1943 it became apparent that there was a need for a Convalescent Home for both officers and aircrew in North-West Africa. Such an organisation would ensure hospital accommodation being used to the best advantage, and the return of personnel to their units in the fittest condition of body and mind. After one or two sites had been inspected and discarded or lost, a location at Madrague Plage, about ten miles west of Algiers, was considered as having most amenities within a reasonable compass. The British Red Cross Society was approached and agreed to control the unit with a capacity of 100 beds. Token occupation was made by No. 31 M.F.H. who commenced to clean up the site and carried out repairs to the property within their capacity. On their departure east, a detachment of the R.A.F. General Hospital was substituted. On the arrival of the B.R.C.S. staff, it was decided to open the unit to convalescent officers and airmen in spite of the delay in receipt of Red Cross stores and equipment. An interim loan of essential stores and equipment was made from R.A.F. sources. By the end of August 1943, the unit was in full working order and receiving cases, mainly from the General Hospital in the Base Area. Authority for admission rested with the S.M.O. No. 1 Base Area, Algiers.

The main types of cases admitted to this depot were:

- (i) Aircrew who were in need of a week or longer away from operational stress, discomfort, bombing, etc., but who were whole in body and mind.



- (ii) Aircrew discharged from hospital recovered, but not as yet fit for full operational duties.

In certain instances it was also possible to arrange for the admittance of members of the P.M.R.A.F.N.S. and officers of the W.A.A.F. On the cessation of hostilities further convalescent amenities were provided at Hammamet, covering units in Tunisia.

#### COMMAND MEDICAL BOARD

Although no medical personnel were established until late 1943,\* a Board with the status of Command Medical Board was functioning in the Command from its infancy. The D.P.M.O. (later D.P.M.O.(H.)) acted as President and medical officers from Headquarters (Unit) and No. 1 Base Area as members. On the arrival of the staff of the General Hospital the Board was reconstructed with a psychiatrist as President and a medical specialist as member, and the Headquarters (Unit) medical officer was co-opted when available.

The Board, being sited within the precincts of No. 2 R.A.F. General Hospital, came within easy reach of the hospital specialists in oto-rhino-laryngology, medicine and surgery and the pathological and X-ray departments. The admission of cases either to hospital for further investigation or to the convalescent unit at Madrague Plage, Guyotville, 15 miles away, was greatly facilitated by this close contact and these advantages more than compensated for the distance which separated the C.M.B. from H.Q.'s. 'P' staff and the P.M.O. when these latter moved to Tunis.

All boards were arranged by appointment. Patients with disabilities usually came from No. 1 Base Personnel Depot (B.P.D.) to which they had been posted non-effective on discharge from Army hospitals and convalescent units. Candidates for aircrew duties were drafted to No. 1 B.P.D. from outlying units in such numbers as could be dealt with

\* Establishment dated July 30, 1943:

Medical Officers .	W/C. 1	S/L. 1	F/L. 1	To be filled by officers experienced in Ophthalmology and Oto-rhino-laryngology.
N/Orderlies .	Sgt. 1	Cpl. —	A.C. 2	
Airmen Clk/G.D. .	—	1	—	

This was superseded by Establishment dated November 19, 1943:

Medical Officers .	W/C. 2	S/L. 1	F/L. 1	To be filled by officers with experience in Ophthalmology and Oto-rhino-laryngology; includes one Wing Commander Neuro-psychiatrist.
N/Orderlies .	Sgt. 1	Cpl. —	A.C. —	
Airmen Clk/G.D. .	—	1	2	

by the Board, while those for commission were as a rule sent direct from the Selection Board by previous arrangement with the formation concerned.

The work of the Command Medical Board was lightened considerably by two procedures decided by H.Qs., viz.:

- (i) R.A.F. Hospitals and M.F.Hs. were empowered to board candidates with disabilities and candidates for aircrew duties and commissions.
- (ii) The evacuation of cases recommended for transfer to hospital in the United Kingdom was permitted subject only to the written advice of the hospital specialist concerned.

In spite of this delegation of responsibility, however, the work of the Board steadily increased during the period July–December 1943.

Owing to the fact that the only specialist in neuropsychiatry in the Command was located with the Board and that all cases of psychological disorder were referred to him, the majority of cases boarded were of a neuropsychiatric nature.

#### GENERAL HOSPITALS

##### NO. 1 R.A.F. GENERAL HOSPITAL, TUNIS

It was necessary, in this area, for the R.A.F. to plan a hospital service quite different from that normally found in a predominantly Army set-up. Army units were in constant action and large numbers of casualties had to be received and accommodated, so that as a general rule, the lighter the casualty the farther back he was required to travel. In the R.A.F., however, all personnel in active areas were key men and it was highly important that they should be retained and treated as close as possible to the operational area so that they could be returned to their units with a minimum of delay.

The original plan to establish No. 1 General Hospital in the region of Blida was delayed by failure to find any suitable location in spite of an intensive combing of the whole area adjacent to the airfield. As time passed the situation in Algiers eased and when it was rumoured that the school at Maison Carrée in which N.W.A.A.F. had its Headquarters would soon be vacant, it was decided to abandon Blida as a hospital area. Agreement that the school should be allocated to the R.A.F. was eventually reached after a brisk struggle with the Army who were equally eager to obtain this commodious site.

But the rapidly changing situation and the collapse of German resistance in North Africa soon made it clear that neither Blida nor Algiers was any longer a suitable location for the establishment of a general hospital in accordance with existing R.A.F. requirements, and it was decided to locate it forward at a point where it would be suitably placed for future operations in Sicily and Italy. When, however, it was

later decided to form a second General Hospital in the Command, the site at Algiers, now vacant on the departure of the R.A.F. and Army Headquarters eastwards, was chosen.

The sites finally chosen for No. 1 General Hospital were L'Institut Perret and La Maison Lavigerie in the Tunis area. The former was an Ecclesiastical School at La Marsa and the latter a convent at Carthage (occupied at the time by No. 31 M.F.H.), two miles distant. (See Plate XXI.)

Preliminary warning to the Officer Commanding and the majority of the staff of the hospital was given in mid-April 1943, when it was proposed that the date of embarkation from the United Kingdom should be early May. This date was later changed to mid-May and eventually to June 16, when the medical officers and nursing sisters embarked at Gourcock, sailing on June 19. They disembarked at Algiers on June 27, the main party of officers being accommodated in the Transit Camp, while the sisters were billeted in the building taken over by the British Red Cross Society at Madrague Plage some 10 miles west of Algiers. The airman contingent had arrived in Africa earlier, having sailed on May 16 from Liverpool and disembarked at Algiers on May 27. These personnel were accommodated in the first instance at the Transit Camp at Hussein Dey, subsequently moving to the British Red Cross Society Convalescent Depot at Guyotville. A small advance party, however, under a warrant officer, proceeded to Tunis where they occupied L'Institut Perret on Saturday, June 19.

The commanding officer, with the medical quartermaster and adjutant, left Algiers on June 29 and arrived at Tunis on July 1. There, the two buildings which had been personally selected by the P.M.O. were inspected and although far from ideal were considered suitable for a general hospital under active service conditions. On the same day the commanding officer attended a conference at H.Q., N.A.T.A.F., during the course of which the Air Officer in charge of Administration (A.O.A.) stated that operations of considerable magnitude were intended at an early date, and that the expected casualty rate would be heavy. The A.O.A. impressed upon the commanding officer the necessity for opening the R.A.F. general hospital without delay. As no medical or barrack stores had so far arrived, it was impossible to fulfil this request immediately, but to expedite the formation of the hospital approval was obtained from the D.M.S. (Army) to demand 'frozen' medical stores which had been captured during the campaign. The stores had actually been delivered when the D.M.S. cancelled his previous sanction and authorised the supply of medical stores for a 200-bed hospital to Army schedule.

The ensuing few days were occupied in collecting supplies from 10 Base Depot of Medical Stores, Tunis. By July 14 it was possible to

open both La Maison Lavigerie and L'Institut Perret with a combined bedstate of 463 (159 beds and 304 stretchers). In the meantime the nursing staff of one matron, one senior sister and 17 nursing sisters had arrived by air on July 6. Later the same day the balance of the medical staff reported with the exception of the neuropsychiatrist and two medical officers who were retained for medical duties in Algiers. The final complement of non-commissioned personnel eventually arrived from Algiers on July 8. By the end of July the hospital was available for the treatment of all classes of disease and injury, and although the casualty rate was not as high as had been expected, 420 patients were accommodated during the seventeen days of July following the opening of the hospital.

All these casualties were conveyed by air from Sicily. The wisdom of placing the R.A.F. hospital within three miles of El Acuina aerodrome was proved by the ease with which patients were transferred with minimal delay and discomfort.

Towards the end of July a burns treatment centre was opened in La Maison Lavigerie. Army patients were sent to the centre from 97 British General Hospital, which did not have adequate facilities for this type of case, and where, being a tented hospital (1,500 beds), mid-day temperatures of 106° F. were frequently recorded in the wards. During the early days of August the water supply to La Maison Lavigerie became unsatisfactory and it was consequently decided to transfer the burns centre to L'Institut Perret where three baths were available, and where an uninterrupted supply of water was provided by water tender.\* During the same month a rehabilitation centre supervised by the orthopaedic surgeon was incorporated within the establishment of the hospital.

For a short period during the first half of August the hospital worked to a reduced bedstate of 250. This step was taken as the admission rate of casualties was less than expected and as a means to facilitate the installation of R.A.F. equipment which was arriving in Tunis from the United Kingdom. This delay in the arrival of medical stores was a source of great inconvenience. Medical stores were unloaded at Algiers in three separate consignments on May 30, June 29 and July 14, but some weeks elapsed before their eventual delivery to the hospital. This delay was due to administrative difficulties experienced on the lines of communication. Furthermore, any satisfaction felt on the eventual receipt of medical and barrack stores abated considerably when it was found that packing cases bore no indication of their contents and that numerous items had been broken in transit.

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\* With the inadequate municipal supply the late arrival of water tenders delayed the opening of the burns centre for several days.

In August further changes were made in the composition of the hospital. On August 14 the P.M.O. informed the commanding officer that owing to operational and geographical requirements it would most probably be necessary to divide the hospital into two sections. This division did not take place until mid-September, when a further R.A.F. General Hospital (No. 2) was formed in Algiers from within the establishment of the present hospital. To form the second general hospital, the commanding officer, four medical officers and sixteen airmen departed for Algiers on September 12 and were followed in the period September 24-27 by three additional medical officers, the catering officer, twenty members of P.M.R.A.F.N.S. and sixty-two airmen.

During September No. 1 R.A.F. General Hospital, which had remained at Carthage, was kept working at full pitch. The number of admissions gradually rose so that there were 306 in-patients at the beginning of the month and 399 on the 30th. The staff, depleted by the personnel required for the second hospital, now consisted of 11 medical officers, a matron and 40 nursing sisters, a warrant officer acting as quartermaster and 139 airmen. The hospital continued to operate in three distinct sections. L'Institut Perret had 137 beds; La Maison Lavigerie, two miles away, contained 171 beds and the administrative offices and stores, while the remaining 105 beds were in a tented hospital nearby. This division allowed for distribution by types (e.g. rehabilitation, convalescent, burns, tuberculosis, skin and venereal diseases) which minimised the difficulties of segregation, but in maintaining adequate services the unit transport was strained to the utmost, as it had been established on the assumption that the hospital would be a compact unit.

The arrival of patients by air continued. With the spread of the campaign in Italy a wider area was covered but the organisation remained the same. Patients were received from No. 30 M.F.H. operating in the Salerno area, from No. 21 M.F.H. on the Adriatic Coast, and from No. 25 M.F.H. in Catania. The majority of patients from Italy had been staged in Catania and all appeared to have stood evacuation in good condition. Towards the end of September air evacuation, both from the forward areas and westwards to Algiers, became more difficult to arrange owing to operational requirements which made it necessary for No. 216 (Transport) Group to reduce activities at El Acuina.

The total admissions for the month of September were 673 and discharges 574. These figures show the rapid turnover in the majority of cases and proved the value of establishing a R.A.F. general hospital in North Africa. Had these cases been admitted to the only Army hospital in the district many would inevitably have been transferred farther westwards and on discharge from hospital would have been

remote from the R.A.F. manning organisation. On discharge from the R.A.F. hospital all R.A.F. patients reported to No. 1 Base Personnel Depot, Tunis, and at once became available for re-posting to units.

No. 1 R.A.F. General Hospital continued to function in its present location until November 30 when instructions were received for the unit to proceed to the Naples area. To facilitate this transfer the air intake from Italy was reduced and 52 cases were transferred to No. 2 R.A.F. General Hospital, Algiers, by special aircraft of the American 37th Troop Carrying Squadron. On December 6, 121 patients were finally transferred to No. 31 M.F.H., which unit was to take over the vacated hospital buildings.

During the two-month period October 1 to November 30 a total of 1,468 admissions was recorded. This figure comprised 1,139 medical and 329 surgical cases; the ratio of medical to surgical cases (3.5 to 1) was indicative of the preponderance of medical cases which had been encountered since the opening of the hospital. Infective hepatitis, at this time reaching epidemic proportions, and malaria, accounting for 50 and 77 cases respectively, were the two main reasons for the high medical admission rate. A recurrent difficulty which faced medical boards disposing of aircrew after they had been ill or injured was the absence of local convalescent facilities and the difficulty of employing these personnel if they were unfit for flying duties. In practice aircrew members whose categories were below A1B (fit full flying duties) were usually retained at the Base Personnel Depot. The employment of aircrew was, of course, entirely within the province of the Personnel Staff but the difficulty of finding suitable employment for those in the lower medical categories in an operational theatre of war increased the number of personnel who had to be repatriated to the United Kingdom.

#### NO. 2 R.A.F. GENERAL HOSPITAL, ALGIERS

The division of the R.A.F. General Hospital at Tunis into two separate units, each working to approximately 300 beds, was the final step in establishing a chain of R.A.F. medical units along the North African coast. By this means the R.A.F. units in North Africa became independent of Army medical establishments which were by now vacating Africa on deployment to areas in Sicily and Italy. Already R.A.F. hospitals, either station or general, were functioning at Tunis, Bône, Algiers and as far west as Oran. The siting of the second general hospital at Algiers completed this chain and provided the remaining link in the evacuation of invalids to the United Kingdom. (*See Plate XXII.*)

Further considerations which decided this division were the greater mobility that would be retained by the two 300-bed hospitals, and the ease with which these two units could each increase to 400 beds compared with the difficulty of expanding a 600-bed hospital to 800.

As stated earlier, Algiers was chosen as by this time (June 1943) ideal accommodation was available in the building originally occupied by H.Q., N.W.A.A.F., and the town was also most suitably located for air and sea evacuation to the United Kingdom.

On June 13, 1943, the Commanding Officer of No. 1 R.A.F. General Hospital and a small nucleus of medical officers and airmen left Tunis to inaugurate No. 2 R.A.F. General Hospital at Maison Carrée. On arrival steps were immediately taken to prepare wards and specialist departments but unnecessary delay was experienced owing to the difficulty in obtaining works services, for the hospital was given priority C which was below that granted in respect of repairs to local dwellings. In spite of the lack of full hospital facilities the first patients were admitted on September 24 when four cases were transferred from 96 British General Hospital. Even as late as mid-October only selected cases could be admitted, as theatre and laboratory facilities were still incomplete and no X-ray apparatus was available. By the beginning of November all departments were finally equipped to scale and accommodation existed for 332 patients. All wards filled rapidly as the number of occupied beds jumped from 27 on October 1 to 239 on October 31 and 311 on November 30.

For the first three months of activity there were vacancies in the specialist establishment owing to the splitting of the staff between the two hospitals. During this period No. 2 R.A.F. General Hospital was without an anaesthetist, a radiologist and an orthopaedic surgeon. Recourse had therefore to be made to Army sources for barium meals, etc., while orthopaedic cases, excepting those of an elementary nature, were transferred to 95 British General Hospital at El Biar.

By the beginning of 1944 the hospital was adequately equipped and staffed and capable of undertaking all branches of treatment. A special asset was the formation of a burns treatment centre on the same lines as the one at Tunis. By this time the hospital was undertaking the air evacuation of invalids to the United Kingdom, from the neighbouring aerodrome at Maison Blanche. Under a reciprocal agreement with the A.D.M.S., Army cases requiring air transport to the United Kingdom were staged at the R.A.F. Hospital while R.A.F. cases for sea evacuation were transferred to 95 British General Hospital. During the period under review 711 cases were evacuated by air to the United Kingdom and 11 to Cairo, while 291 cases were transferred for evacuation by hospital ship. By March 1944 the rate of air evacuation declined owing to the decreasing availability of aircraft, but it was still possible to arrange an air lift for an urgent case with a delay of up to seven days.

The average daily number of occupied beds throughout the whole period was approximately 200. The highest figure reported was in

December 1943, when the daily average approached 330. The figure gradually grew less with the movement of personnel into other theatres of activity. In the last quarter of 1944 there was a slight rise in the average daily bedstate to 220, this being due to the seasonal incidence of infective hepatitis (50 cases) and an outbreak of food-poisoning at R.A.F. Station, Maison Blanche (56 cases).

In September 1943, an outbreak of plague occurred among the civilian population in Algiers. The first case was notified on August 31, and others continued to be reported up to December 1943, when the outbreak subsided; by this time the figures were:

<i>Confirmed plague</i>		<i>Suspected plague</i>	
Deaths . . .	28	Deaths . . .	6
Other cases . .	34	Other cases . .	17
Total 85			

No cases were reported among British troops stationed in the Algiers district.

Reports show that a total of 1,785 general surgical and 517 E.N.T. cases were admitted during the period September 1943 to June 1945 and 795 orthopaedic cases from September 1943 to December 1944. From September 1943 to June 1945, 1,760 operations were performed of which 535 were of a major character. The only figures readily available for medical admissions are for the last quarter of 1943 and amount to 1,084. Assuming, however, that medical cases occurred in their customary average ratio of 3.5 to 1 surgical, the total medical admissions would appear to have approximated 8,000.

#### MOBILE FIELD HOSPITALS

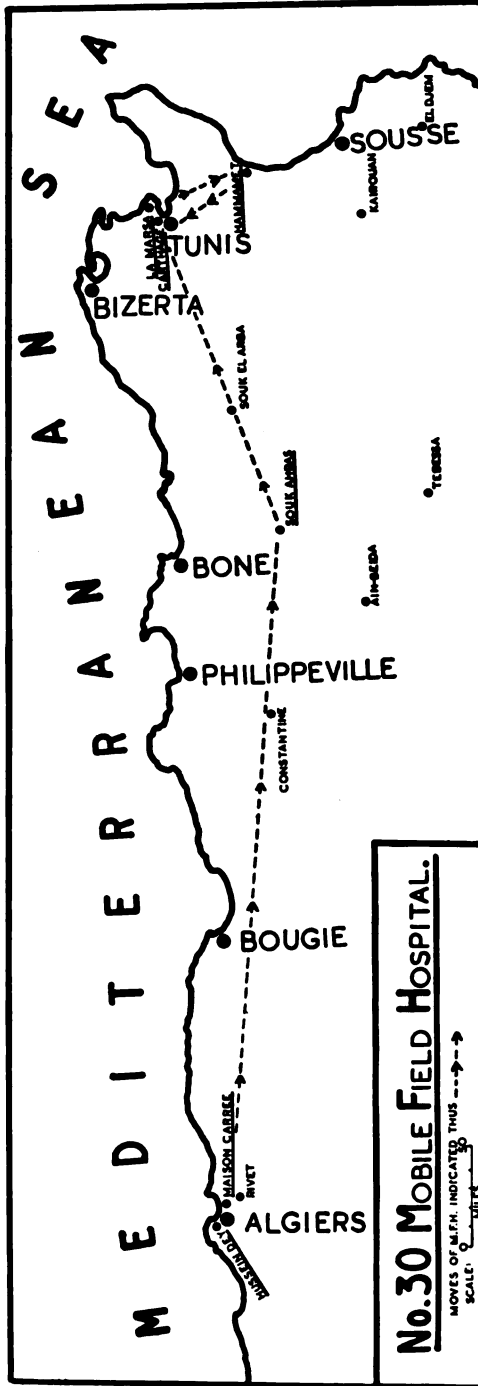
##### NO. 30 MOBILE FIELD HOSPITAL.\* (See Map 10)

Officers and airmen who had been posted to No. 30 M.F.H. assembled at No. 1 P.D.C. West Kirby on March 22, 1943. On the same date unit transport, barrack and medical stores were delivered. It was several days before all personnel of the unit could be completely paraded owing to the time spent on kitting to the overseas scale and on inoculations. Instructions had been received that all tentage was to be erected and slept under for one night before repacking but owing to inclement weather and the inadvisability of packing tentage in a damp condition, this was not possible. Instead, all tentage was unpacked and inspected in a dry shed and sample checks of stores were carried out. A complete check of all equipment was not feasible, as the majority of crates had been steelbound in readiness for shipment and, moreover, no copy of the scale of equipment for a M.F.H. was

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\* This title, which was not allotted to Medical Receiving Stations until May, 1943, is used for the sake of continuity.





MAP 10. Moves of No. 30 M.F.H.

available while comparison with vouchers was extremely slow owing to their irregular arrival. Numerous deficiencies were found among the M.T. vehicles, and owing to a misunderstanding they had not been equipped to the correct scale before arrival at West Kirby. However, it was possible to obtain essential items before the unit left for overseas.

Personnel embarked at Liverpool on April 12, 1943, and after an uneventful voyage arrived on April 23 at Algiers where officers were accommodated at the Base Personnel Depot at Hussein Dey and airmen at Maison Carrée, some five miles distant. Here the unit remained for the next two weeks awaiting the arrival of equipment and transport and it was not until May 5 that the unit transport was delivered after reconditioning by the Servicing Unit at Rivet.

One major difficulty experienced when unloading the equipment was how to determine when the full amount had arrived. On the ship's papers all the M.F.H. equipment was shown as a complete item, but various crates and packages had been distributed throughout various parts of the ship. Even though all stores unloaded were scrutinised, numerous articles of M.F.H. equipment were removed from the docks by other units. However, most of the 'lost' articles were traced and recovered, while the remainder were replaced by the local maintenance units.

On May 9 orders were received instructing the unit to move to the Souk el Khemis area without delay. Arrangements were accordingly made to obtain the necessary seven days' rations for the unit and sufficient petrol to allow each vehicle to cover 500 miles. The M.F.H. left Maison Carrée in convoys on May 11, and good progress was made in spite of minor mechanical breakdowns and the inexperience of most of the drivers. However, on arrival at Souk Ahras it was learned that the destination of the convoy had been altered to Carthage, which was duly reached on the evening of May 13.

The Commanding Officer of No. 30 M.F.H. had meanwhile proceeded ahead of the main convoy and arrived early on May 13. Immediate contact was made with the Senior Medical Officer, No. 242 Group, and the D.D.M.S., V Corps, and together they surveyed the ex-German hospitals in the Carthage and Ariana areas. The ex-German Orslazaret St. Augustin, situated in L'Institut Perret at La Marsa, was provisionally selected as being most suitable for occupation by No. 30 M.F.H. After negotiation with the D.D.M.S. it was agreed that this building should be put at the disposal of the R.A.F. who, after receiving official confirmation from the military authorities at H.Q. Tunis area, took formal possession on May 14. This hospital, originally a school, had a decided advantage over other hospital buildings in the area in that it contained no enemy wounded and was consequently ready for immediate occupation. As the building was in a

filthy condition, due partly, no doubt, to the sudden evacuation by the Germans, immediate steps were taken to restore it to a reasonably hygienic standard. This entailed the clearing of the main drains leading from the ablutions, which had been deliberately obstructed with tiles and stones, and clearing of the basement which appeared to have been used promiscuously as a lavatory. The building was devoid of all hospital equipment except beds, mattresses and bolsters. The beds were a welcome acquisition, but the bedding was heavily infested and required baking in a disinfectant before being put into use. It was, therefore, a considerable time before the buildings could be made fit for the reception of patients, and the opening was further delayed by the lack of opportunity to unpack, check and assemble all the numerous items of medical and barrack stores.

On May 19, when No. 30 M.F.H. was ready to receive patients, 76 beds were available, and the operating theatre, X-ray and other ancillary departments were open.

In consequence of visits paid to units in the Tunis area, and through the co-operation of the S.M.O. No. 242 Group and squadrons of the R.A.F. Regiment, valuable additions were made to the M.F.H.'s equipment. For example, many items were obtained to supplement the initial issue of drugs which was quite inadequate; similarly the value of the pathological department, which previously consisted of a microscope and a few stains, was greatly increased by the acquisition of a small centrifuge and culture media.

After a fortnight's activity certain internal administrative problems arose which had to be overcome. Among these the questions of water supply and lighting deserve mention. The water supply was scanty and irregular, due partly to the damage done to the Tunis municipal water system by the enemy. Because of lack of pressure, water could only be obtained from taps on the ground floor and had to be carried by hand to the first and second floors. During the afternoons the water supply invariably ceased so that use of the conservancy system was restricted to the hours 0700 to 1200. The electricity supply had also been damaged by the enemy but it was found possible to connect the unit power tender to the mains and to provide a current which was reduced from the normal 240 v. output to 120 v.

By the end of May, 146 patients had been admitted in the short time since the unit had opened. Of these, 110 cases were medical, gastro-enteritis accounting for 78, and 36 surgical, 23 of which were treated in the theatre. No. 30 M.F.H. had the further task of providing out-patient facilities for the numerous small R.A.F. units in the vicinity, although its staff was depleted by one M.O. who was detailed to supervise the treatment and evacuation of German prisoners-of-war in the adjacent hospitals of La Maison Lavagerie and St. Joseph.

Early in June 1943, the Commanding Officer was instructed by the Air Officer in charge of Administration, Tactical Air Force (who, advised by the P.M.O., N.W.A.A.F., controlled the movements of the M.F.H.), to prepare for a move which had become necessary owing to new operational requirements. On June 2, as a result of this information, it was decided that No. 30 M.F.H. would move to the Hammamet area where it was to be operational by June 7. Having selected a site three kilometres north-east of Hammamet the unit moved to the new location on June 6. Before this move all remaining patients were transferred to No. 31 M.F.H. or to adjacent Army medical establishments. For the first week at Hammamet the M.F.H. was called upon to do little work, most days being taken up in visiting the new formations in the area. Many visits were paid to the M.F.H. by medical officers of the Army to whom a R.A.F. field hospital was an unknown quantity. Most of them expected to find the M.F.H. larger than it was; no doubt the term 'hospital' was responsible for this. Towards the end of the first week work became heavy owing to the sudden departure from the area of all the Army medical units, including field ambulances and medical dressing stations. The M.F.H. immediately felt the effect of these moves, as it was now the only medical unit between Tunis and Sousse. The daily sick parade now lasted three to four hours and accident cases from a wide area converged on the M.F.H. Accommodation at this stage proved a difficulty and this, combined with the shortage of staff, entailed evacuation to the general hospitals whenever the bedstate exceeded fifty.

Difficulties were experienced at this time due to non-receipt of administrative memoranda which had been circulated within the Command at the opening of the campaign. As No. 30 M.F.H. was a newcomer to the Command and had not received composite memoranda on arrival, there were frequent errors in administration due to ignorance of policy. Another difficulty was the shortage of unit (medical) stationery. Large quantities of obsolete forms were included in the pack-up while Field Medical Cards (F.3118A) were not provided. Similarly a very large stock of F.41 (Patient's Clinical and Treatment Card) was issued, but as these were not used in the field their provision was unnecessary.

During the month of June 77 cases were admitted to the surgical ward. Thirty-nine of these cases were due to trauma of various types, including 3 accidental grenade wounds, 5 petrol burns, 2 accidental gunshot wounds, 2 scalds and 2 severe burns. There was a number of severe injuries due to M.T. accidents, including a compound fracture of the skull with traumatic *hernia cerebri*, a dislocated hip and a lacerated thigh. This last case was unique in that the handlebar of the motor cycle the patient was riding had penetrated the inner side of the thigh,

separating the sartorius from the rectus femoris muscle, and exposing the deep femoral vessels in Hunter's canal for a length of 6 in. without causing any serious damage to them. Except for the ragged skin edges the appearance was that of a carefully performed anatomical dissection of the femoral vessels and their branches. Three airmen were admitted following an aircraft crash; two suffered comparatively minor injuries but the pilot had compound fractures of both tibiae and fibulae and a fracture of the right ulna. His condition was poor but following blood transfusion, operative treatment was successful.

During June a total of 73 cases were operated on in the theatre; this figure includes primary in-patient and out-patient operations and major dressings on in-patients. In the X-ray department 70 cases were examined, necessitating approximately 200 exposures.

It was the practice of the M.F.H. to evacuate to general military hospitals those patients unlikely to return to their unit fit for full duties within three weeks and also cases requiring specialist treatment not available at the M.F.H. With this policy it was found adequate to reserve approximately 20 beds for surgical admissions.

Early in July, No. 30 M.F.H. was ordered to prepare to take part in the invasion of Sicily. Accordingly a light section (advanced surgical team) departed on July 5, 1943, leaving the larger portion of the M.F.H. at Hammamet working to a reduced scale (30 beds). The light section, which was to provide surgical cover in close proximity to the advanced fighter wings in the early stages of the invasion, was completely self-contained. Its personnel consisted of a surgeon and anaesthetist and 13 other ranks including an operating room assistant and six nursing orderlies. Sufficient stores were carried to equip an operating theatre and a 20-bed ward, with tentage to accommodate theatre, ward and personnel. The whole unit was carried in its own transport, one 15 cwt. and one 3-ton truck.

The rear portion of the M.F.H. continued to operate until July 27, on which date it proceeded to the embarkation area in Tunis. During this period the number of admissions steadily decreased as neighbouring units left the Hammamet area. For the same reason daily sick parades, which had previously been extremely heavy, also diminished. When necessary, patients were transferred to 97 British General Hospital or, in the case of U.S.A. personnel, to No. 54 Station Hospital. It was during this month that the R.A.F. General Hospital in Tunis became operational and was able to accept cases from the M.F.H.

As it was believed that suitable accommodation would not be available on board ship, it was proposed to transport the two nursing sisters by air. However, at the last moment the Commodore of the convoy left the tank landing ship (L.S.T.) on which the main part of the unit was embarking, and his cabin was placed at their disposal.

All vehicles were loaded by 0800 hours on July 31 and the convoy of L.S.T. and escorts anchored in the roadstead until the following night.

NO. 31 MOBILE FIELD HOSPITAL. (*See Map 11*)

Personnel of this unit assembled at No. 1 Personnel Despatch Centre (P.D.C.), West Kirby, on March 22, 1943, before embarkation from Liverpool on April 12. The period at No. 1 P.D.C. was spent in equipping all personnel to tropical scale, checking stores and mechanical transport, assigning convoy orders and draft numbers, and generally familiarising all ranks with M.F.H. equipment.

The unit disembarked at Algiers on April 24, 1943, the officers proceeding to the Base Personnel Depot at Hussein Dey while the airmen proceeded on foot to Maison Carrée, about five miles farther on. The following two weeks were spent in visiting and interviewing various staff officers at H.Q. North-West African Air Force and in gaining an outline of the system in the Command, while all personnel were put through a complete course of training including the use of arms. The mechanical transport and medical equipment arrived on April 29, and after the bills of lading had been checked the transport was delivered to the Mechanical Transport Servicing Unit at Rivet for reconditioning.

On May 7 instructions were received from the P.M.O. that an advance party of the unit was to proceed to Madrague Plage near Guyotville, 10 miles west of Algiers, to take possession of the villas intended for a R.A.F. convalescent depot. Here, while unit equipment was unpacked, taken on charge and issued to the various departments, inventories of the twelve villas were completed and essential interior repairs and decorations were effected in collaboration with the British Red Cross Society representative.

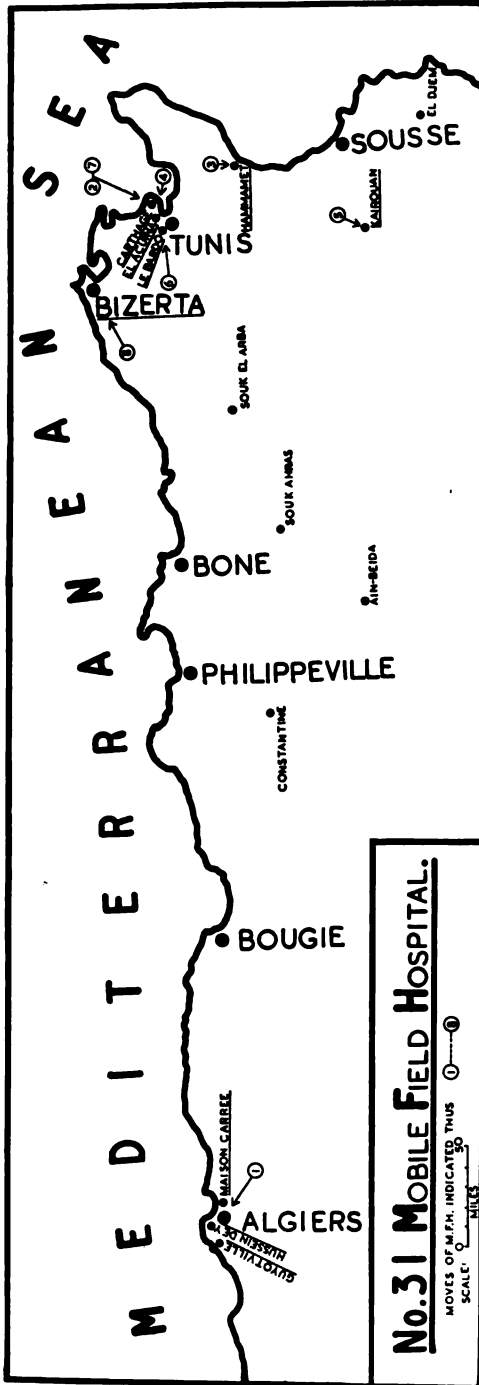
Instructions were received by signal on May 25 for the unit to move eastwards by road to Carthage in Tunisia. Accordingly an advance party\* of five vehicles, including a surgical pack-up, departed early on May 26, followed by the main party later that day. One officer and nine airmen were detailed to remain at Madrague Plage pending the arrival of the British Red Cross staff. Meanwhile the members of the P.M.R.A.F.N.S. who were attached to R.A.F. Station Blida on arrival in the Command, rejoined the M.F.H.

After many minor mechanical failures the two parties arrived at Carthage on May 28 and 30 respectively, and assumed command of

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\* Advance party consisted of:

- |   |                          |
|---|--------------------------|
| <ul style="list-style-type: none"> <li>(i) Operating equipment and staff</li> <li>(ii) Surgical ward equipment and staff</li> <li>(iii) Kitchen utensils and rations for 21 men for 7 days</li> <li>(iv) One ambulance containing X-ray apparatus.</li> <li>(v) Humber utility for surgeon and anaesthetist.</li> </ul> | } Five 3-ton<br>Bedfords |
|---|--------------------------|



MAP 11. Moves of No. 31 M.F.H.

the German 'Krieglazaret' in La Maison Lavigerie which was previously a school under the auspices of the White Sisters. All German equipment was listed and plans for the evacuation of German patients to prisoner-of-war hospitals were commenced in collaboration with the S.M.O. No. 242 Group and A.D.M.S. Tunis Area. At the same time necessary sanitary measures and repairs of major degree were effected by German labour gangs. By mid-June the remaining German patients were 'doubled-up' and one wing of the building was opened for R.A.F. patients. By July all the prisoners-of-war had been transferred and the entire hospital was available for the treatment of British and Allied casualties.

La Maison Lavigerie was occupied by 120 German patients with a medical staff of 70. The maximum number of patients held in this hospital was 350 when it was said to be grossly overcrowded. The interior of the building was cool but very heavily fly-infested. In the surgical wards many of the mattresses were found to be breeding sites for flies, having been heavily contaminated by pus from wounds. The existing sewage system was grossly inadequate, since the drains merely discharged into the earth on each side of the building. On one side the Germans had dug a pit 12 ft.  $\times$  12 ft.  $\times$  10 ft. which was uncovered and contained excreta, tins, dressings and entrails, while on the other side the effluent had seeped through to the surface over a wide area and provided a prolific breeding site. The ablutions in the large wards were blocked, while the hand flushing system in the latrines was un-serviceable, resulting in gross fly infestation. It appeared that the Germans had made some effort to improve the general hygienic arrangements before being taken prisoner, since when they had lost interest. This state of affairs was accentuated by the complete lack of supervision on the methods of disposal carried out by native labour. A gang of German prisoners was employed to put in a complete new sewage system which carried well beyond the hospital boundary.

As double-decker beds were used all the wards were generally overcrowded and inadequately ventilated. The majority of patients, many of them seriously ill, were orthopaedic and were satisfactorily immobilised in plaster-of-paris, but a surprisingly large number had a co-existing suppurative arthritis, with little or no attempt at drainage.

No. 31 M.F.H. became operational with a bedstate of 80 on June 6, 1943, when 31 patients were transferred from No. 30 M.F.H. as the latter unit had been ordered to move south to Hammamet. The remaining beds were quickly filled with patients suffering from gastro-enteritis which was causing a mild epidemic in the locality. Cases admitted were only of a minor nature, as by this time the campaign in North Africa had been concluded and units were having a brief rest preparatory to the invasion of Sicily.



Difficulty was experienced at this time in obtaining medical supplies from Army stores. Such sources of supply were frequently far distant from units in the field and Army quartermasters were often reluctant to accept unit medical officers' estimates of needs. Even when indents had been accepted supply was extremely slow and unreliable and, when requisitioned items were not delivered owing to unavailability, no indication was given as to whether they had been noted for later delivery.

On July 1 the M.F.H. handed over the buildings to No. 1 R.A.F. General Hospital and pitched camp in the Amphitheatre at Carthage. Here the unit remained until July 14, when it was ordered to stand by to move to Hammamet to replace No. 30 M.F.H. which was preparing to take part in the invasion of Sicily. Following the transfer of all the patients to the general hospital, all ward equipment was packed into containers, beds dismantled and equipment brought to a state where it could be loaded for movement or put back into use within two hours. This situation continued until July 27 when instructions were issued for the unit to proceed to Hammamet, where it arrived on July 28. During the period in July when the unit was operating all wards were kept active. Surgical cases included 5 cases of acute appendicitis (4 of them of a matted retrocaecal type following caecitis); 3 cases of concussion; 1 case with extensive second degree burns; several fractures of small bones; and 17 other cases requiring minor operations. Of the 21 medical patients admitted the majority were suffering from gastrointestinal infections and upper and lower respiratory conditions.

By this time the M.F.H. had managed to improve its equipment by bringing into use many valuable items of captured material. An excellent German ridge tent proved vastly superior to the R.A.F. operating tent, and captured laboratory supplies permitted a wider range of pathological examinations to be undertaken, while a mobile Italian dental trailer, which had proved its worth, was transferred from No. 30 M.F.H.

The unit continued to operate at Hammamet until September 6 when, anticipating early departure by air for Sicily, it moved to El Acuina. On September 8, however, the move to Sicily was cancelled as a result of the sudden Italian capitulation, and the unit remained at El Acuina until September 15, when it proceeded to Kairouan to cover the operational units within No. 205 Group (8,000 personnel). During the month of August, theatre cases amounted to 39, of which 5 were of a major and 34 of a minor character. Three of these cases were compound fractures of the elbow joint due in each instance to driving a vehicle with the elbow protruding through the window and sustaining injuries from a glancing blow from a vehicle passing in the opposite direction. In addition there were three cases of multiple wounds of

trunk, limb and face, resulting from the explosion of a land mine. Medical admissions were varied, the most noticeable disease being nasopharyngitis due to dust-borne contamination, which accounted for 20 cases. This month was marred by the occurrence of two separate road accidents in which the general surgeon and the dental clerk orderly were killed.

The M.F.H. remained at Kairouan until November 7. During this period the daily admissions rose to a high level, making it necessary to borrow additional tentage to accommodate convalescent patients from the Advanced Main Dressing Station, Sousse area. The number of equipped beds was maintained at 80, of which 40 were the German 'Europa' type folding bed, and the remainder stretchers. Unfortunately no records are available to show the total admissions for the period when No. 31 M.F.H. was operating at Kairouan, although unit reports indicate that the M.F.H. underwent its busiest period since its formation, 133 and 210 cases being admitted in September and October respectively, medical cases predominating over surgical cases in the proportion of 2.2 to 1. The increased admissions during October were mainly due to infective hepatitis which accounted for 65 cases.

Owing to the redispersing of units within No. 205 Group, No. 31 M.F.H. moved to Le Bardo on November 7. Here the M.F.H. was in the area of greatest concentration of units of that Group and was kept working at full pitch, especially in the medical wards as cases of infective hepatitis were now occurring in alarming numbers. Examination of these patients produced no new points of interest as regards aetiology or symptomatology. The main problem of the disease continued to be the lengthy period required before the patient was fit to return to duty; in view of this it was considered justifiable to try a course of treatment which had produced favourable reports. This consisted of giving the patient ten units of insulin twice a day, twenty-five milligrams of vitamin C three times a day, and at least five ounces of glucose spread over the whole day. Ten cases were given this treatment and ten were treated as controls receiving a fat free diet and sodium sulphate. The date of commencement of the symptoms was noted on admission and the treatment was continued until the urine was free from bile; the total length of the disease was calculated as the period between these two dates. Although the average length of the disease in the two groups differed only slightly, being 11.2 days for the treated cases and 13.1 days in the control series, the most striking observation was that the former improved subjectively at an earlier date than the latter. At this time the treatment of patients suffering from infective hepatitis occasioned much anxiety, as the M.F.H. was issued with the ingredients for special diets on a fixed percentage. This allowance was exactly

one-tenth of the scale which had been issued to units in North Africa when under the control of Headquarters, Middle East. Towards the end of 1943, after continual representations, the supply of special rations improved, when issues were made not on a fixed percentage basis, but for the actual number of special diets required.

On December 6, 1943, the mobile field hospital returned to its original site at La Maison Lavigerie, Carthage, to replace No. 1 R.A.F. General Hospital which was proceeding to Italy. Medical organisation of the M.F.H. was adapted to that of a small base hospital, as 122 cases had been transferred from the general hospital. No. 31 M.F.H. was now providing hospital treatment for numerous repair and salvage units in the Tunis area, for the remaining operational squadrons at Sidi Amour and, in addition, for numerous cases arriving from Italy by air. Long term cases were evacuated to No. 2 R.A.F. General Hospital in Algiers. During the month of December 221 cases were treated in the medical and surgical wards. Traumatic and septic conditions were the reason for the majority of surgical admissions, while infective hepatitis (75 cases), amoebic dysentery (13) and malaria (16) were most prominent in the medical wards.

The MX-1 X-ray apparatus which had been in constant use by the unit over a period of seven months was at this time found to have certain limitations. The exposure table provided by the manufacturers was based on the assumption that the input voltage remained constant during exposure, and that 'Super-Speed' intensifying screens were used. As ordinary intensifying screens were provided and, as had been found, a drop of 10 v. occurred when using a Mobile Power Tender, results were not satisfactory. The output of 60 k.v.p. (kilo-volt peak) with 25 ma. (milliampères) did not allow latitude for any drop in the input voltage and consequently the time factor had had to be increased in compensation. The exposure time of 0.5 seconds, and 28 in. f.f. (focal factor) distance for a chest was quite inadequate, from 1.5 to 2.0 seconds being required for the average patient. Much detail was therefore lost due to cardiac and respiratory movements, and the resultant radiograph was of little assistance except in the grossest conditions.

No. 31 M.F.H. remained at Carthage during the months of January and February. There was no outstanding incidence of any disease during this period and admissions fell to the lowest recorded, only 20-30 beds being permanently occupied. All hospital activity was suspended on March 5, 1944, when orders were received for the unit to stand by to proceed to the embarkation area. The M.F.H. remained in this state until April 2 when it proceeded to the Texas Transit Camp at Bizerta, finally embarking for Italy on April 20, 1944. The War Establishment of No. 31 M.F.H. is given opposite:

*War Establishment of a Mobile Field Hospital (No. 31)  
North West Africa. April 19, 1943*

	W/C.	S/L.	F/Lt.	F/O.	Women	Totals
<i>Officers</i>						
Medical <sup>(a)</sup>	1	1	2	—	—	4
Medical (Quartermaster)	—	—	—	1	—	1
Nursing Sister	—	—	—	—	2	2
<b>TOTALS</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>7</b>
	W/O.	F/S.	Sgt.	Cpl.	A.C.	Totals
<i>Airmen</i>						
Aircrafthand (G.D.) <sup>(b)</sup>	—	—	1	2	8	11
Carpenter II	—	—	—	—	1	1
Clerk (G.D.)	—	—	—	1	2	3
Clerk (Pay Accounts)	—	—	—	—	1	1
Cook (Hospital) <sup>(c)</sup>	—	—	—	1	3	4
Chemical Warfare Fighter	—	—	—	1	1	2
Driver M.T.	—	—	1	2	14	17
Electrician I	—	—	—	—	1	1
Equipment Assistant	—	—	—	—	1	1
Fitter M.T. <sup>(d)</sup>	—	—	—	1	—	1
Mechanic M.T. <sup>(d)</sup>	—	—	—	—	2	2
Medical (Dispenser) <sup>(e)</sup>	—	—	1	1	—	2
Medical (Nursing Orderly) <sup>(f)</sup>	1	—	3	5	14	23
Medical (Operating Room Assistant) <sup>(e)</sup>	—	—	1	1	—	2
Medical (Radiographer) <sup>(e)</sup>	—	—	—	1	—	1
Motor Cyclist	—	—	—	—	2	2
<b>TOTALS</b>	<b>1</b>	<b>—</b>	<b>7</b>	<b>16</b>	<b>50</b>	<b>74</b>

## NOTES

(a) F/Lt. posts may be filled by Flying Officers.

(b) Includes for: Discipline 1 Sgt.  
 Mess Stewards 1 Cpl.  
 Ward and miscellaneous duties 6 A.Cs.  
 Sanitation 2 A.Cs.  
 Post Duty 1 Cpl.  
 (c) Includes for: Patients and Officers 1 Cpl., 1 A.C.  
 Airmen 2 A.Cs.

(d) Also for electric light plant.

(e) May be filled by airmen one rank higher.

(f) Includes: Wardmasters 1 Sgt.  
 Convoy Duties 1 Cpl., 1 A.C.  
 Anti-gas Duties 1 A.C.  
 Trained in Sanitation 1 A.C.

Posts of one sergeant and one corporal to be filled by trained nurses if available.

## HEALTH OF THE COMMAND. NOVEMBER 1942-JUNE 1943

The incidence of disease during the whole period of the campaign remained surprisingly low and in no instance was an epidemic due to indigenous causes reported.

The forces in North Africa during the winter months experienced climatic conditions that were not unlike a typical English winter with

an abundant rainfall. Any rigorous periods that did occur were counter-balanced by the physical fitness of the entire force. Again, after the initial thrust during the first fortnight most units became static and remained so until the closing stages of the campaign, and were therefore able to perfect all measures regulating comfort and well-being. By the time summer approached with its concomitant dangers personnel had adapted themselves to field service conditions and had been repeatedly warned of the personal measures required to minimise infection. Restriction of intercourse with the native population did much to keep the incidence of many endemic diseases extremely low. As summer approached dust and fly-borne contamination was expected to take its toll, but the cessation of hostilities before the hot season got completely under way minimised this danger, as at this stage operational requirements did not interfere with site selection.

Venereal disease was held to be the greatest potential danger during the early months of the campaign. Statistics, although not alarming, show that this opinion was not ill-founded. A rough indication of the incidence of venereal disease is shown by the figures for R.A.F. personnel stationed in the Algerian area during the months of December 1942 and January 1943.

<i>December</i>		<i>January</i>	
Gonorrhoea .	0·333	Gonorrhoea .	0·375
Urethritis .	0·209	Urethritis .	0·319
Syphilis .	0·083	Syphilis .	0·069

(incidence per 1,000 per week)

During the period November 5, 1942 to June 25, 1943 a total of 393 cases were recorded, giving an incidence per 1,000 per annum of 31·79.

Adequate measures to eradicate venereal disease were impossible. The provision of certain supervised brothels did little to help. It was the experience in this campaign, and later in the Sicilian and Italian campaigns, that the chief obstacle was the attitude of the civilian female population. The lower standards of morals and the financial incentive to the women (some prostitutes earned 1,000 francs a day) resulted in an opportunity which some personnel were only too eager to seize. In Algiers alone there were 600 prostitutes registered as such with the police. The number of clandestine prostitutes or occasional offenders was unknown. Registration was voluntary but could be enforced, and once diseased, a prostitute was compelled to undergo treatment or suffer imprisonment. Although a special clinic—'Centre de Salubrité'—existed for treatment of all prostitutes, its effects were limited, as the cursory periodic examinations did not eliminate interim infection, and the treatment for gonorrhoea was inadequate; furthermore bribery was not unknown as a means of securing release from regulations.

During the period December 21, 1942 to June 20, 1943 the following diseases occurring among the civilian population in Algeria were notified by the French authorities:

Typhus fever	.	217	cases
Tuberculosis	.	50	„
Typhoid fever	.	41	„
Smallpox	.	39	„
Measles	.	22	„
Diphtheria	.	11	„

Figures for R.A.F. personnel stationed in Algeria during the same period gave no undue cause for concern:

Typhus fever	.	2	cases
Tuberculosis	.	2	„
Diphtheria	.	4	„

In January 1943 the P.M.O. reported: 'The incidence of sickness is extremely low in this Command, and the number of cases of infectious and contagious diseases and infestations with vermin is very small. There is, however, evidence that it will need some careful supervision by administrative and medical officers to keep these figures low, and neither can afford to relax their efforts for a moment. It is really too early as yet to build up opinions but the start at least was very satisfactory.' The guarded, though relatively optimistic, outlook of the P.M.O. was justified, as will be seen in the following sections and, with regard to verminous states, is well illustrated in the graph overleaf compiled over the period November 1942–May 1943. The largest number of cases occurred during transit and were primarily due to the unsatisfactory living conditions along the lines of communication during the first months of the campaign.

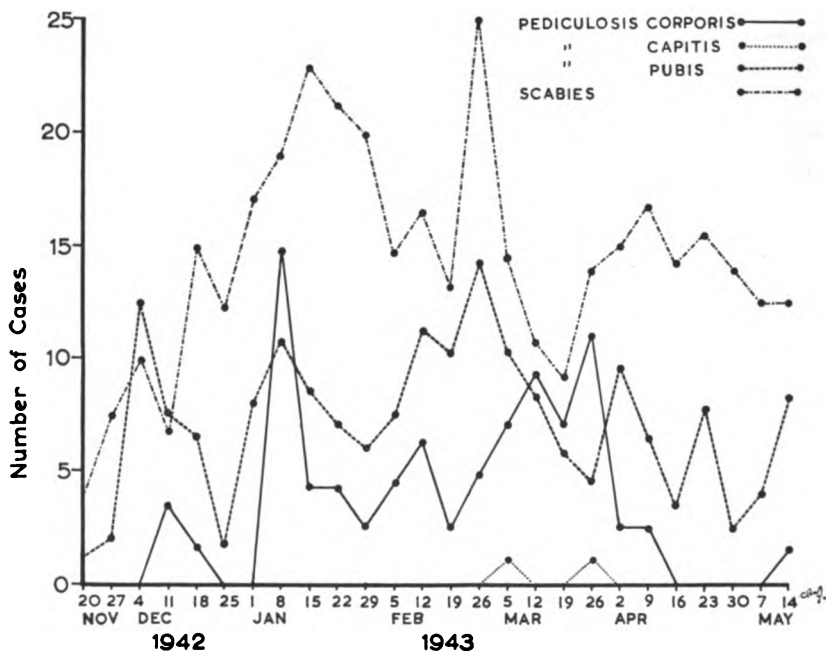
#### NOTIFIABLE DISEASES

Data extracted from Forms 241 (Return of Health in the R.A.F.—including Notifiable Diseases) for the period November 1, 1942 to June 25, 1943 inclusive show that a total of 609 cases of notifiable disease were recorded. (See Appendices I and II.)

##### (i) *Dysentery*

This group accounted for the greatest number of cases—a total of 312 giving an incidence of 25·23 per 1,000 per annum. Of these 237 clinical cases were reported (19·17 per 1,000 per annum), while bacillary and amoebic types amounted to 74 and 1 (5·98 and 0·08 per 1,000 per annum) respectively. Active service conditions made the war-time cultural examination of the stools impossible and even microscopic examination of the exudate was not often feasible in cases treated in unit lines. Sulphaguanidine in the commonly recommended dosage was used whenever the supply allowed. Severe cases were rare. There

was little doubt that the incidence of dysentery and other intestinal diseases might have been lower had the general standard of discipline and the enforcement of orders, issued on medical advice, been stricter. The incidence of amoebic dysentery was considered most satisfactory in view of the high endemicity in the civilian population.



Graph showing incidence of verminous state, November 20, 1942 to May 14, 1943.

(ii) *Enteric Group*

No cases were reported.

(iii) *Jaundice*

During the period 123 cases (9.95 per 1,000 per annum) were reported and represented all types. The exact number due to infective hepatitis is unknown but some cases were thought to have been disguised as malarial jaundice and catarrhal jaundice.

A sudden epidemic of infective hepatitis was reported early in 1943, the facts being as follows. Between January 14 and February 27, 69 cases of jaundice (infective hepatitis) occurred among personnel of No. 600 Squadron. The first cases were reported on December 29 and up to February 27 fresh cases were occurring every few days. All except one of the personnel concerned had received yellow fever inoculations at R.A.F. Station, Church Fenton on November 4, 1942. Information received from the Director of Pathology, War Office, stated that a

batch of yellow fever vaccine prepared at a London laboratory had been contaminated with the agent of infective hepatitis and was giving rise to cases of jaundice. These contaminated batches were in use in the United Kingdom up to mid-December. Although jaundice of unknown origin was occurring throughout the force, no epidemics were reported apart from this explosive outbreak among personnel of No. 600 Squadron; there was no definite evidence to show the source of infection but it appears likely that the outbreak was caused by the use of a contaminated batch of vaccine, particularly as the incubation period corresponded to the period between the date of inoculation and the onset of symptoms.

Leptospiral jaundice accounted for 4 additional cases.

(iv) *Malaria*

The incidence of malaria was 8·16 per 1,000 per annum. This was made up of 96 cases of primary and 5 of recurrent malaria. Quite a few of the cases occurred out of season and were due to 'hibernating' mosquitoes. The advocated method of treatment was a combination of the drugs quinine, mepacrine and plasmoquine. In a few cases mepacrine alone was used but the disadvantage of this was the comparatively longer period required to produce an afebrile condition.

(v) *Diphtheria*

A total of 11 patients (0·89 per 1,000 per annum) were admitted.

(vi) *Pneumonia*

Nineteen cases (1·54 per 1,000 per annum).

(vii) *Miscellaneous cases*

Chickenpox . . . . .	2 cases	
Smallpox . . . . .	1 "	
Measles . . . . .	5 "	
Mumps . . . . .	4 "	
Scarlet Fever . . . . .	2 "	
Tuberculosis (surgical and pulmonary)	8 "	
Infective Enteritis . . . . .	1 "	(0·08 per 1,000 per annum)
Typhus . . . . .	5 "	
Cerebro-spinal Fever . . . . .	2 "	
Polio-encephalitis . . . . .	4 "	
Food Poisoning . . . . .	5 "	



APPENDIX I  
*Diseases, Injuries and Deaths*  
*Number of Cases and Incidence per 1,000 per annum. British North African Forces (Royal Air Force)*  
*from November 1, 1942 to June 25, 1943*

Average strength for period of return 19,041	DISEASES				INJURIES				TOTAL DISABILITIES				DEATHS			
	V.D.	Notifiable diseases	Other diseases	Total diseases excluding 48-hr. cases	Enemy action	Flying accidents	Other accidents	Total inj. excluding 48-hr. cases	Excluding 48-hr. cases	48-hr. cases	Including 48-hr. cases	Enemy action	Flying accidents	Other accidents	Total deaths	
No. of cases	393	609	4,691	5,693	281	102	720	1,103	6,796	5,612	12,408	74	62	28	164	
Incidence per 1,000 per annum	31.79	49.26	379.42	459.74	22.73	8.25	58.23	89.21	548.96	453.92	1,002.87	5.98	5.01	2.26	13.26	

## NOTES

1. These are provisional figures based on monthly returns of sickness.
2. Deaths from Enemy Action do not include personnel missing and later presumed dead.

## APPENDIX II

*Number of Cases and Incidence per 1,000 per annum of Notifiable Diseases Occurring in the British North African Forces (Royal Air Force) from November 1, 1942 to June 25, 1943, Inclusive*

<i>Disease</i>	<i>No. of Cases</i>	<i>Incidence per 1,000</i>
		<i>Per Annum</i>
Cerebro-spinal Fever . . . . .	2	0·16
Chickenpox . . . . .	2	0·16
Diphtheria . . . . .	11	0·89
Encephalitis Lethargica . . . . .	—	—
Measles . . . . .	5	0·40
Mumps . . . . .	4	0·32
Pneumonia . . . . .	19	1·54
Polio-encephalitis . . . . .	4	0·32
Poliomyelitis . . . . .	—	—
Rubella . . . . .	—	—
Scarlet Fever . . . . .	2	0·16
Tuberculosis (Pulmonary and Surgical)	8	0·65
Whooping Cough . . . . .	—	—
Cholera . . . . .	—	—
Dysentery (Amoebic) . . . . .	1	0·08
Dysentery (Bacillary) . . . . .	74	5·98
Dysentery (Clinical) . . . . .	237	19·17
Typhoid . . . . .	—	—
Paratyphoid A. B. and C. . . . .	—	—
Clinical Enteric . . . . .	—	—
Enteritis (Infective) . . . . .	1	0·08
Food Poisoning . . . . .	5	0·40
Jaundice . . . . .	123	9·95
Leptospiral Jaundice . . . . .	4	0·32
Schistosomiasis . . . . .	—	—
Undulant Fever . . . . .	—	—
Blackwater Fever . . . . .	—	—
Kala-azar . . . . .	—	—
Oriental Sore . . . . .	—	—
Malaria (Primary) . . . . .	96	7·76
Malaria (Recurrent) . . . . .	5	0·40
Plague . . . . .	—	—
Relapsing Fever . . . . .	—	—
Trench Fever . . . . .	—	—
Typhus . . . . .	5	0·40
Yellow Fever . . . . .	—	—
Anthrax . . . . .	—	—
Erysipelas . . . . .	—	—
Glanders . . . . .	—	—

*R.A.F. MEDICAL SERVICES*APPENDIX II *continued*

<i>Disease</i>	<i>No. of Cases</i>	<i>Incidence per 1,000 Per Annum</i>
Rabies . . . . .	—	—
Smallpox . . . . .	1	0.08
Tetanus . . . . .	—	—
Beriberi . . . . .	—	—
Scurvy . . . . .	—	—
	—	—
Total	609	49.26
	—	—

## NOTES

1. These are provisional figures based on monthly returns of sickness.
2. The numbers of cases shown are based on the diagnosis made on admission.

## CHAPTER 4

# GREECE AND CRETE: 1940-1941

### Greece: 1940-1941

#### GENERAL OUTLINE OF THE CAMPAIGN

**T**HE ITALIAN ATTACK on Greece was preceded by a display of 'technique' which had become a familiar accompaniment to similar Axis moves. For some time there had been alternating blandishments and threats; then, on October 4, 1940 the two dictators, Hitler and Mussolini, met at the Brenner Pass. Ten days later Italy demanded the exclusion of British newspapers from Greece; on October 26, the Stephan Agency announced a frontier clash in Albania immediately denied by the Greeks; finally, on the 28th, came the 'ultimatum' to the Greek Government and the simultaneous advance of Italian troops across the Albanian border. On October 31 they had reached the River Kalamas, with Yannina as their objective, and in the north they were advancing towards Florina.

So great was the Italian surprise and bewilderment at finding that the Greeks proposed to offer a stubborn resistance—they had supposed that the futility of resistance would be realised immediately—that it gave the defenders two invaluable days of respite in which to speed mobilisation and dispose their forces. It was not, in fact, until November 4 that the Italian Minister in Athens could bring himself to face reality and ask for his passport. By this time British aircraft had arrived in Athens and the Greek Army had already driven the Italians back and was advancing into Albania south-east of Koritza.

The British Force which began arriving on March 7, 1941 at Piraeus, the port of Athens, and at an advanced base at Volos to the south east of the Larissa Plain, totalled approximately 58,000 men of whom 35,000 were from fighting formations. Each of the Australian and the New Zealand Divisions had its anti-tank regiment, and there was also a British Armoured Brigade numbering between three and four thousand men. The basic plan was to form a defensive line in suitable country west of Salonika, running along the Vardar valley and covering the Larissa Plain.

It was obvious from the beginning of hostilities that the Greek forces would be unlikely to be able to repel the Italian superior force of arms and the fate of the campaign was sealed when the German forces launched their attack through Albania on April 6. The campaign developed into a series of withdrawals and attempts to form stable

defensive lines which, against the determined German and Italian attacks supported by both overwhelming air superiority and motorised German divisions, was a virtual impossibility despite the fanatical heroism shown by the Greek forces. On April 22 the hopelessness of the situation was abundantly apparent and the King of the Hellenes made it known to the British commanders that they were free to withdraw from Greece and continue the fight elsewhere. The Greek Government transferred its headquarters to Crete on April 23.

The Imperial Forces were now (April 24) falling back on Athens while a race was begun by the Germans in an attempt to prevent the British from withdrawing to the Peloponnese and to cut them off. The main evacuation from Greece was undertaken in convoys of H.M. ships between April 24 and 30 with any assistance that could be given by air evacuation. Troops were taken off from the beaches east of Athens, from Marathon and Raptis; from the coast near Megara on the Isthmus of Corinth; and in the Peloponnese from Navplion (near Argos), Monemvasia, Githion, Kalamata and the island of Kythera. The landing of enemy parachutists on the Isthmus of Corinth fortunately came at a time when the move southwards could only be limited to a small extent, and at the embarkation points mentioned above the enemy for the most part arrived late, although he managed to cause considerable interference by repeated and heavy air attacks.

Altogether 3,000 British and Imperial troops were said to have been left behind in Greece. A naval estimate put the number of personnel evacuated at between 43,000 and 45,000. Many, if not all, of those personnel who later escaped did so through the courage and ingenuity of the Greek people.

#### GENERAL OUTLINE OF THE CAMPAIGN (AIR)

Advance elements of the Royal Air Force began to arrive in Greece at the beginning of November 1940, Air Headquarters being formed in the Grand Bretagne Hotel, Athens. No. 30 Squadron was located at the aerodrome of Eleusis, eleven miles north-west of Athens, where an Air Defence Centre was immediately organised with a R.A.F. sergeant/observer acting as assistant controller to a Greek general. The first air duty undertaken by the R.A.F. Commander was the defence of Athens and the Corinth Canal, as far as the nine Blenheim fighters\* then available would allow. Accommodation at Eleusis, which was to have become the Greek 'Cranwell', was imposing but unfinished and much levelling work was necessary on the aerodrome surface.

In the middle of November further squadrons—Nos. 84 and 211 (both Blenheim bombers)—arrived from Egypt and were stationed at

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\* A proportion of No. 30 Squadron's Blenheims were fitted as bombers.

Tatoi, an aerodrome nine miles north north-east of Athens. These were followed shortly by No. 80 (F) Squadron, flying Gladiators and stationed later at Trikkala, 160 miles north-west of Athens, and No. 31 Air Stores Park located at Daphni, where it was joined in December by No. 33 Air Stores Park.

The Greek Air Force originally comprised 26 bombers\* and 42 fighters; these were of many types, mostly French and Polish. The force operated almost entirely in support of the Army and by the time the R.A.F. component arrived, it had succeeded in bringing down five Italian aircraft. On November 15, however, (according to a statement made by the British Minister in Athens) its fighter strength was reduced to six and early in December twelve British Gladiator aircraft were flown to Larissa and handed over to the Greek Air Force for its exclusive use. By the end of the year the whole force had been reduced to a few serviceable machines, and it was clear that if it was to be able to use effectively the new aircraft that had been promised, the Greek Air Force would require some degree of re-organisation and reconstruction.

The operational plan, though greatly hampered by the lack of modern airfields, was put into action as soon as possible and with the help of Wellington bombers sent over from Egypt for use during the moonlight periods, the Italian port areas were attacked with maximum intensity during the last two months of the year; Valona and Durazzo were the chief targets but attacks were also made on ports along both sides of the Adriatic.† The fighters were also acquitting themselves well and established a moral if not numerical superiority in the battle area; on November 18 and 19, they succeeded in shooting down definitely nine, and probably eleven, Italian aircraft without loss to themselves.

In the New Year weather conditions deteriorated, and snow and low cloud made bombing operations both difficult and hazardous. Icing of aircraft was severe in the mountainous country between the base at Athens and the target areas, and Headquarters had to route the aircraft *via* the coast, thus limiting both their operational radius and the necessary element of surprise. Italian ground and air reinforcements soon began to appear and large numbers of modern enemy fighters were met over the target areas—possibly an answer to the success of the British bombing effort. Full use had to be made of cloud cover and a fighter escort was necessary if heavy casualties were to be avoided; the provision of an escort created a problem in view of the lack of modern fighter aircraft, while poor communications between the bomber and fighter bases made synchronisation difficult.

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\* Seven of these were unserviceable.

† Aircraft of the Fleet Air Arm took part in these attacks.

It was realised that until the weather improved the effort could have little effect other than that of harassing the enemy. However, by the week ending February 18, one hundred and eight sorties had been made by Blenheims in support of the Greek attack in the Tepeleni area, while between February 19 and March 4, ninety Blenheim sorties were made against enemy positions in the southern and central sectors. Owing to the large number of enemy fighters, Gladiators and recently arrived Hurricanes were used as escort and frequent combat with large enemy formations ensued.\*

By March the pilots were beginning to feel the operational strain of the long winter, the hazardous flying conditions, the numerical superiority of the enemy air force and the fact that all squadrons were below strength. It became apparent that there was an immediate need to reorganise these small forces to cope with the deteriorating military position and the inevitable fact that their services would be needed simultaneously on two fronts.

At the time of the German attack on Greece on April 6, the serviceable Allied aircraft in Greece amounted to 80, against an estimated strength of 800 German and 160 Italian aircraft with a further 150 aircraft based in Italy. The first contact with the German air force occurred on April 6 when a patrol of 12 Hurricanes encountered 30 Me. 109s, shooting down 5 without loss. Shortly after on April 15 to 20 a general withdrawal took place with our forces falling back to the Athens area; this meant the loss of the Larissa Plain airfields, and involved the disbanding of both the Eastern and Western Wings. Added difficulty was experienced over the withdrawal of the Western Wing from the Paramythia area by the arrival, at the last moment, of 44 fugitive Yugoslav aircraft and personnel demanding fuel and food.

On April 19, one hundred German dive-bombers and fighters attacked the Athens area. The R.A.F. Commander put in the remainder of his fighter force, amounting to 15 Hurricanes operated from Athens aerodromes, to intercept them. The British aircraft brought down 22 enemy aircraft for certain and 8 unconfirmed for the loss of 5 fighters. On April 22 the remaining Hurricanes were sent to Argos to cover the evacuation of British troops; the following day the enemy air attack on that place reduced the number of Hurricanes to 6, survivors of Nos. 33 and 80 Squadrons. These, together with 14 Gladiators (of which only five were serviceable) of Nos. 80 and 112 Squadrons, were flown to Crete on April 23 to take part with the remainder of No. 30 Squadron (whose 14 Blenheims had been sent there on April 18) in the defence of

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\* Six of the Hurricanes arrived late in February. On their first sortie on the 20th they shot down four, and on the 27th, accompanied by Gladiators, twenty-seven enemy aircraft without loss and in full view of both armies in the fighting lines. The heartening effect this had on the weary Greek soldiers can easily be imagined.

Suda Bay and in providing cover for sea convoys engaged in the evacuation. A further total of 24 Blenheims and 4 Lysanders (all that was left of Nos. 11, 84, 113, 211 and 208 Squadrons) flew to Egypt *via* Crete on April 22 and 23, having transferred as many key personnel (aircrew, etc) to Crete as possible.

The Wellingtons of Nos. 37 and 38 Squadrons had flown to Egypt on the 17th. Air evacuation by Sunderlands began on the 18th, when King Peter of Yugoslavia and political refugees were flown to Egypt from Kotor. The flying boats continued this work, taking a party from No 30 Squadron on the 19th and the King of Greece to Crete on the 22nd. Other essential personnel were flown *via* Crete to Egypt. Transport aircraft (Bombays and Lodestars) and two B.O.A.C. flying boats assisted in these operations. The record number of personnel carried in a Sunderland was 87. The total air evacuation amounted to 600 from Greece to Crete and 870 from Greece to Egypt *via* Crete. Two Sunderlands were lost, one from enemy action at Scaramanga and another while alighting at night at Kalamata. Picking-up points in Greece included Navplion, Kalamata and Githion—from the last two places 4 Sunderland loads evacuated to Crete some of a R.A.F. party of 1,700 which had moved there from Argos. The last flight by flying boat was made on May 2.

The main sea evacuation took place between April 24 and 30, under air cover (for the Greek mainland area) of Blenheims based in Crete. The few remaining Hurricanes and Gladiators protected the convoys approaching Crete and disembarking at Suda Bay. It was due to the work of these pilots, 'whose courage', wrote the A.O.C., 'never failed' that such a large proportion of the total British Forces in Greece was evacuated.

So, doomed to failure from the commencement of the German appearance on the scene, ended the Greek campaign. The British air component had been overwhelmed by a combination of sheer force of numbers and the qualitative inferiority of R.A.F. aircraft. The small bomber force had begun by bombing targets in the Struma Valley and had then tried to relieve pressure against the Yugoslav army in the west, the Greek army in Salonika and the British and Imperial Forces in the centre. The fighters, handicapped by rapidly dwindling numbers of aircraft and a chronic lack of intermediate aerodromes during the later period of retreat, had done what they could until they had virtually no aerodromes from which to operate. A final blow was the destruction of 13 precious Hurricanes on the ground at Argos on April 23. At no time after the beginning of April could the whole force do more than 'bomb a column of enemy fighting vehicles here, and shoot down a handful of enemy bombers there'—infinitesimal compared with the damage the Axis air forces were inflicting. Despite these overwhelming disadvantages



the British air forces are believed to have destroyed more enemy aircraft than they lost themselves. The total British aircraft losses in the Greek campaign were 209 of which 82, many of them damaged by enemy attacks on aerodromes, had to be abandoned or destroyed during the withdrawal. The total number of aircraft missing and lost in combat with the enemy was 72. Against this an estimate of losses inflicted on the enemy was 259 aircraft destroyed, 99 'probables', and an unspecified number damaged. The same authority gives the British losses in personnel at 148 killed or missing and 15 prisoners. Of this total 130 were aircrew\* while one medical officer and 2 sergeants and 3 aircraftman nursing orderlies were reported missing believed killed and one corporal listed as a prisoner-of-war.

#### MEDICAL NARRATIVE

The Principal Medical Officer of the Royal Air Force contingent unfortunately fell sick on arrival in Greece and had to be admitted to hospital and later invalided to Egypt, so that all the earlier medical arrangements were undertaken by a squadron medical officer. As the Director of the Greek Military Medical Services and his department were heavily overburdened with work, this officer approached the Hellenic Red Cross authorities, who placed their hospital outside Athens at the disposal of the R.A.F., pending the arrival of 26 British General Hospital; a member of the British Military Mission was engaged in trying to find a suitable site for the Army hospital and the R.A.F. medical officer was fortunately able to assist in the requisitioning of four Athens hospitals in which it was later located.

On November 22, 1940, a R.A.F. P.M.O. arrived by air from Egypt and undertook the medical administrative duties for the rest of the campaign. In the meantime the squadron medical officer, with the assistance of R.A.M.C. officers loaned by the commanding officer of the general hospital, had been making medical preparations for the reception of further R.A.F. units at Eleusis and Daphni. By the end of the month four more squadron medical officers arrived and in December 26 British General Hospital opened, thus making the R.A.F. more or less independent of the Greek hospital. In addition, an Army Field Ambulance was established and early in the new year a Central Medical Inspection Room with 15 beds was opened in Athens and a subsidiary M.I. room at New Phaleron, near Piraeus. The P.M.O.'s staff at Air Headquarters was later increased by an assistant medical officer, whose duties were mainly connected with anti-malaria work; otherwise medical arrangements were on a squadron basis.

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\* Reference : Air Chief Marshal Longmore's Despatch (January 1, 1941-May 3, 1941).

As will have already been seen from the outline of the campaign, squadrons moved frequently, particularly in the latter phases; it is not proposed to describe all stations at which medical arrangements had to be made but to list the principal ones and describe in detail a typical unit, for most locations were very similar with the attendant problems of hygiene and sanitation associated with the character of the country.

Principal stations in the three main areas:

<i>Athens Area</i>	<i>Larissa Area</i>	<i>Western Region</i>
Eleusis	Larissa	Yannina
Menidi	Trikkala	Paramythia
Daphni	Niamata	
Hassani	Almyros	
Ampkiklia	Kazaklar	

#### CONDITIONS ON A TYPICAL STATION—MENIDI

This camp was situated in a valley enclosed by mountains rising to over 4,000 feet and covered with pine, olive and eucalyptus trees. An aerodrome of moderate size had been built for the use of the Royal Hellenic Air Force (R.H.A.F.) and several R.A.F. squadrons, including No. 211, were located here, personnel being housed partly in Athens, nine miles distant, and partly in tents in a pine wood near the camp. The station buildings were at first used to house cadets of the R.H.A.F. but were later taken over by our forces; in February and March 1941 the squadrons, most of whose personnel had lived under canvas during the winter, were provided with huts. An officers' mess was located in a nearby 'summer restaurant', with a large marble-floored dining room, glass windows on three sides and a big fireplace, but the comment of a medical officer that 'the only warm place was in bed during winter' is understandable. Later in the campaign it was possible to take over a hotel called the Varibobi and, for the airmen, two buildings south of the aerodrome which offered electricity and sanitation. The station sick quarters was housed in a permanent building on the aerodrome and cases needing hospital treatment were transferred to the 26 British General Hospital, as was the custom at most stations.

The following details were obtained from an account by one of the medical officers, writing of November 1940, and illustrate the general conditions on this station. The cheerless, ugly, two storied building (officers' mess) on the south-east corner of the landing ground was, apart from a few forms and trestle tables, completely unfurnished. Its floor-boards were rotting and it was cold, damp and evil-smelling. Food was supplied by an unscrupulous Greek contractor and only served to heighten the atmosphere of monastic gloom. Sleeping quarters were in small unfurnished rooms in which two or three officers were crowded. There were ten semi-serviceable wash-basins

with cold water, and a couple of showers, which owing to their unsealed basins, regularly flooded the corridor. There were two baths but these were so filthy that it was necessary for all personnel to use the public baths in Athens. The six water closets and three urinals emptied into cesspits and were impossible to keep sweet. The outlet pipes were small and blockages, with the accompanying unpleasantness, were common.

The airmen lived in a cold and ill-designed barrack block, previously occupied by cadets of the R.H.A.F. Additional blankets were essential to preserve morale and combat colds, bronchitis and fibrositis, to which newly enlisted Palestinian airmen seemed particularly prone. Though the airmen's cookhouse and dining hall were reasonably satisfactory, muddy ground outside made them difficult to keep clean and washing-up space was extremely limited. Later the addition of an outdoor ablution bench, basins and a Soya-stove-boiler improved matters. Rations were poor and the cookhouse staff found it difficult to vary the diet though some assistance was given by the system of extra messing whereby it was possible to purchase locally eggs, green vegetables and additional 'comforts'.

Administrative offices were located in a building 200 yards from the main barrack block and two rooms of this building were converted into a station sick quarters.\* The Z.I medical equipment proved inadequate for the many minor maladies and 'unofficial' supplies of liniment, stock mixtures and unguents brought from Egypt proved useful.

Iron bedsteads borrowed from the R.H.A.F. helped to improve matters, as did the billeting of some of the airmen in one of the hangars. Shortly before Christmas, owing to the need for better dispersal of aircraft and personnel, the airmen were moved to a tented camp three-quarters of a mile to the north-west of the aerodrome and the officers took over the relatively well-equipped Varibobi Hotel (mentioned above) one and a half miles away in the same direction. The station sick quarters was also moved farther away from the aerodrome though the original two rooms were retained as a crash room and in case of emergency. In the tented camp the Royal Engineers constructed bucket and seat latrines on concrete bases, soakage pits, grease traps, water supplies and brick buildings for both messes and canteens. Coarse gravel floors were laid in the tents and eventually heating stoves were provided.

When in April the squadron began to move back from the forward aerodromes *via* Menidi, considerable strain was imposed on both accommodation and dispersal facilities with attendant discomfort to

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\* Before the arrival of a R.A.F. medical officer, the Greek medical staff had, with little material, treated our sick at their station sick quarters, showing much kindness and consideration.

all concerned. Fortunately no heavy air attack was experienced until the 20th, 21st and 22nd of the month when systematic and skilful ground strafing caused three fatal and four other casualties and the loss of four aircraft.

#### THE WITHDRAWAL

The conditions which have been outlined in the preceding paragraphs bring the medical narrative to a close as far as the campaign itself is concerned. A selected account taken from a medical officer's diary is now included as illustrative of the problems encountered in the withdrawal. It should be remembered that the withdrawal was made under very unfavourable conditions, over very difficult terrain, with communications often non-existent and under continual attack by an overwhelming number of enemy aircraft piloted by skilful pilots who pressed home attacks against minimal opposition.

The medical officer concerned left Daphni on April 23 in an ambulance, complete with medical equipment and accompanied by a medical orderly. The route was *via* Eleusis and by the coastal road of Salamis Bay. As they approached Megara a heavy raid took place setting fire to large petrol and ammunition dumps there, and the party had to take cover several times on account of low level machine-gun attacks by Me.110s. Passing Corinth in darkness they were directed to Navplion which was reached at 2300 hours. Here large numbers of retreating troops were arriving on the outskirts of the town and on the next day the medical officer set up a first-aid post near the port, in a small tree-covered square. The first two R.A.F. casualties to be brought in were taken to the Politikon Civil Hospital where the medical officer operated on them. At noon the port was severely dive-bombed and a transport vessel lying off shore, which was being cleared of explosives to make room for troops, was hit seven times and set on fire, the working party of Royal Engineers being machine-gunned in the water while trying to swim to the shore. About 50 casualties were carried or led to the municipal school where the medical officer administered first aid, eight cases then being transferred by ambulance to the hospital for operation. The medical officer's party now consisted of a R.A.F. chaplain as operating assistant, a medical orderly and an ambulance driver. Two members of aircrew—one R.A.F. and one Fleet Air Arm—with thoracic and pelvic gun-shot wounds respectively were operated on.

Later that afternoon, the party was advised to leave, as the transport vessel (which still contained 500 tons of light explosive aboard and was burning fiercely) was due to blow up at any moment, as it drifted towards the town. A rendezvous was fixed, therefore, four miles north of the town, and the rest of the medical equipment and a number of British patients were transferred there. Then came the explosion of

the ship as the ammunition blew up and the first-aid party returned to their post under the trees for a few hours. Meanwhile, more ships having arrived in the port, the enemy made further attacks. By this time the medical officer was able to arrange for stretcher-bearers for his cases, evacuation being planned for 2000 hours that night. As the aerial bombardment was heavy the wounded were moved to a Greek church, where yet other cases were dealt with.

The medical staff had now increased to eleven, by the addition of Army and R.A.F. personnel. An operating table was set up in the church and work on casualties continued until nearly 2200 hours—zero hour for the evacuation. After some time the stretcher cases were collected and moved down to the quayside. The ship which was to take them unfortunately went aground, later having to be abandoned and use was therefore made of armoured landing craft (A.L.C.) which took the wounded to other ships in the Bay. While they were half-a-mile off shore a corvette cut one of the A.L.C. in half. Searchlights from surrounding ships showed a scene of indescribable confusion and out of the 60 men only 38 could be picked up, the remainder presumably being drowned.

Finally the medical party reached their ship and the twenty-seven stretcher and nineteen walking cases were taken aboard. A R.A.M.C. surgeon specialist from 26 British General Hospital took charge of the cases for the first watch, the R.A.F. medical officer relieving him at 0600 hours the next day. Seven cases remained for operation and these were duly dealt with, though the presence of a two-inch anti-aircraft gun mounted directly above the roof of the operating theatre was hardly conducive to surgery and two bombing attacks were made on the convoy while surgical operations were in progress.

On arrival at Suda Bay the wounded were disembarked by A.L.Cs., the last party being taken ashore at 2300 hours. The medical officer paid particular tribute to the efficient organisation for which the Naval P.M.O. of the ship was responsible.

#### OTHER FEATURES

Many other incidents could be included, such as the Sunderland which took off 87 men from Argos and the petrol barge navigated from Scaramanga to Crete by a squadron leader, with a Greek colonel, a Greek soldier and two Army nurses as crew. Right to the end, although they were obviously being deserted, the Greek peasants and soldiers were 'amazingly good' to the R.A.F. It was stated by one medical officer that during the withdrawal contact was inevitably lost with the moving Army casualty clearing station and on arrival at the new site the location of the nearest hospital or reception centre was a matter of speculation. Thus a medical officer was often 'landed' with a number

of casualties whose disposal, particularly in view of the scarcity of motor transport, was a matter causing much anxiety. One complaint made by a General Duties Branch officer who stated that the squadron medical equipment made very little provision for crutches is of some interest and must be considered fair in the exceptional circumstances where it was necessary for the wounded to fend for themselves.

#### MEDICAL COMMENTARY

##### CLIMATE

Greece and Southern Albania have a milder climate than that in the north Balkans and, though snow is rare in Athens, farther north the winters become progressively more severe. In the plains of northern Greece and southern Albania, the snow seldom lies for long in the lowlands but the frost is sharper and more frequent. In the mountains—even in the Peloponnese—snow is common, lies deep, and remains for a considerable time; for example on January 16, 1941, it was two metres deep in the hills and one metre deep on the coast. The Albanian winter season starts in mid-October with very strong north-east winds, November and December being characterised by heavy falls of sleet and rain which reach such proportions that traffic is often impeded. By April the rainfall is diminishing and the summer months are extremely hot and productive of insect pests.

##### COMMUNICATIONS

Road communications, particularly in the remoter country districts, were primitive but in the mountains horse or mule transport was often the only method of moving at all. On one occasion a medical officer had to go a distance of 25 miles to recover the body of one of our pilots who had crashed in the hills, this journey consisting of 12 miles of tarred roads, 8 miles of hill tracks over which vehicles could be driven with difficulty and 5 miles of walking when even the small track ceased. It can be imagined that in this type of country the difficulties encountered in seeking to render first aid to any of our pilots who crashed were almost insurmountable and much reliance had to be placed on good relations with the Greek mountain peasants.

In the early days of the R.A.F. stay in Greece it was necessary for a squadron to move from Larissa to Yannina in the middle of January. This involved a crossing of the Kalabaka Pass, normally snowbound in winter, but on this occasion it was kept open by the efforts of dozens of Greek peasant women from the local mountain villages; even then a number of vehicles became stuck and for about a week approximately one hundred of the squadron personnel were isolated on the Pass, the peasants housing them as best they could in barns and sharing their meagre rations.

It will thus be seen that all transport in Greece was a hazardous affair and the difficulties encountered in the withdrawal, harassed by the enemy, can well be imagined. The Greeks themselves relied very much on small coastal boats for communications and in evacuating their army casualties from Yannina, for example, the patients were taken to Preveza, thence by hospital ship to Piraeus and so by road to the base hospitals at Athens.

#### ACCOMMODATION

In Athens and the other larger cities all suitable buildings—hotels, schools and public buildings—were requisitioned as billets. On the whole these were of a poor standard and many were frankly oriental in construction with the accompanying dirt and squalor; consequently, the airmen fared badly but little could be done in view of the circumstances, and the situation had to be accepted.

#### MESSING, RATIONS AND WATER SUPPLIES

So far as the terrain of Greece allows the occupations are mainly agricultural; little livestock is carried by farmers and it was obvious that the available cattle were insufficient to feed the British Forces, so that for a considerable period before the arrival of refrigerator ships the meat ration for all personnel consisted of 'bully'. Fish and eggs were scarce in most areas but vegetables were usually plentiful and excellent in quality. The local bread was brown, rather sour and unpalatable but was issued for some weeks until an Army bakery arrived and began to make excellent white bread.

Fruit was scarce owing to the time of the year (November to April) and because of the shortage of transport oranges could not be brought from the west part of the country. Cow's milk was practically unobtainable; the country folk used sheep's milk, but as the sheep almost without exception suffered from mastitis this supply was not utilised and all personnel existed on tinned milk.

In the initial stages of the campaign catering was difficult and many units were supplied by Greek contractors; however, a system of messing on standard lines was soon established, although use had to be made of local purchase, the efficiency of which varied very much from area to area.

Water supplies were in certain areas a problem of some degree. In Athens excellent water was available from the Marathon works but in other areas it varied from town supplies to wells and local streams and wherever there was doubt about its purity it was boiled. The need for this precaution is well illustrated by the reply of a country doctor who, on being asked if the local water supply was safe, said 'We always drink it—of course there are occasional cases of typhoid'.

Medical officers impressed on personnel the dangers of drinking water from dubious sources by means of lectures and official orders and it is of note that no cases of typhoid occurred; how much this was due to the precautions taken or to the fact that the hot season conditions were not experienced by our personnel will never be known.

#### HEATING AND BATHS

In the early months of the campaign our personnel suffered considerably from the cold conditions, the situation being made even worse by the fact that the majority of them had arrived from the warm climate of Egypt. Little could be done to improve matters, and, though the Greek authorities made every effort, it was impossible to provide sufficient stoves for everyone; this matter was later remedied to some degree when supplies became available. When the necessity for dispersal forced our personnel under canvas the matter again became serious and little could be done to ameliorate the unpleasant conditions. It is, however, noteworthy that very little sickness arose from these conditions, which might reasonably have been thought liable to cause high disability rates.\*

Baths were relatively few and those that were available were often in such a state of disrepair as to be useless or lacking in hot water because sufficient fuel was not available. Wherever possible arrangements were made with local authorities for personnel to use bath centres of the local Turkish baths but in the main they had to rely on their own ingenuity in improvising with whatever material and fuel could be obtained. The lack of baths was part of the general backwardness of the country, which in itself provided the biggest medical hazard of the campaign and one that it was impossible to alter in the time available under conditions of war.

#### SANITATION

This was of the most primitive kind, the standard being lower than that usual in Egypt, Palestine or Iraq. Before the war a town system was being installed in Athens but this had to be abandoned on the opening of hostilities. Septic tanks or cesspits were therefore usual even in the most modern buildings, while in the rural areas little or no attempt was made at any form of sanitation. Most latrines were of the squatting type and all were characterised by very small-bore waste pipes and a very poor standard of plumbing with, more often than not, the omission of inspection traps. The systems were so unreliable that the Greeks did not dispose of toilet paper down the lavatory pans but filed it on sharp hooks; when this fact was discovered and the poor plumbing system thoroughly appreciated orders were issued forbidding

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\* Similar findings were recorded for personnel under canvas in Iceland.



our personnel to use the local latrines until these were passed by the Royal Engineers as fit for use.

This order meant that bucket latrines would have to be used in most of the billets, but this apparently simple solution was found to be impracticable as the ordnance stores had no buckets, only one blue print copy was available for the making of standard seats and finally no tools were available for the necessary construction work. Thus the order for the use of bucket latrines had to be cancelled and local latrines had to be used. Petrol tins containing cresol were placed in latrines for the disposal of paper and the contents were regularly burnt.

#### MEDICAL ARRANGEMENTS

The British expedition to Greece was unique among combined operations in that the R.A.F. provided the A.O.C. and S.M.O., the Army providing general hospital, field ambulance, field hygiene section, a mobile malaria field laboratory and works services. The Officer Commanding the Army hospital was very much senior to the S.M.O. of the R.A.F., but this made no difference to the loyalty and close co-operation between the medical services. Two months before the final withdrawal, with the arrival of British land forces, the medical services reverted to the customary practice of the Army being in charge, and the excellent co-operation between the two Services continued.

Army aerodrome-defence personnel were, of course, under R.A.F. medical care and exchanges of medical personnel between the Army and R.A.F. were arranged whenever necessary with the minimum of official procedure. The Greek civilian medical authorities, though desperately short of facilities, equipment and materials of all kinds, placed as much as they could spare at the disposal of the British Forces and no question of remuneration ever arose. A Greek medical officer was attached to the S.M.O's. staff for medical liaison duties and he smoothed out administrative difficulties as they arose. The R.A.F. medical services were able to repay the Greeks for their kindness to the British sick and wounded to some degree when aircraft of No. 30 Squadron took a complete surgical team and equipment to Larissa to deal with civilian casualties following the earthquake there and the subsequent heavy bombing.

During the first two months of the campaign R.A.F. patients who could not be dealt with in sick quarters were treated in Greek hospitals. The hospitals outside Athens were somewhat primitive, but the two in Athens itself were of recent construction and well equipped; the medical staff were excellent, but the nursing staff lacked training according to British standards.

26 British General Hospital arrived in December and was opened in Kephissia, the summer resort of Athens, being installed in three

modern hotels. (Although other military hospitals arrived in March they never became properly established and the brunt of the medical work was borne by one or two C.C.Ss. in the forward area and the general hospital.) A R.A.F. medical officer was appointed to carry out boarding at 26 British General Hospital and attended twice a week for this purpose; board work was increased during the latter part of the campaign by the entry of Greek cadets and junior officers into the R.A.F.

Greek hospitals were established in several of the larger towns, the principal ones being those at Yannina and Larissa, but wherever possible use was made of Army facilities. In forward areas, such as Yannina, casualty evacuation was a difficult problem, as both the road and the rail journey to Athens was long and tedious. The most satisfactory means of transport was by air, and Greek civil Ju.52s called for cases once or twice weekly; these aircraft were a blessing but considerable difficulty was encountered in manoeuvring stretcher cases through the hatchways. R.A.F. Bombay transport aircraft were used for evacuation whenever possible and proved very satisfactory. At the beginning of the campaign casualties were evacuated by hospital ship, but later transport supply vessels, flying boats and heavy bombers were pressed into service at every opportunity, arrangements for the most part being made locally.

#### THE FIFTH COLUMN—RELATIONS WITH THE GREEKS

Though of no special medical significance this subject is of interest as providing further 'background' to all R.A.F. activity during the campaign. When the R.A.F. arrived in Greece, Athens was full of Axis 'tourists'. It should be remembered that the German Legation, with its numerous staff, was ideally situated for espionage, as up to April 6, 1941, Germany was still 'neutral'. A continual flow of information was thus available to the enemy, and this was helped by the fact that our aircraft were on two aerodromes in Athens in full view of casual passers-by. In these circumstances it is not surprising that Wellingtons attacking Valona in daylight often found Italian fighter patrols waiting for them as they reached the target.

Another strong fifth column element was thought to exist in the youth organisations which worked on the Fascist system and were suspected of having put out stories about the niggardly character of British aid to Greece; these stories found a ready ear in that part of the population of Athens which was not whole-heartedly for the Allies.

With the vast majority of the population, however, particularly the Greek Army and Air Force and the country people,\* the attitude was

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\* On one occasion when a British bomber crashed at a remote inland village, killing all the crew, the inhabitants named a street after each of the crew, organised and paid for the funeral, and had photographs of it taken so that these could be sent to the men's relatives.

very different. This was shown by their enthusiasm at the British intervention, by their ready help at all times and in all ways, and particularly by their selfless and heroic actions during the withdrawal.

#### AIR-RAID PRECAUTIONS AND GENERAL MORALE

Personnel in field units sheltered in slit trenches during air raids while in the towns strengthened basements were used. Dispersal of first-aid material was universal policy and formed an integral part of all airfield defence schemes. At first damage due to enemy action was small and moral and physical effects on raided personnel were negligible, consisting, in the words of one medical officer, of 'mainly cuts and bruises from over-hasty leaps into trenches'. It was universally observed how effective slit trenches were and casualties occurred mainly in A.A. gunners protecting the aerodromes and men caught in the open; even during the withdrawal all accounts suggest that the casualties from air attacks were surprisingly low.

When the Germans had air superiority and could bomb and machine-gun at will, morale was in some instances lowered, but on the whole the men's endurance remained good right to the end. One medical officer wrote that not even the final bombing and strafing of the last few days, and the virtual failure of the ordinary means of evacuation, seemed to make any noticeable impression on the general atmosphere of light-hearted optimism. As usual, operational success played a large part in raising morale just as the loss of well-loved flight commanders lowered it, and it was only among the officers and older senior N.C.Os. that any serious signs of despondency were observed over the final withdrawal, possibly because the rank and file did not realise the plight that our allies the Greeks would soon be in under Axis domination.

#### FLYING PERSONNEL PROBLEMS

##### GENERAL CONDITIONS

The General Outline of the Campaign (Air) has indicated the operational conditions under which fighting took place and other paragraphs have dealt with the terrain, primitive conditions and poor communications, all vital matters for the prosecution of aerial warfare.

The winter was long but its rigours were eased by the gradual improvement in flying clothing, equipment and general squadron comfort. Spring, however, brought a steady increase in the numbers of enemy aircraft encountered and with it heavy British losses. In early April the overwhelming strength of the combined German and Italian forces was let loose on the small British force, and this, coupled with the withdrawal of the Imperial Army and the collapse of Greek resistance in the west, was a severe test for our aircrews.

In December 1940, flying conditions in Greece were difficult. The weather changed with such rapidity that forecasting was impossible and the terrain was such that landing away from base was extremely hazardous. Instruments froze and oxygen masks acquired a covering of ice, making it difficult to maintain sufficient height to clear the mountain ranges with which the country abounded. Temperatures at this time of year encountered by aircraft flying at from 5,000 ft. to ceiling were rarely above 28° F. and sometimes as low as minus 50° F.

Aircrews were required to maintain a scale of effort far beyond that normally expected from serving squadrons working under favourable conditions and this, when they were constantly outnumbered by aircraft of a superior quality\* placed a considerable burden on squadrons, demanding the highest leadership and resilience. Pilots accustomed to flying in Egypt and over deserts found it difficult to modify their technique so as to thread their way up valleys and many, encountering cloud in such circumstances, flew blindly into the sides of mountains. These conditions are typified by the last disastrous sortie of No. 211 Squadron on the Vardar Gap, when six aircraft set out but only one member of aircrew returned alive, and that to Athens on a stretcher.

Possibly the best tribute that can be paid to our aircrews is that of the R.A.F. Commander who stated that 'our pilots never hesitated to give battle whenever the enemy appeared, with aircraft inferior in performance to those to which they were opposed'.\*

#### CLOTHING AND FLYING EQUIPMENT

The earlier squadrons arriving in Greece had the same clothing as that worn in the Western Desert—shirt and shorts. Lack of warm flying clothing proved a serious problem to begin with, and in one squadron (No. 30) the aircrew 'pooled' all they had—flying boots, gloves, jackets, etc. Comforts were in time sent to them but these did not include gloves, which were most urgently needed, while a consignment of leather jerkins sent from Egypt proved to be so small in size that they were dropped, for the benefit of the children, on Corfu. In due course supplies improved but not before there had been several cases of frostbite due to inadequate clothing. Sidcot suits were finally replaced by Irving suits and before the cold weather ceased most of the crews had been issued with the latter.

The winter conditions are well summed up by a note from a squadron medical officer's diary: 'Sometimes crews returned after flying over snow-clad mountains at 18,000 to 20,000 feet, with white stiff fingers requiring two hours of treatment before they returned to normal. Twice

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\* This refers to the middle and later stages of the campaign.

pilots actually had enemy aircraft in the gun-sight, but as a result of cold hands were unable to press the firing button. These cases were not due to oxygen lack, as at this time the pilots were able, and were always careful to keep the oxygen turned on to 5,000 feet above their actual indicated height'.

#### OXYGEN

Shortage of oxygen was a most important defect in the early days, and at times it was in such short supply that it could only be used when approaching and leaving the target. It should be noted that the aircraft were not fitted with economisers\* which would have greatly assisted in eking out the small stocks of oxygen held at the airfields. As it was there was some evidence of aircrews cutting oxygen consumption down below efficiency levels in order not to 'waste' the dwindling supplies.

#### GENERAL HEALTH PROBLEMS

##### EPIDEMIOLOGY IN GREECE

Epidemics in Greece have been severe at various times, as in 1922 and 1923, when moves of the Greek population in Smyrna and Anatolia were associated with typhus, relapsing fever and trachoma, and some anxiety was felt in this respect. Public health measures were, however, improving up to the time of the present war, largely as a result of the efforts of the Rockefeller Foundation.

In Greece, malaria was not notifiable and patients suffering from the disease rarely visited a doctor. In 1933, a conservative estimate of the average spleen rate was 39·6 per cent. on investigations carried out in 26 different localities. The very real danger of considerable outbreaks of malaria did not arise as all British Forces were withdrawn before the beginning of the malaria season.

Enteritis, diarrhoea and dysentery are prevalent in Greece, particularly in summer, being closely related to the primitive sanitation of the country. Though dysentery was said to be mainly bacillary, much evidence suggested that amoebic forms were relatively common. Typhus outbreaks occurred sporadically and assumed menacing proportions in times of earthquakes, crop failures and war. Dengue epidemics were recognised in summer and also outbreaks of sandfly fever.

*Malaria.* It was realised before our forces were committed to operations in Greece that this might be the biggest medical problem encountered and accordingly preventive measures were worked out in conjunction with the R.A.M.C. The main precautions that were proposed are listed briefly below:

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\* See R.A.F. Volume II, Chapter 1, Bomber Command, page 90.

- (a) A malaria survey to be made of all sites where aerodromes were likely to be sited. (This was undertaken largely by 1 Mobile Malaria Field Laboratory, R.A.M.C.)
- (b) Scales of equipment, chemicals and repellents to be worked out.
- (c) Provision of anti-malaria squads, using supervised Greek labour.
- (d) Equipping of aircraft with Paris green dusting apparatus. (Three Vincent aircraft were so equipped, but did not arrive before the campaign ended.)
- (e) Arrangement for the issue of prophylactic quinine at a proposed dosage of 5 gr. for aircrew and 10 gr. for ground crew, the whole to be at the discretion of the S.M.O.
- (f) Courses in anti-malaria technique to be arranged at 1 Mobile Field Malaria Laboratory for medical officers and key N.C.Os.

Fortunately the efficiency of these measures never required to be tested but all medical officers in the field considered that, if British forces had still been in Greece during the malaria season, casualties from this disease would inevitably have been high.

#### SICKNESS AND INJURY IN THE R.A.F.

Despite rigorous living conditions and poor sanitation, and apart from venereal disease, the general health of the R.A.F. in Greece was excellent. Even in the mountains of Yannina and Paramythia there were few colds and no instance of pneumonia or other serious pulmonary conditions.\* One squadron at Yannina reported two cases of jaundice and there were three cases of undulant fever, thought to be due to drinking milk in restaurants (all cattle in Greece were suspect as diseases of the udder were very common). At Paramythia several cases of otitis media and diarrhoea were recorded. Venereal disease will be dealt with separately as it was a matter of some seriousness; the rate was halved on the issue of condoms to all ranks.

*Venereal Disease.* There was general agreement on the fact that venereal disease created one of the most important problems to be tackled by the general and medical branches of the Service and it is fair to state that in some respects the R.A.F. authorities were not as prepared as they might have been, even making allowances for the undoubted difficulties encountered in this campaign.

Three main reasons were put forward for the high venereal rate:

- (a) The prevalence of the disease among the civil population in this as in all countries in Eastern Europe, and the indifference of the population to the disease.
- (b) The advantage taken by personnel who after many months of fighting in the Western Desert found themselves in populated

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\* Pulmonary tuberculosis was very common in Greece.

surroundings, coupled with the undoubted enthusiasm of the population on the arrival of our forces.

- (c) The absence of any early planning in the way of providing condoms or E.T. packets.

Prostitution was licensed in the country. This entailed registration and periodic medical inspection but there is considerable evidence to suggest that this was undertaken in a very perfunctory manner. In certain towns Service medical officers assisted civil doctors in the supervision of brothels, organising the necessary microscopic and serological tests, and it is recorded that this measure, though possibly undesirable, was effective to some degree.\*

The gravity of the position was soon brought home to the medical authorities by the rapidly rising V.D. rate and all possible methods to counter the menace were adopted. Medical officers gave lectures to all personnel, pointing out the personal dangers and also emphasising that at such a critical time any man becoming non-effective from such a cause was not only letting himself down but also his comrades; this approach was particularly effective in squadrons where a high team spirit was the rule. All efforts were made to organise amusements and games on the camps, but in the early stages these distractions were a poor substitute for the delights of the towns and it is hardly to be wondered at that the incidence was high at the beginning of the campaign.

#### NOTES ON GREEK SURGERY

Two R.A.F. medical officers in the Yannina area had the opportunity of observing and assisting Greek surgeons dealing with casualties from that sector during the winter. The following remarks are factual statements of what occurred and are in no way meant to be critical of the Greek surgeons, who worked unceasingly in the most unsuitable surroundings, on streams of casualties who arrived in pitiable conditions. The wounded arrived in 'buses converted into ambulances and were ragged and unkempt and lice-ridden; the majority of the cases were of limb wounds and frostbite and there was much gas gangrene, the latter mainly in those wounded by Italian trench mortars. Few cases from the front line reached the hospital earlier than four days from the date of injury and some took as long as eight days, travelling part of the way by mule transport. Soldiers with abdominal wounds generally died *en route*.

The hospital had two large theatres in converted basement kitchens with three tables in each. There was a great shortage of equipment—

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\* Though some drop in the V.D. rate was obtained the situation was always far from satisfactory.

bedding, clothes, antiseptics, sera, morphia, instruments and plaster-of-paris. Morphia was rarely administered and the stoicism of the Greek soldiers was incredible. Most gunshot wounds had had some sketchy treatment at the front and surgical treatment consisted mostly of re-draining and re-dressing wounds and amputation in gas gangrene cases, from which the stench was appalling. A verbatim quotation from one of the diaries dramatically crystallises the position: 'There was no attempt at anti-shock treatment. An anaesthetic—generally ethyl chloride—was given only when the soldier's howl became so loud as to penetrate outside the theatre. There was no X-ray, no sulphanilamide, no thorough débridement and practically no plaster treatment. The surgeons were hopelessly overworked and quite unable to spare the time to make a thorough job of each operation. Nearly all cases not unnaturally became complicated with sepsis. The few trained sisters were without exception required for theatre duties. Nursing being a humble profession in Greece, the rest of the staff were little above ward maids, the result being deplorable ward management and all serious dressings had to be done by the overworked doctors'.

Squadron personnel in the Yannina area were very good in visiting the Greek wounded and many saved their meagre rations of cigarettes for the patients. Some of the braver ones ventured into the wards, but the stench of gas gangrene was usually too much for them, and as it was not considered good for morale further visits were discouraged.

#### CONCLUSION

Thus in April 1941 ended a campaign which from the outset had been doomed to failure despite the most gallant resistance put up by the Greek forces in conjunction with what help the Allies had been able to spare at a period when all facilities were stretched to breaking point.

Relationships with the Greek authorities had been most cordial, and, even when it was obvious that the campaign was lost and Greece would come under the heel of the Axis powers, all efforts were still made to assist the Allies in every respect. The Greek medical authorities throughout the campaign offered all possible assistance though in nearly every instance it meant depriving themselves of much needed and precious supplies.

In the last moments of the campaign the Greek villagers, almost without exception, risked their lives to shelter an Ally whose language they could not understand and who had failed to save their country. Men were passed safely from hand to hand, from village to village, in circumstances where a single disloyal word would have cost their lives. There are tales of hurried embarkations at night in small boats sailing southwards on perilous journeys; and of little groups of Greeks on the shore waving farewell to the men they had saved, and then turning and

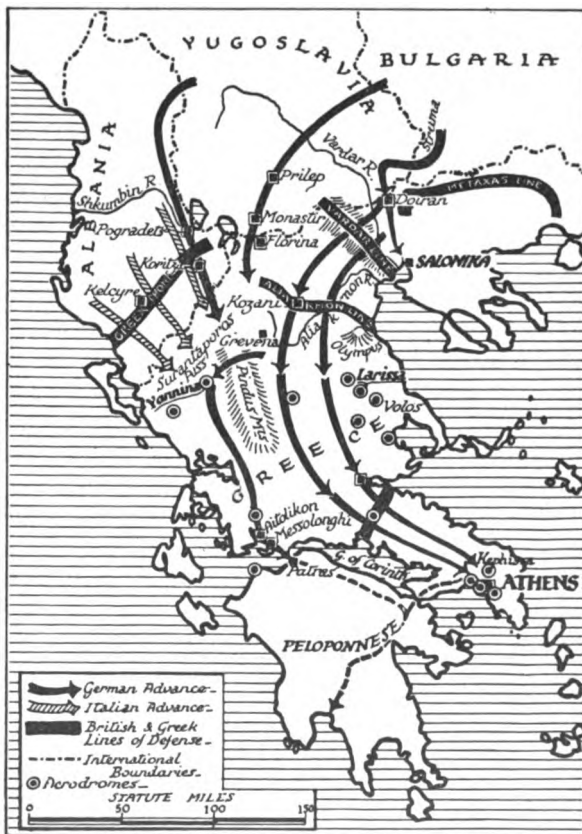


going slowly inland, back to the life of hunger and oppression which was to be their lot until it was possible for the Allies to return to Greece.

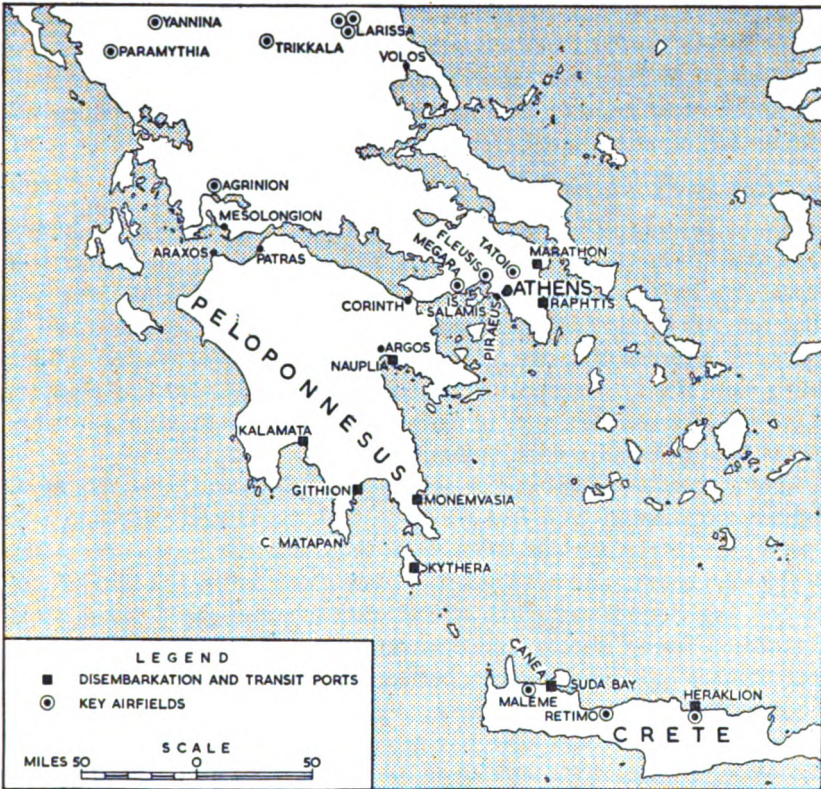
From the medical point of view, from experience gained, the following criticisms and recommendations were made on the termination of the campaign:

- (i) Full information concerning the climate, sanitation and endemic disease incidence in Greece should have been available to all units before arrival.
- (ii) More effort should have been made to provide adequate cooking facilities, messing arrangements and opportunity for drying wet clothes for units under canvas.
- (iii) The locating of units in a cold climate should be preceded by the issue of adequate flying clothing and bedding.

(Maps 1 and 2 show the lines of the German and Italian advances, the chief disembarkation and transit ports and the key airfields used.)



MAP I. German attack on Greece, April 1941.



MAP 2. Evacuation from Greece, May 1941.

## Crete, November 1940—May 1941

### GENERAL NARRATIVE—MILITARY AND AIR

Crete was occupied by British Forces during November 1940, at the request of the Greek Government and in anticipation of hostile Italian naval operations. It had a small garrison, and three aerodromes on the north coast—at Heraklion, Retimo (landing strip only) and Maleme. An advanced naval base was established at Suda Bay, a Fleet Air Arm squadron providing air defence from Maleme, 15 miles to the west. (No. 203 R.A.F. Squadron, flying Sunderlands, used Suda Bay as an advanced anchorage for air reconnaissance of the Ionian Sea.)

A Royal Air Force operations room was installed at the capital, Canea (Khania), between Maleme and Suda Bay. At first the only aerodrome in use by the Royal Air Force was Heraklion (also known as Candia) where bombers on their way from Egypt to Greece were

refuelled. The airfield was situated a few miles to the east of the town of that name, itself 65 miles east of Canea. Retimo landing ground was between Suda Bay and Heraklion, somewhat nearer the former. On the south coast another landing strip to the south-east of Canea was chosen for bombers but never used.

#### WITHDRAWAL FROM GREECE

Crete became an operational theatre during and after the evacuation of air and military forces from Greece in the latter half of April 1941. The Royal Air Force commander took over on April 17. Though there were now two Air Ministry Experimental Stations (near Maleme and Heraklion) and a Greek observer system on the island, there was no artillery and practically no transport. Telephone communication was poor and there was a general shortage of material. There were no aircraft maintenance facilities and no maintenance spares.

The evacuation from Greece began on April 18 and remnants of the fighter squadrons which had taken part in the Greek campaign were based on Crete at various times from then onwards for the protection of the sea convoys and of the Cretan bases. Assisted by the Sunderlands of No. 203 Squadron (which at this time were engaged with the air evacuation from Greece), and operating from Heraklion and Maleme, the fighters provided escorts between April 21 and 29.\* No. 203 Squadron aircraft were withdrawn to Egypt at the end of the month.

In the meantime administrative arrangements had to be made for the reception of R.A.F. personnel from Greece and for their onward transmission to Egypt. A transit camp was therefore established on April 19 in a well-concealed site near Suda Bay. Personnel disembarked from the R.A.F. depot ship *S.S. Dumana*, diverted to Crete while on its way to Greece from Egypt, assisted in the establishment of this camp, and everything was ready in 24 hours. The camp provided accommodation, blankets and hot food for up to 1,500 at a time. There was also a small officers' mess at Canea.

#### GERMAN ATTACKS PRELIMINARY TO INVASION

At the end of April our military forces on the island exceeded 28,000 but they were short of equipment and weapons, and only about a quarter of them were fresh troops. Now came the preparatory phase leading up to the German attack on Crete. By May 9 all R.A.F. personnel not required for the defence of the island had been evacuated to Egypt, and the transit camp, after three weeks activity, was closed. This left the fighter squadrons referred to above, the Maleme Fleet

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\* Apart from No. 203 Squadron Sunderlands, the serviceable machines at this time did not exceed 20. There were 8 Blenheims from No. 30 Squadron, 6 Gladiators and Hurricanes from Nos. 33 and 80 Squadrons, and 6 Gladiators from No. 112 Squadron.

Air Arm Squadron (No. 805) with six aircraft, Nos. 220 and 252 A.M.E.Ss., headquarters staff, the Suda Bay Port Detachment, and sundry other small units. Aircrew and ground staff, especially those from Greece, had had a strenuous time and, not unnaturally, were somewhat low-spirited. Aircraft were in a poor state of serviceability, and there were no spares. Most of the men had only the clothes they stood up in.

Frequent enemy air reconnaissance now began, and it soon became clear that an airborne attack was pending, with a strong likelihood of Cretan aerodromes and landing strips being used for the purpose. Development of new landing grounds was therefore stopped and all unused ground on aerodromes was blocked with barrels filled with earth so as to reduce available space. Petrol barrels 'covered' by machine guns were arranged at strategic points and protective pens (nine at Heraklion and four at Maleme) were constructed. At dusk all aircraft were flown from Heraklion and parked near the Retimo landing strip for the night, returning to Heraklion every morning, thus minimising the risk of damage from enemy night-bombing. Anti-aircraft guns, spared from the small number which had by this time been landed in the island, were now installed at Maleme and Heraklion, and the R.A.F. headquarters at Canea was moved to a semi-protected site on a hillside outside the town, near Army headquarters.

From the beginning of May the enemy had concentrated his attacks on ships plying between Greece and Crete and in Suda Bay. From May 13 onwards the two aerodromes began to receive attention, with spasmodic bombing and low flying attacks which grew in intensity and frequency. Enemy bombers and dive-bombers had strong fighter escort and although a heavy toll was taken by the small British fighter force, 'whose performance', the R.A.F. Commander wrote, 'was heroic', our aircraft strength was slowly decreasing. Towards the end of this period, when it was realised that the numerical and qualitative odds against the British aircraft were such that the fighting was merely resulting in a waste of men and material, our fighters were used to hinder enemy reconnaissance and to undertake reconnaissance themselves. Night bombing operations on enemy air concentrations in Greece were undertaken by Wellingtons based in Egypt, but nothing more than small scale attacks could be maintained. By May 16 the few remaining Blenheims were operationally unserviceable and were removed to Egypt. On May 19, the eve of the German air invasion, our fighter force in Crete was reduced to seven aircraft—three Hurricanes and three Gladiators at Heraklion, and one Hurricane at Maleme.

#### THE GERMAN INVASION

At 0800 hours on Tuesday, May 20, after heavy preparatory bombing of Maleme, low-flying glider-towing machines made their appearance

over the island. The first wave comprised fifty gliders, each carrying approximately 12 men and equipment. These began to land to the west of Maleme aerodrome. Six came down on the Akrotiri peninsula and three near Suda Bay and Canea. At about the same time parachutists were dropped in four other areas—east of the aerodrome, in the valley between the prison and lake Aghya, near Galatas and near Pyrgos;\* the men, who were carried by three-motored troop carriers flying in formations of fifteen at a time, fired Tommy guns and threw hand grenades during the descent. A large proportion of those landing east of Maleme were killed,† and others near Canea were rapidly mopped up; a few Ju.52s crashed on the beach and on the aerodrome itself. Enemy troops soon captured the 7 British General Hospital near Canea, but it was retaken later in the day. The Galatas area was cleared by the defence and at Pyrgos most of the enemy were killed or wounded. To the west of Maleme aerodrome the situation was less promising, for the New Zealand 22nd Battalion defending the aerodrome had been forced back, and the enemy were able to prepare a landing ground in the prison area.

To the east of Heraklion further airborne troops were dropped, but the defences made certain that no live Germans got near the aerodrome. A number of troop-carriers—one report states 16 out of a total of 130—were brought down by A.A. fire, and several flew into falling parachutists with mutually disastrous results. At Retimo the parachutists captured the landing strip, but were wiped out by a counter-attack by Greek and Australian troops. An estimate of the number of German troops landed during this first day was 1,800 at Canea, 1,700 at Maleme, 1,700 at Retimo, and 2,000 at Heraklion. By the end of the day prospects seemed good, and there was a reasonable chance that, if the enemy could be driven out of Maleme and cleared from the landing ground, his plans might end in disaster.

Early on May 21, however, the German stronghold near Maleme was reinforced and the personnel and equipment from 60 troop carriers had been dropped before the first British counter-attack could be made. More parachutists were landed and there were heavy air raids on Canea, accompanied throughout by energetic enemy air reconnaissance. During this day the New Zealand Battalion in the Maleme area was all but wiped out, and by the evening several thousand Germans had obtained a firm footing. The New Zealand 5th Brigade launched a heavy counter-attack but it was too late to dislodge the enemy. The number of German survivors from the airborne landings was now mounting steadily but during that night an attempted German seaborne landing was effectively dealt with by the Royal Navy.

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\* The area in which they landed was approximately 10 × 5 miles.

† Sometimes as many as four-fifths of the parachutists were killed as they descended.

Enemy air landings continued on the 22nd, troop carriers alighting at Maleme aerodrome, which our Forces were unable to recapture. The enemy hold on the Maleme sector was growing stronger but Heraklion was still firmly held by our Forces. Enemy dive-bombing was a prominent feature of the day's operations.

On May 23, gaps had to be closed in the British line in the Maleme sector and ground given. On the 24th heavier bombs were dropped and the enemy began to advance eastwards along the coast. For the next two days there was heavy fighting but the Allied Forces, in spite of retaking Galatas on the 25th, were gradually edged east and south-east from the German bridgehead in the Maleme sector. The situation was deteriorating, and there was now no real hope of a successful defence of this sector, and, consequently, of the island as a whole. On the 26th, H.M. ships began to withdraw troops from Suda Bay.

During the 27th, the defences at Retimo and Heraklion had more than held their own and it was hoped that German losses were exceeding replacements, but airborne troops had been concentrated east of the Heraklion defence zone and were now joined by seaborne reinforcements. It was therefore decided to withdraw the garrison. This was undertaken by H.M. ships on the night of May 28/29. The defence at Retimo had become isolated on May 27 and, having failed to receive instructions dropped by a British aircraft to retire southwards, continued to resist until they finally succumbed to an overwhelming enemy attack using tanks; some members of the force later escaped into the hills and eventually reached Egypt from the south coast of the island.

Further west, the Allied troops had to fight a two-day rearguard action from Suda, southwards in Sphakia, which was reached at dusk on the 28th. For three days, unobserved by the enemy, they 'lay up' there in scrub or in caves by day and, their signals party having established successful communication with Headquarters in Crete and Middle East, were taken off by H.M. destroyers by night. Once again Sunderlands took part in the evacuation. At Tymbaki, in the Gulf of Messara, 35 miles to the east of Sphakia, a small party of men of all Services embarked from the beaches in a Landing Craft Mechanised. When 20 miles on their journey to Egypt they were intercepted by an Italian submarine and their officers were taken prisoner. The remainder reached Egypt on June 5 and reported that 1,000 British were still in the Tymbaki area. An estimate of the total (all Services) brought away from the island by the Navy was 16,000.\*

Thus, after 8 days' hard fighting, and once again with a hopelessly

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\* In the course of this final evacuation naval losses were heavy. One cruiser and two destroyers were sunk, and four cruisers and four destroyers damaged. The naval authorities stated: 'A total of 26 warships sunk or damaged, apart from the auxiliaries, in twelve days had made heavy inroads into the Mediterranean Fleet'.

slender air defence, Crete was lost. Of R.A.F. personnel 257 (nearly 200 of them from Nos. 30 and 33 Squadrons and from the Heraklion party) became casualties in this battle; 361 returned to Egypt.

Any account of naval and military casualties is not relevant to this narrative. An estimate (which can never claim to be more than a vague speculation) of German losses was 6,000 killed or drowned and 11,000 wounded.

#### CONCLUSION

In his report on the Crete air operations the R.A.F. Commander stated that by May 19, the day before the air invasion, the enemy had completely neutralised our air forces and substantially reduced the efficiency of our A.A. defences.\* To counter these air attacks large numbers of fighters would have been necessary but no such reinforcements were available. Although ground gunners caused heavy casualties among the airborne troops both in the air and on the ground the survivors were able to exploit their advantages later; the enemy's success in establishing a landing ground where troop carriers could alight and take off and gliders could land was also decisive but the main factor in achieving such rapid victory was the close support which the German air force gave to its troops.

#### MEDICAL NARRATIVE AND COMMENTARY

##### GENERAL MEDICAL ARRANGEMENTS

The R.A.F. strength in Crete, apart from personnel passed through the transit camp, was approximately 700. Military forces on the island were not far short of 30,000, and shore based Naval units accounted, at one time or another, for a further 1,000. R.A.F. medical problems thus formed only a small part of the general and highly confused picture.

The chief medical units of the other two services were a Naval tented hospital near Suda, an Army general hospital near Canea and a field ambulance near Heraklion. The Naval tented hospital, designed for 60 cases, had an establishment of 7 medical officers and 27 other rank medical staff; this unit arrived at Suda on May 9 and was set up near the site of the transit camp. By May 22 the operating theatre was working continuously throughout the 24 hours, and on the next two days the hospital was dealing with 200 in-patients; when fit to travel, patients were sent to a rendezvous near Suda whence they were taken off by destroyers at various times during the withdrawal.

To the 600-bed 7 British General Hospital serious cases from R.A.F. units in the western part of the island and all V.D. cases were sent. On the first day of the air invasion the hospital was attacked

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\* Eighteen light, and four 3·7 A.A. guns had been installed before the attack.



and captured by the Germans but retaken by the British later in the morning. At the time of the attack there were two R.A.F. patients in the hospital and they later recounted their experiences.\* 189 Field Ambulance arrived at Heraklion during the second week of May, and as its experiences are closely connected with those of the R.A.F. medical officer of Heraklion aerodrome it will be referred to in greater detail under this officer's narrative below. Use was also made of civil hospitals at Heraklion.

At various times between April 25 and May 31 there were three R.A.F. medical officers posted for duties in Crete—one at Heraklion, one at the R.A.F. transit camp, and another (who, with five medical airmen from three different squadrons, became a prisoner-of-war) at Maleme. As the period covered is a short one their experiences are described separately, by locations.

#### THE TRANSIT CAMP

As mentioned in the General Narrative, this camp opened for the reception of personnel evacuated from Greece on April 19, 1941. To begin with, medical attention was provided by medical officers in transit but on April 28, the medical officer of No. 208 Squadron reported for duty. At this time approximately 1,800 men had arrived there.

When this medical officer took over, the sick quarters consisted of a ridge pole tent as M.I. room and living quarters for the staff, and a bell tent for the bed patients. Equipment to Scale Z.1 was available. Two medical orderlies, one from No. 112 Squadron and the other from Headquarters Canea, comprised the staff. Serious cases were transferred to the 7 British General Hospital near Canea, an ambulance being available for this purpose. For part of the time a flight of Sunderlands was operating from Suda Bay, and the medical officer was able to make arrangements for cases to be evacuated by these flying boats to Egypt.†

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\* Points from their account are: 'The Germans entered the tents and ordered all patients, then approximately 300, to line up on the main road of the hospital, with the exception of a few serious cases who were allowed to stay in the ward. The patients were dressed in pyjamas or hospital blue, and some were without shoes or slippers. The party was then marched out of the hospital on to the Canea-Maleme road and into a wood 300 yards away. There, in a clearing, and near a British Army ration dump from which the Germans gave them food, they stayed until they were ordered to move through the wood in front of the Germans. A British tank was encountered, which (seeing them) moved back. Eventually they were made to lie down flat. They then saw British patrols coming towards them with a Bren gun, whose first burst of fire killed several patients. After about a quarter of an hour the Germans were pushed back into the wood and the patients made their way off towards the hills. From this point they moved by road to British positions just outside Canea where they stayed the night. On the next day, the hospital having been recaptured, they moved back there, some of them preferring to live in caves on the seashore. Eventually they made their way back to Canea, the two R.A.F. casualties reaching R.A.F. Headquarters in the early hours of May 22'.

† Two of these cases were of interest—one of meningitis in an airman who had been unable to complete his convalescence and was suffering from attacks of giddiness, and the other a post-diphtheritic paralysis.



For the camp itself accommodation was limited by the scarcity of tents, and most of the men had to sleep in the open; few had brought blankets, and the resources of the camp stores were small. A running stream in the village above the camp provided water, and a rough field kitchen had been erected in which tea and bully beef rations were prepared; water was conveyed in 8-gallon containers to 40-gallon drums at the cookhouse. Rations were drawn from Suda Bay and sometimes fresh vegetables and meat were obtainable. For cooking, hot plates over kettle trenches were used, there being no petrol or other stoves available.

Sanitation was crude and, disposal measures not having been supervised, the camp was heavily fly-ridden. When the medical officer had been there for 24 hours the whole camp population, with the exception of a working party of 30 men, the C.O., and himself, was hurriedly evacuated, leaving things in a chaotic state.

During the next few days further transit personnel arrived, raising the strength to between 400 and 500 men. The most important medical problem was to maintain an efficient sanitary squad, for men would be detailed for duties and then promptly withdrawn elsewhere, with the result that sanitation duties were not carried out efficiently; after a few days therefore, a permanent sanitary squad was organised and the arrival of a disciplinary warrant officer improved matters considerably and noticeably raised morale. Deep trench latrines were erected; latrine buckets, which had been lying hidden and unattended to for days, were removed and their contents burned or buried; and an incinerator and pit were erected for the disposal of swill and refuse. Difficulties similar to those which arose over sanitary squads were experienced in regard to catering, for frequent changes of cooks made arrangements in the cookhouse very unsatisfactory.

Men arrived in scattered groups, often separated from their units and without a responsible officer to lead them; they had no change of clothing and often had had unpleasant and sometimes harrowing experiences and were in low spirits; they were kept occupied unloading ships in the bay, work for which night shifts were often necessary.

Among the clinical conditions encountered in the camp was a mild outbreak of diarrhoea, traceable to Cretan ice cream sold by the natives, as it ceased when the sale of this commodity was prohibited. Later, skin diseases—mainly pediculosis and scabies—appeared, probably attributable to lack of clean clothing and bedding. Mosquito and other insect bites were also frequent, as the men were sleeping in the open without any kind of protection.

The final evacuation from the transit camp was completed on May 10, and the remaining personnel, together with the medical officer, were taken off by H.M. ships. Each man was issued with two blankets, and

allotted space on the deck or in the hold. It was impossible to make hot tea, and rations consisted of bully beef, biscuits, tinned fruit and cheese consumed on deck. Latrines were available on the lower deck. The sea crossing to Egypt took three days and nights and was without incident.

In his report this medical officer stressed the importance of detailing permanent cookhouse staff and personnel for permanent sanitary duties in a transit camp even in the circumstances experienced in Crete.

#### R.A.F. STATION, HERAKLION

The aerodrome at Heraklion was controlled by 'Z' Wing. At first, the latter used four stone buildings for messes, orderly room and canteen and tents for sleeping accommodation; the tents were well-dispersed and some of them were concealed in an olive grove near the edge of the aerodrome. An operations room was set up in a cave two miles from the camp and accommodated the signals, cypher and meteorological sections; later the orderly room also moved to this cave. Except during the period of evacuation from Greece the strength of the station was about 250, consisting of 'Z' Wing itself and a detachment from No. 112 Squadron, and the sick quarters provided was staffed by a medical officer and one corporal who were flown there from Egypt on April 25. An A.M.E.S., with one officer and fifty men, also came under the medical care of the station, as did a party of one officer and about twenty men who looked after the landing strip at Retimo. The Senior Medical Officer of the area was a R.A.M.C. major.

Slit trenches were dug off the camp, and the medical officer also had small caves dug for the reception of casualties and for the medical staff. The sick quarters cave, which although only 10 feet below the surface was supposedly proof against direct hits, catered for six stretcher and 12 sitting cases. Before, and during, the invasion air attack was on a large scale and often directed against the slit trenches; the protection provided by the caves was particularly useful against ground-strafting. During the whole period no R.A.F. personnel were injured by air attack, although the buildings and tents were severely damaged and the A.A. gun crews and Army personnel in the trenches round the aerodrome sustained a few casualties. The A.M.E.S., five miles away, gave about 20 minutes warning of approaching aircraft and this allowed time to take cover.

General health was good, the chief causes of sickness being coryza and tonsillitis, with a few mild cases of enteritis and septic sores—mainly among men withdrawn from Greece. The incidence of V.D. was, however, fairly high, particularly among patients evacuated from Greece, although many of these cases were relapses. There was no malaria and no typhoid fever.

Until the end of the second week in May, when 189 Field Ambulance arrived, casualties were evacuated to the civil hospital at Heraklion, officers being sent to a small private Greek hospital in the town. V.D. cases were transferred to 7 British General Hospital, Canea. When the bombing became severe 189 Field Ambulance moved out of Heraklion town and split into two parties, each occupying villas, one about three miles from the camp and the other six miles away.

The value of having a sick quarters on the camp in which casualties could be safely retained was well illustrated when the air invasion began on May 20. Both sections of the field ambulance were cut off at once; fortunately the road to the nearest section was cleared of German troops in a few days, but the distant section was completely isolated, as this area was held by enemy troops. The Germans brought their wounded to this section of the field ambulance and did not interfere with its functionings—ration convoys were in fact allowed to proceed to it from Heraklion and the R.A.F. camp unmolested. This situation of a British field ambulance working in an area under German control was made even more strange by the fact that the Germans supplied it with dressings and drugs which had run out very quickly. Cases were transferred between the two sections of the field ambulance as the distant one was better equipped for treatment than the other.

Equipment at the R.A.F. medical officer's own sick quarters consisted of a medical companion and surgical haversack. Attempts to increase supplies by application to Headquarters Canea failed, but on the fourth day of the invasion a large quantity of medical supplies was dropped on the camp in error by six Ju. 52s; there were two large canisters of medical supplies, together with arms and ammunition, and a supply of Greek beer. Most of the drugs, dressings and instruments were sent to the nearer section of 189 Field Ambulance at which, incidentally, a captured German doctor and six of his medical orderlies were working. (Another German doctor who was captured shot himself.)

The final withdrawal of the R.A.F. and Army from the Heraklion area took place on the night of May 28/29. All the wounded from the field ambulance (near section) were conveyed to the harbour whence they were transferred by destroyer to the cruiser *Orion*. On the sea journey to Alexandria the convoy was bombed almost continuously from 0630 hours to 1600 hours and the *Orion* sustained three direct hits, causing casualties estimated at between 400 and 500 killed; the number of R.A.F. casualties was 2 killed, 11 missing presumed killed and 11 wounded. On arrival at Alexandria surviving casualties were transferred to 8 and 64 British General Hospitals. Many of the R.A.F. cases suffered from burns; one corporal and another airman were said to have died in hospital from pneumonia caused by inhalation of fumes

and smoke. The entire staff and patients of the distant section of 189 Field Ambulance had to be left in Crete; a few R.A.F. personnel were among those who remained.

Summarising, the medical officer noted that flying personnel medical problems were of small account as the few aircraft of No. 112 Squadron were rapidly destroyed. Crews were flying Gladiators against which at least five times as many Me.110s were opposed and on receipt of an air-raid alarm, in an effort to preserve the few remaining aircraft they were instructed to take off, fly inland and not return until the all clear was given.

It is noted that during the land operations in Crete the blue R.A.F. uniform was a great disadvantage to our men, as not only were they easily visible against the sandy coloured terrain and therefore repeatedly fired at by the Germans, but they were difficult to distinguish from the Germans themselves. In one instance, when airmen from the A.M.E.S. were cut off from the aerodrome and attempted to regain the British lines they were fired on by our troops and a few of them were killed.

The Germans respected the Red Cross\* and the ambulance at Heraklion camp was practically the only undamaged vehicle. Wounded Germans at the field ambulance were greatly concerned when they found that there was no Red Cross on the roof, insisting that their own airmen did not wantonly bomb the Red Cross unless instructed to do so by their intelligence branch. Their faith in the protection of the Red Cross was proved by the fact that they fixed a flag to the roof of the field ambulance.

The total number of casualties in the wing and sector at Heraklion is estimated at 10 officers and 100 men. Other casualties are believed to have occurred in two parties of officers and men who left for the Messara plain in the south of the island in order to open a landing ground, but most of these men were later reported to be prisoners-of-war.

#### R.A.F. STATION MALEME

No. 30 Squadron arrived here on April 18. Some notes on experiences at Maleme have appeared in the 'General Narrative' section above and from these it will be seen that in this sector, the German airborne troops made an early and firm bridgehead. An air gunner reported on his experiences between May 20 and 28 and from his account it appears that wastage was high; casualties included personnel of No. 252 A.M.E.S., which was situated on a hill overlooking the aerodrome, who joined the New Zealand troops in the fight against the airborne troops.

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\* A hospital ship lying off Canea was not bombed.

No medical records are available for Maleme, but the medical officer of No. 30 Squadron was known to have accompanied his men, being posted as missing, believed prisoner-of-war, on May 31. The following citation published in *The Times* gives details of the occurrences at Maleme and the part played by the medical officer of No. 30 Squadron for which he was awarded the M.B.E.

A few days before the German invasion of Crete this officer fell sick with dysentery at Maleme. When the heavy air attack on Maleme began, although too weak to walk properly, he attended to the wounded until his post was captured. He then established a first-aid post in a village near by and worked alone and without sleep for three days after which he was joined by two doctors of the New Zealand forces. Over 1,000 wounded were passed through this post before it was finally taken over by an Australian Field Ambulance.

#### NOTE ON GERMAN PARATROOPS AND MEDICAL EQUIPMENT\*

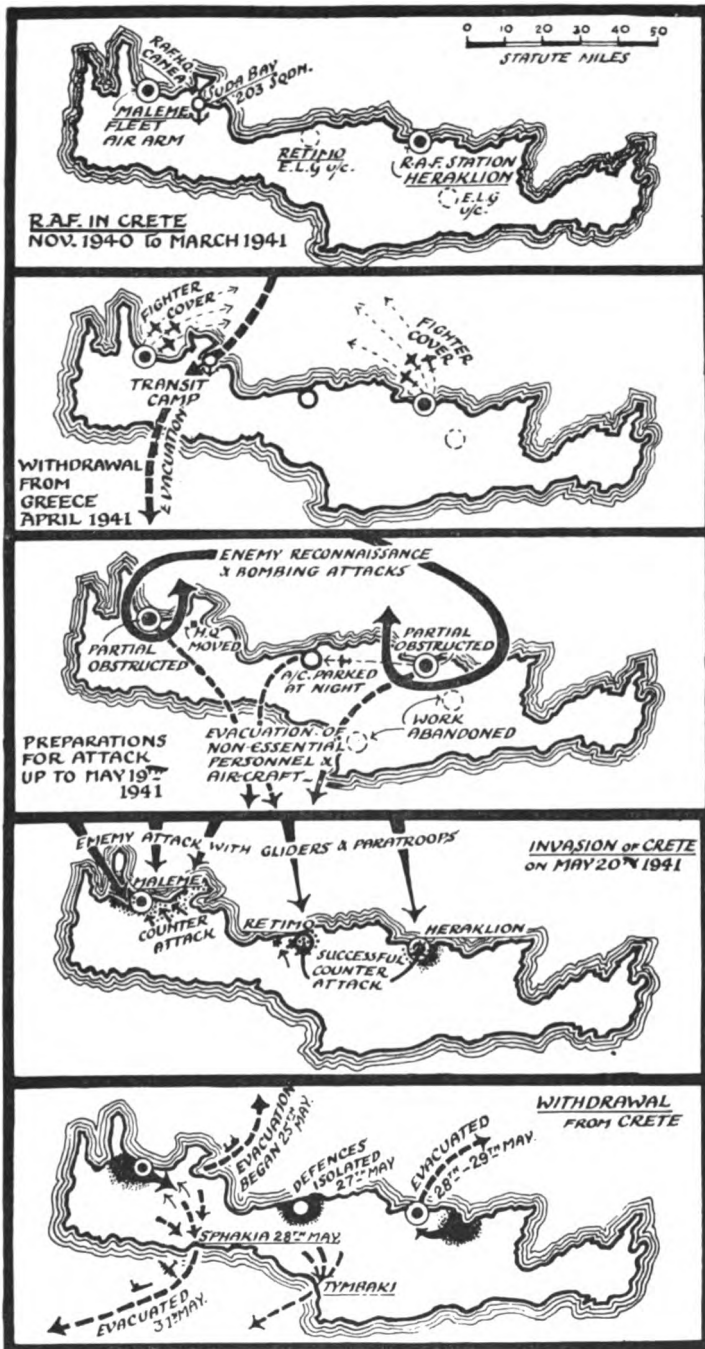
##### PARACHUTE TROOPS

The average man was of medium build. All were young, seemed to be in a very fit physical condition, full of confidence, and of high morale. They had firm abdominal walls and little fatty tissue. Examination of the cardiac, respiratory and abdominal systems and the pulse response suggested that they were all A.I.B. (R.A.F.) standard, but it was not possible to make any visual or auditory tests. They wore crêpe bandages around both ankles, from the mid-tarsal region to about three inches above the ankles, four thicknesses of bandage being used. Despite this, many were brought in for treatment with badly sprained or broken ankles, having landed on hilly or broken, rocky ground. Their personal rations consisted of a large sausage and two slabs of chocolate. 'Dextro-energen' tablets were also carried but it is thought that these were nothing more or less than dextrose and did not contain any 'dope'.

The use made by 189 Field Ambulance of German medical staff has already been referred to. The surviving doctor was only 22, and quite incapable of undertaking any surgery, even of a minor character, being, as he said, a physician, but he was able to give some help with anaesthetics. It was understood that after the war he would have to return to hospital for further training before being allowed to practise. Six German nursing orderlies were employed and they seemed well trained and competent. It is estimated that in the Heraklion sector a total of about 12 medical officers and 50 medical orderlies were dropped; one of the latter was found searching for casualties with a stretcher party.

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\* Compiled from observations made by the medical officer of 'Z' Wing, Heraklion.



MAPS 3-7. Phases of the campaign in Crete, November 1940 to May 1941.

## MEDICAL EQUIPMENT

The German first-aid outfit included a useful pair of clothing scissors, first field dressings of French manufacture, and bandages, gauze and cotton wool substitute made from artificial silk. The medical and surgical equipment was all brand new, having been manufactured between March and June 1940, and was on a plentiful scale. No tubunic ampoules were seen, but a 5 c.cm. syringe and glass ampoules of morphia were provided in a sealed tin with instructions that this was only to be opened by a doctor. Large quantities of cardiac and respiratory stimulants—e.g. cardiazol and lobeline—were included. Other German medical equipment falling into British hands 'was sufficient to establish a general hospital', and included folding operating tables, steam sterilisers, anaesthetic apparatus and laboratory equipment and aluminium stretchers. The only item not seen was an X-ray machine.

Aircraft medical equipment was obtained from a Me.110 and a He.111K. The equipment was carried in a satchel similar to the British holder and included a box containing Kramer splinting and, in addition to the drug items already mentioned, had camphor in oil, digitalis, hyoscine, caffeine, and sodium salicylate for injection. Also included were plaster-of-paris bandages (with written instructions that they were to be used only by a doctor), a bone saw, artery forceps, scalpels, forceps, and other surgical equipment, including burn ointment and burn dressings.

It is worth noting that the German organisation for rations and other supplies seemed to be very good, aircraft making a regular morning and evening delivery by parachute of all supplies. It appeared that aircraft of the regular standing patrol took the orders by R.T. at dawn and in the afternoon and were followed after a relatively short interval (two hours or so) by many troop-carrying aircraft which dropped what was required. The German orderlies working with 189 Field Ambulance stated that any supplies could be obtained within 24 hours.

Maps 3-7 illustrate various phases of the campaign in Crete.

**CHAPTER 5**  
**NORTH RUSSIA**  
**No. 151 R.A.F. Wing in Russia**

SEPTEMBER-NOVEMBER, 1941

**T**HE OBJECT of this expedition was to assist in the defence of the Naval Base at Murmansk; to demonstrate the operational capacities of Hurricane (Mark IIB) aircraft, carrying 12 machine guns each; to provide all information on their care and maintenance; and to hand them over, together with all necessary equipment (including medical) for the use of our Russian Allies and as a prelude to further supplies. The wing therefore subserved the functions of a British operational unit in action, with the Russians, against the enemy on the northern front, and a kind of Operational Training Unit and School of Technical Training for the Russians.

No. 151 Wing comprised two squadrons, Nos. 81 and 134, both formed from the flight of an existing squadron made up with personnel posted from various units. The total strength was 556, all ranks, including 36 pilots. The combined squadron personnel numbered approximately 220, and there was in addition to the wing headquarters, a large maintenance unit (100 men), a repair and salvage unit, and a signals section. No observer screen was taken, and the A.A. defence of the wing was in Russian hands. There were two medical officers.

The wing formed at Leconfield in Yorkshire on July 31, 1941, and left, after twelve days, in the middle of the night for the port of embarkation, Liverpool. The main body sailed from there on August 12 on a 10,000 ton ship, a small party proceeding on another ship in the same convoy for Iceland, where further escort vessels were picked up and the voyage continued round North Cape, as far north as latitude 76°, to Archangel. It lasted twenty days and was uneventful. Twelve pilots from each of the two squadrons, who were to accompany 24 of the machines, followed later on the aircraft carrier H.M.S. *Argus*, embarking on August 19.

The main body of the wing landed at Archangel on September 1. Some time was lost here owing to vital equipment being stowed in the bottom of the ship's hold. The first concern was to establish wireless communication between the wing's aerodrome at Vaenga, near Murmansk, 400 miles away, and the aircraft carrier, so that the pilots could be flown off. An air party, including the signals siting party, of 36 officers and men therefore left Archangel, flying in Russian machines,

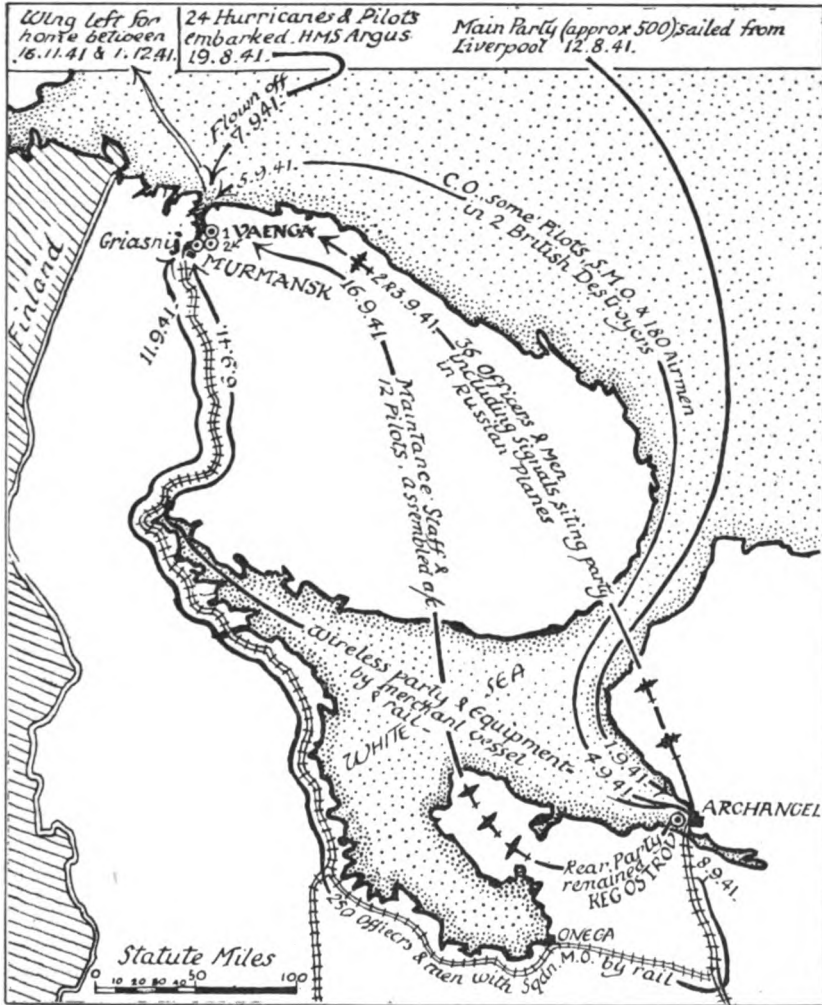


on September 2 and 3, for Vaenga. A second party, consisting of the C.O., some pilots, the senior medical officer and 180 airmen, left the next day in two British destroyers, arriving at Vaenga on September 5. The wireless party with its equipment went by merchant vessel to Kandalakcha and thence by train to the aerodrome which was reached on September 6. The fourth party of 250 officers and men, accompanied by the other medical officer, left by rail on September 8 on the southern route round the shores of the White Sea, reaching Vaenga four days later. All parties took medical equipment. A rear party, comprising maintenance staff and twelve pilots, remained behind at Archangel to complete the assembly of crated aircraft which had been brought by cargo vessels together with other 'help for Russia'. The erecting section of this party lived on a paddle-wheel steamer near the aerodrome at Kegostrov, and did a fine piece of work in uncrating and erecting fifteen Hurricanes in nine days under difficult conditions, without specialist tools or Hurricane kit.

In the meantime the 24 Hurricanes which had been assembled on the aircraft carrier were ready to fly off. This was done on September 7 in poor weather, and despite the fact that none of the pilots had previously flown off a carrier, was achieved with success, marred only by damage to two aircraft which struck the deck ramp on taking off and had to make belly landings—fortunately without injury to the pilots. On September 11 all but the rear party, which joined the wing five days later, had arrived at Vaenga and operations began (*see* Map 1, R.A.F. in North Russia, 1941).

There were two aerodromes, separated by a few miles, one from which Russian army fighters operated alone and the other for the use of the wing and Russian medium bombers (Naval). Group (Russian) headquarters was at Griasnij a few miles away. The Wing's aerodrome had been constructed during the Finnish War and was a drained lake filled in with rocks. These were covered with rolled sand and offered a fair surface, though during bad weather there were soft patches which made taxi-ing difficult and were responsible for damage to machines, particularly to propellers, through 'tipping up'. (*See* Plate XXIII.) Even experienced pilots had to exercise special care in landing and taking off. The two main runways were 600–700 yards long; there were excellent dispersal huts for both squadrons, which used opposite sides of the aerodrome, and each aircraft was housed in a separate wooden hangar. The surrounding country was rugged, strewn with scrub and boulders and with many lakes and low hills.

Living accommodation was provided in four two-storey barrack blocks, built of brick and well separated from each other. The nearest point of the wing's aerodrome was half-a-mile and the furthest dispersal point one-and-a-half miles from this accommodation, which was part



MAP 1. R.A.F. in North Russia, 1941.

of a village the Russians had been building at upper Vaenga, but had not completed. Vaenga village was one-and-a-half miles away.

Each barrack block had electric lighting, and heating was by wood-fuel stoves and fires built into the walls, except in one block which was centrally heated. Pipe-borne water supply was available to within 20 feet of the barracks, but was not laid on inside. There were eight outside latrines to each block, housed in a small octagonal building, nicknamed 'pagoda', and standing over a cesspool. In one block there were wing administrative offices and sick quarters on the ground floor with officers' ante-room and sleeping quarters on the first. The men used the

three other blocks, a wooden hut being taken over as sergeants' mess and a further single storey brick building as officers' and airmen's mess, kitchen and stores. As accommodation was limited, meals, which were provided partly by the Russians and partly from the ninety-day store of rations taken with the wing, had to be staggered. Russian baths were available in the village.

The Russian-Finnish front was roughly 25 miles to the west of Vaenga, and this was the chief operational area. Duties consisted mainly of escorting Russian bombing raids and patrolling Murmansk, the base, and other areas. The first reconnaissances were made on September 11 by sixteen of the British aircraft, without contact being made with the enemy. On the next day a flight of five Hurricanes attacked six enemy aircraft, destroying three and sustaining the first and only battle casualty—a sergeant pilot from No. 81 Squadron killed when his plane was shot down. In a later sortie on the same day another enemy aircraft was destroyed. On September 17 four more enemy machines (fighters) were brought down, and on the 24th a flight of Hurricanes on escort duty accounted for another four. By the end of the month twelve certain victories and one 'probable' were claimed. On September 27 a fatal accident occurred on the aerodrome, when, due to a misunderstanding, a pilot took off with two airmen on the tail of his machine; they were catapulted into the air and instantly killed,\* the pilot surviving with a broken thigh. At the end of the month flights in the Hurricanes had already been made by two Russian pilots, and one of the machines had been formally handed over to the Soviet Major-General for his own use.

During the first few days of October bad weather interfered with operations. On October 6, however, following a 20-bomb air raid on Vaenga which resulted in two casualties, the British fighters accounted for two Ju.88s and a Messerschmitt, with one Ju.88 'probable' and an uncertain number of enemy machines damaged. A second raid ten days later caused no damage. Operations ceased half way through the month, by which time all aircraft and most of the equipment had been handed over to the Russians and ground crews were supervising Soviet operations. There followed a difficult period of one month's relative inactivity for pilots and many of the ground staff before the wing was ordered to return to the United Kingdom. The rest of the equipment was handed over during this month. During the whole period intensive instruction was given to Russians of all ranks in the flying and maintenance of the aircraft, and two British and one Russian officer and four Russian women were continually engaged in translating technical books and instruction manuals into Russian. The Soviet technicians proved themselves adept at picking up knowledge. Some amusement was

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\* The British dead were buried in the part of the local cemetery set aside for the 'Heroes of the Soviet Union'.

caused by the fact that 'while there was a general failure to turn up early in the morning' they were 'willing to work at high pressure at any hour of the night'. A close and friendly liaison between the British and Russians was established and maintained throughout, fostered perhaps to a great extent by the skill of our pilots in good formation flying and fighting, by the performance of the Hurricanes, and by the bond of unity against the common enemy.

Weather was not abnormal for the area. During the first part of September it was fine, with cold nights but no frost. Towards the latter part of the month there was rain and a good deal of mud, and later on snow. (See Plate XXIV.) Night frosts became severe early in October, and snowfalls continued at intervals from then until the end of November, when the wing left. When winter conditions had set in frosts of between  $-10^{\circ}$  and  $-16^{\circ}$  C. were common, the lowest recorded ground temperature being  $-20^{\circ}$  C.\* The prevailing wind was from the south-west and it was when this was blowing that conditions seemed most severe.

The wing was divided up for the return journey. The advance party left Vaenga on November 16 for transfer to minesweepers sailing for the United Kingdom in convoy. Three days later half the wing embarked in H.M.S. *Kenya* and the destroyers H.M.Ss. *Bedouin* and *Intrepid* at Murmansk. While waiting to pick up the convoy from Archangel they took part in a combined naval operation with the Russian Navy, finally sailing for home on November 28. The remainder of the wing returned on December 1 in H.M.S. *Berwick*. The homeward voyage was without incident, apart from rough weather and the transfer from the *Berwick* to a hospital ship at Scapa Flow of four casualties. On arrival in the United Kingdom on various dates during the first two weeks of December wing headquarters proceeded to R.A.F. Station, Ouston, No. 81 Squadron to Turnhouse and No. 134 Squadron to Catterick.

#### MEDICAL ORGANISATION

Medical personnel of the wing comprised the two medical officers, one of squadron leader rank as Senior Medical Officer and the other a flight lieutenant. They shared the medical work of wing and squadrons, with a staff of one flight sergeant, one sergeant sanitary assistant, one corporal, and eight nursing orderlies, all volunteers, selected at Leconfield to the verbal specification of the D.G.M.S. of: 'good men who can "take it", and no passengers'. Squadron medical equipment was to the Z.1 Scale and there was one ambulance, two 500 gallon-per-hour water trailers, four Bell water sterilisers, one medical and one

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\* Acid in accumulators and even petrol froze, on one occasion, inside an unheated wooden hut.

surgical companion, a medical board pannier and sanitary stores. Before embarkation full medical and dental examination was carried out and personnel were inoculated against the enteric group, tetanus and smallpox on departure.

For the sea voyage medical equipment was provided on the ship. There was no opportunity of checking wing medical stores, as these had already been loaded. General health *en route* was excellent. On arrival in Russia many culicine\* mosquitoes (but no anopheline) were encountered. Stores and equipment were split up for the use of various parties proceeding by different routes from Archangel to Vaenga and for the assembly party which was left behind. The only medical problem arising in the four-day train journey made by one of the parties was that of bed-bugs. Pocket boxes of water sterilising tablets and thio-sulphate enabled water to be rendered potable by hyperchlorination in the water bottles, an additional safe supply being obtainable from boiling cauldrons at the railway stations *en route*.

On arrival at Vaenga six rooms of the administrative block were taken over as wing sick quarters with accident reception room and a ward of (at first) 5 beds. Accommodation was satisfactory, if a little crowded, and was warm and comfortable; the three barrack blocks in which the men lived were, however, infested with bed-bugs. At the aerodrome there was a first-aid post with three Russian ambulances and a Russian medical officer and orderlies. The pipe-borne water supply to the barrack blocks was pumped from a tank through the water trailers for drinking purposes and distributed in the water-bins. Drinking water for the aerodrome was obtained by pumping through the trailer from a nearby lake. (*See Plate XXV.*) When, on October 2, the pipe-borne water supply from the village was cut off, the lake provided a substitute source, though hand-dosing was necessary towards the end of the month when the trailers became unserviceable through freezing up. Ablution facilities were satisfactory and each man had at least one Russian bath per week in the village.

The S.M.O. made early contact with the medical officer at the British Naval base at Polyarno, and with medical staff of the Russian hospital there.† Close co-operation was maintained at all times with officers of the Russian Fleet Air Arm and Army Medical Services and two of the former lived in the wing sick quarters for a period at the end of September in order to study R.A.F. medical arrangements. Visits to the wing were also paid about the same time by the Consultant in Surgery to the Russian Army, Northern Area, and by the corresponding

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\* Assumed culicine.

† The junior medical officer was attached here for a few days during November to assist in the care of a British Naval officer with a fractured femur, and to look after naval sick.

officer of the Russian Fleet and the Regional Administrator. Both the British medical officers were able to visit Russian hospitals\* in this area; four of the hospitals acted as clearing stations or base hospitals for the wing. A diagram of the casualty evacuation plan is shown below.

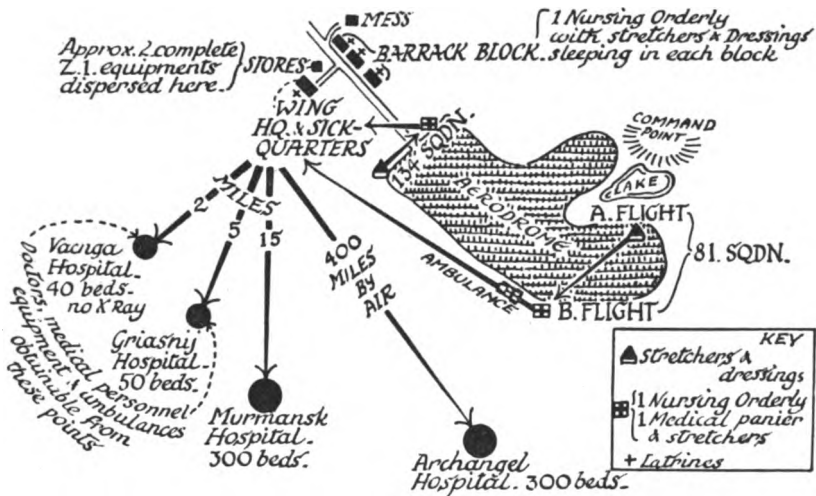


FIG. 1. Diagram showing the casualty evacuation plan, Vaenga.

The first case to be transferred to one of these hospitals was the pilot survivor of the accident on September 27, suffering from compound fracture of the thigh and concussion. He went first to the local hospital at Vaenga, thence to Murmansk and from there by hospital train to Kandalakcha and boat to Archangel, where, after a wait of three weeks, he joined a convoy for the United Kingdom. The balance of cases not fit for duty at the time of the wing's withdrawal were transferred from the sick quarters to H.M.S. *Berwick* which brought them, together with two embarkation accidents (fractured tibia and torn thigh muscle respectively), back to the United Kingdom. Four of the casualties were transferred to the hospital ship *Amarapoora* at Scapa Flow in the first week of December, during the return voyage, which otherwise offered no problems of medical interest.

Further details of working conditions, personnel, equipment, general health, and disposal of casualties are given below. Enteritis and coryza formed the chief causes of disability.

WORKING AND LIVING CONDITIONS

The chief hygiene problem concerning accommodation was bed-bugs. Affected rooms were systematically treated by the Russians with pyrethrum powder insufflated into cracks in the wood-lined walls.

\* These are described in the second part of this chapter.

This was supplemented by spraying, using an emulsion of paraffin, anti-mosquito oil, and soap solution, but neither method acted as more than a deterrent. The bugs caused severe though not disabling bites, and proved of little more than nuisance value. Rats were not seen, but mice were plentiful and did a certain amount of damage.

The six rooms for the wing sick quarters were satisfactory. Regular weekly 'F.F.Is.' were carried out but little pediculosis and scabies were found. Cover from air raids by means of slit trenches on the aerodrome and near the barracks was also adequate and there were only two raid casualties during the three months in Russia. The pipe-water supply facilitated provision of water for drinking and washing, but for the former purpose it was purified by the trailer as an extra safeguard; boiling and direct chlorination were also used, a large barrel for drinking and cooking water being kept at each of the two kitchens, and 8-gallon containers or bins from the trailer being distributed daily to the men's living quarters and the aerodrome. Sanitation required no improvisation, as the cesspool type of latrine was already provided.

#### MESSING

On arrival at Vaenga (0830 hours) the wing was provided with a meal comprising caviare, smoked salmon and tinned Latvian ham, accompanied by champagne, red wine, and vodka and served by Russian girls. On the orders of the wing commander this princely fare was soon modified, though wine was allowed, while it lasted, with the evening meal. Russian tea was served with every meal, and during the cold weather a 2½ oz. issue of rum, diluted on the spot, was issued to officers and airmen every night. Goose, veal, beef, salmon, eggs, milk (this was regularly boiled) and beet-sugar were among other foods supplied in this 'Russian mess', and soups were excellent. There being no fish, and scanty fresh vegetables and fruit, diet was supplemented by ascorbic acid 25 mg. per man, daily. As the wing had brought its own field-service rations a rival 'English mess', seating 200, was started and this relieved pressure on the other mess, which could only seat 100. The two messes were used alternately, with a weekly change over, and in time there was only a slight preference for Russian fare 'when the garlic and other stuff had been taken out'. So far as alcoholic drinks were concerned there was nothing obtainable nearer than Murmansk.

#### PERSONNEL

The medical personnel included one airman veteran of the 1914-18 War from the R.A.M.C. but were for the most part young and the majority of them proved keen and capable despite the fact that, with one or two exceptions, none had been in the R.A.F. longer than six months. The morale of the wing as a whole was good, though lack of

work, when it had handed over its aircraft and equipment to the Russians, offered a difficult occupational problem. Skis had been provided at the outset, but inexperience, over enthusiasm and rough ground soon rendered these unserviceable; other winter sports included tobogganing and traction (by motor transport) across the aerodrome at speed. Kit inspection, rifle shooting, route marches, football and P.T. on the aerodrome (necessarily stopped during the extremely cold weather) were the only solutions to the difficulty, which was enhanced by an unaccountable delay in delivery of mail from home, the first batch of which did not arrive until November 8. In this connexion the opinion was expressed that, quite apart from the resultant provision of organised worship, the posting of a chaplain to the wing would have been of value. Vaenga was relatively isolated, with no shops and only one 'general store', the absence of any nearby town contrasting forcibly with conditions existing in the French campaign. Despite this, use of the communal village hall (Home of Culture) for dances and singing (with the Russians) and bi-weekly cinema shows was possible, and time-off allowed many of the personnel to visit Murmansk. Films were mostly Russian, the British pictures arriving only towards the end of the period. Russian fairy tales and English cartoons were universally popular.

Despite language difficulties a solid basis of mutual respect and understanding was formed between Russian and British personnel. A surprising feature was the absence of political propaganda. On the professional side the two wing medical officers made good use of their unique opportunities of exchanging knowledge and ideas with the Russians.

#### EQUIPMENT

The two 500-gallon-an-hour water trailers worked well apart from some initial trouble with obstruction of the filter candles, causing high readings. When the cold weather set in, however, they froze up, even while working. The extreme cold and absence of adequate cover from the prevailing wind may have been partly responsible but it was thought that this design would never be proof against the low temperature experienced—even lamps proved useless to prevent freezing. The trailers were handed over to the Russians, with other equipment, when the wing returned. Four Bell sterilisers were used and proved satisfactory. A large 1,000-gallon tanker lorry, loaned to the wing by the Russians, was also used. This was fitted with a mono-stator pump, was of robust construction and had the absolute minimum of piping liable to freeze. Tank and pump were drained after each delivery round.

Three portable box disinfectors were to have been sent with the wing but did not arrive in time; improvisation on the lines of the 'Serbian



barrel' was therefore made. The only disinfectant possessed by the Russians in this district was at Murmansk and as it had to cater for large numbers of naval and military personnel it was not available to the R.A.F.

Aircraft flown from the carrier were by an oversight not provided with first-aid outfits. The medical and surgical equipment (Scale Z.1) provided for the squadrons, however, proved adequate, though the addition of a surgeon's roll of instruments and dried plasma for blood transfusion would have been useful. The Crookes' normal saline and glucose supplied was not considered satisfactory. Medicines—even cough mixtures—were in tablet form, but could be supplemented by local purchase; soap, liniment and medicinal paraffin ran short towards the end of October. Anti-mosquito oiling solution was included in the stores but the character of the country would have made its effective use, had this been necessary on an extensive scale, a matter of some difficulty.

No arctic clothing was received by the wing, though three officers and fifty men of a proposed rear party which was to be left behind in the country were issued with Russian winter clothing. This consisted of fur hats with ear flaps, dog fur gloves and thick felt knee boots; the officers had quilted trousers and lined leather coats with fur collars, and the men sheepskin coats. (See Plate XXVI.) The aircraft servicing parties found they could not work freely or climb over the aircraft in their heavy long coats and it was necessary to obtain short warm jackets of Russian type. Russian flying helmets made of leather lined with fur, with a silk skull-cap worn underneath, were given to some pilots in exchange for their British helmets.

#### CLINICAL WORK

Health on the whole was good. The typhus belts issued were not worn as there was no indication for using them, and—in view of the small number of cases (six of *P. pubis*, one of *P. capitis* and none of *P. corporis*)—no opportunity for testing them arose. There were only five cases of scabies. The chief conditions requiring treatment were coryza and naso-pharyngitis, which provided 55 cases (of whom 9 were admitted to sick quarters necessitating 67 days off duty), and enteritis. The latter disease came in two waves, resulting in 73 cases of whom 13 required admission to the sick quarters. The first attack was about seven days after arrival and the second coincided with the change over from automatic to hand-dosing in the water trailers. Flies may have played a part in the infection.

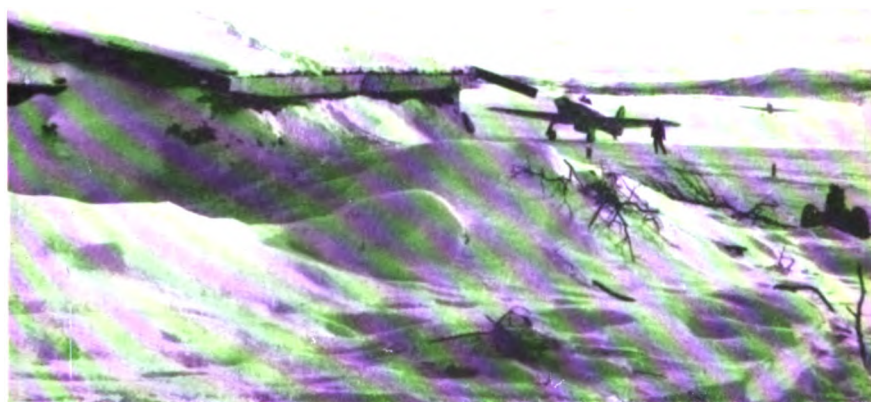
The bill of health is illustrated in the following summary.\* From

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\* Strength of the Wing=553-556 (34 officers).



**PLATE XXIII:** 'Pooling' of airfields in wet weather causing accidents on landing



**PLATE XXIV:** Snow on the airfield



PLATE XXV: A mobile water cart filling from a nearby lake



PLATE XXVI: Airmen in Russian winter clothing. There is obvious difficulty in aircraft maintenance while so dressed

the opening of the wing sick quarters on September 1, 1941, until its closing on November 29 there were only 114 admissions to sick quarters, 61 of which were 'under 48 hours' cases; of the admissions all but 8 returned to duty before the wing's return. During the whole period five patients had been in Russian hospitals at Vaenga, Murmansk, Griasnij and Archangel.

Medical conditions accounted for well over two-thirds of the admitted cases. Taking the fifty-three 'over 48 hours' cases: of the respiratory infection group there were 14, including one case of pneumonia; of alimentary conditions 15, all but two of them enteritis. There was one case of chickenpox, one of gonorrhoea (contracted in England), half a dozen general medical conditions of no special note, one dental and one eye case. Of the surgical conditions there were four major (multiple injuries) cases, three of these (two fatal) from the Hurricane accident, and one the sergeant pilot shot down in flames and killed in action. There were only two air-raid casualties, one with shrapnel wounds (admitted) and one with concussion. Five cases suffered from staphylococcal skin infections and there were three other surgical conditions including one fracture-dislocation.

An average of ten beds was equipped at the sick quarters, the greatest number occupied being 14 (during September) and the least four. Medical returns included Forms 38, 41 and 3118.

#### EVACUATION OF CASUALTIES

The local evacuation arrangements have already been described and shown diagrammatically. There were two main routes of evacuation from the area, one by rail from Murmansk through Kandalakcha and Onega to Archangel taking five to six days; and the other by the same route as far as Kandalakcha and thence by hospital boat through the White Sea to Archangel. The long sea route from Murmansk to Archangel round the Kola Peninsula took two to three days. Air ambulances were frequently used by the Russians, the machines being converted Douglasses and Catalinas, taking up to 20 cases each.

An account of the Russian medical arrangements in this area is given in the second part of this chapter.

#### MAINTENANCE PARTIES IN RUSSIA—WINTER 1941-2

In addition to No. 151 Wing there were, during the latter part of 1941, two R.A.F. parties working on the assembly of aircraft at Kinechma (near Gorki, on the Volga) and Kadnikov (near Vologda, in the Archangel district). Although no R.A.F. medical arrangements were made for these men a short note on their living conditions is given here, based on a report rendered by a R.A.M.C. major, a member of the Military Mission to Russia, who visited and inspected them during November

1941. At both stations the men were fit and in good spirits, their chief wants being news from home, reading matter and games, and English cigarettes and pipe tobacco.

The Kinechma party, consisting of 3 officers and 19 airmen engaged in the assembly of Hurricanes, was housed in a small hotel four miles from the aerodrome, to and from which they were driven in a closed bus. Except for the use of a small hangar for initial assembly and a shed in which spares were kept, all work was done in the open, often in conditions of extreme cold, or wet. The Russians with whom the men were working did the purely manual labour, but the British airmen had to do the fine adjustments with bare hands out of doors, and this resulted in several cases of minor frostbite. Sanitation was in the charge of a female officer, a male Russian doctor looking after 'household complaints'. During his visit the R.A.M.C. major handed over drugs and other medical stores for the men's use. Latrine and washing arrangements had at first been bad, but a roster for sanitary work had been organised by the officer in charge with satisfactory results. The men, who had left the United Kingdom at short notice, possessed no winter scale clothing but had managed to get heavy coats in Archangel, while the Russians had provided them with caps with ear flaps, wind proof mittens, felt knee boots and, later, winter underclothing.

At Kadnikov a party of six airmen was giving technical advice to the Russians on the assembly of Tomahawks on the Sokol aerodrome ten miles distant. Here again much of the work was done in the open air, but the men had improvised a shed from aircraft packing cases, heated by a stove, and had made a dining room by joining several of these together. This party was also living in a small hotel with inferior washing and latrine facilities, for the improvement of which arrangements were made. They, too, had been provided with winter clothing by the Russians, consisting of quilted coats and trousers, gloves, hats and felt boots.

## **Notes on the Russian Fleet Air Arm Medical Service**

The Russians had two medical services, Naval and Military, the Air Force Medical Service being a branch of one or the other.

Medical personnel could be interchanged between the two services depending on the area to which they were posted. Anyone wishing to enter one of the medical services commenced his medical training at a Service Institute of Medicine and continued through a complete course there, lasting five years. These Military Medical Institutes were separate

from the Institutes for would-be civilian medical men, although every civilian doctor had to do three years' military service as a medical officer. Distinct from the Service doctor was the 'Feldsher' who passed through a special curriculum lasting approximately two or three years, and was then admitted to the Services. His duty was to assist the doctors and dentists in the giving of first aid and morphia, the control of sanitation and in anti-gas work. Medical orderlies could become Feldshers but had to do the two or three years' course first. There were two grades of dentist—doctor-dentists, who had medical training and specialised in dentistry (a five years' course); and dentists proper, who had about two years' instruction and were only employed to do extractions and fillings of a minor type. The dentists were prepared to carry out most treatments when a doctor-dentist was not available.

Both medical officers of senior rank and hospitals had Commissars attached to them. These Commissars usually retained connexion with medical personnel or Institutes throughout their service. Their duties seemed to be mainly welfare and political instruction of patients, though at the same time they kept watch on the manner in which their medical officer or hospital superintendent was performing his duties.

#### FLEET AIR ARM MEDICAL SERVICES

The grading in the Fleet Medical Service corresponded neither to that in the R.A.F. nor to the actual duty the officer had to perform. The various grades of Fleet Air Arm medical officers and Feldshers were, working upwards, as follows:

<i>Grade</i>	<i>Rank Badge</i>
(1) Feldsher . . . .	One and a half thin silver stripes on a green background surmounted by a silver star.
(2) Senior Feldsher (or first-year doctor on probation)	Two thin stripes.
	(There was some controversy over this rank, as the doctors wanted it cancelled, and confined only to Senior Feldshers. A Feldsher never gained a higher rank than this.)
(3) Doctor 3rd Rank . . . .	Two and a half thin stripes.
(4) Doctor 2nd Rank . . . .	Three thin stripes.
(5) Doctor 1st Rank . . . .	Four thin stripes.
(6) Brigade Doctor . . . .	One broad stripe.
(7) Divisional Doctor . . . .	One broad and one thin stripe.
(8) Corps Doctor . . . .	One broad and two thin stripes.

A 'regiment' of two to three Air Force squadrons would have one junior medical officer attached as regimental medical officer. He travelled with the squadrons wherever they were posted, but without staff or equipment. As soon as he reached the aerodrome or aerodromes



with his regiment he reported to the area medical officer and requested medical personnel, equipment and ambulances for his squadrons while he was in that area. This regimental medical officer was responsible for the welfare, dieting and messing of his personnel. The area medical officer was situated at a military headquarters of some kind, and had hospitals available, together with medical specialists who would attend to cases, including those from the squadrons operating at aerodromes in his area. Assisting the area medical officer were medical officers for sanitation, catering and other duties, the area medical officer being responsible to the inspecting medical officers at Moscow, who were departmentalised into the control of sanitation, administration, flying, etc. Finally, the Fleet Air Arm medical chiefs were responsible to one man, the head of the Naval Medical Service.

The Russian field medical equipment seemed less adequate than that of the R.A.F. They had the corresponding squadron pack-ups, which included washing materials and concentrated fluid drugs, with empty bottles for solutions (these were in a dispensary box); there was also a complete set for testing food and water supplies. For two squadrons a larger box was used carrying approximately double the material for one squadron. These were only for use when the units were going to areas devoid of area medical assistance and equipment. Splints were not seen, but these were carried separately; a Thomas-Vinogradus splint (ordinary Thomas splint with an expansible ring) was used for transporting lower limb fractures.

#### NORTH RUSSIAN AREA MEDICAL ORGANISATION

The main control centres for this area were Archangel and Murmansk, the former being the most important. All severe casualties were, if possible, evacuated to Archangel, but the consulting specialists were continually visiting both places.

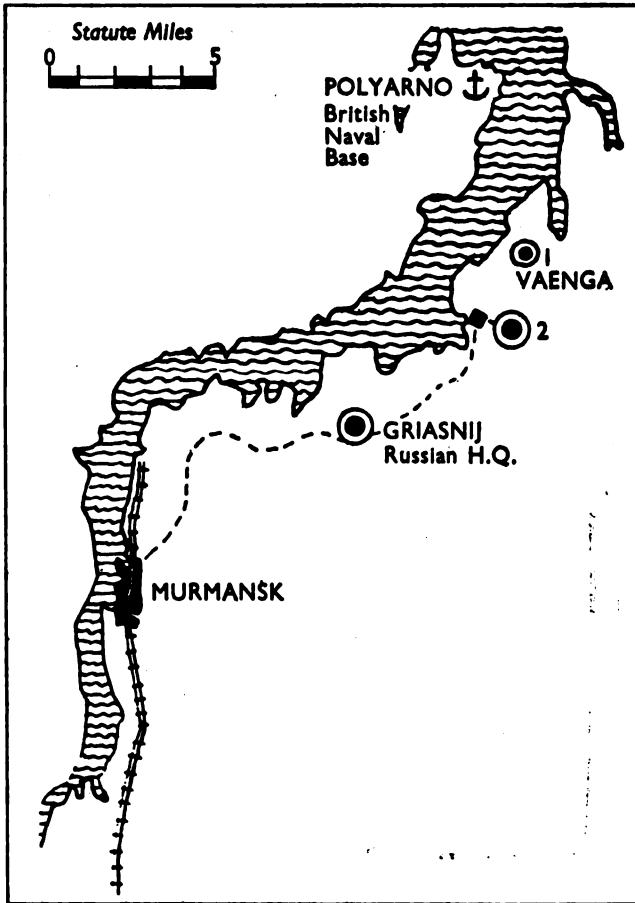
Army wounded from the Finnish Front had to be transported down a bad road to Murmansk, crossing the Murmansk inlet, the only hospital on the west side of the river being at Polyarno. The road from Murmansk to Griasnij and Vaenga\* was third rate and sometimes became impassable in January and February. There was also a single track railway. From November 1 till approximately late April the White Sea was impassable for hospital ships and consequently only the air and rail routes could be used.

The Murmansk–Archangel sea route (for hospital ships) passed round the Kola Peninsula, and the journey usually took two to three days. This was the most popular route. The Murmansk–Archangel rail and sea route was *via* Kandalakcha, the first part of the journey taking

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\* Location of aerodrome from which No. 151 Wing was operating.

12 hours in an ambulance train. Cases were transferred to a hospital ship at Kandalakcha and taken to Archangel across the White Sea, the latter part of the journey requiring 36 to 48 hours. The whole journey took about 72 hours. By air the route was by road ambulance to Griasnij, from Griasnij and Vaenga by Catalina aircraft, and thence to Archangel by Douglas aircraft, a journey of between 3 and 4 hours. (See Map 2.) The all-rail route, Murmansk–Archangel, was *via* Kandalakcha and Onega and took 5 or 6 days by ambulance train.



MAP 2. Murmansk area.

The hospital ships were well equipped—some with operating theatres on board. They were of considerable size, and could transport from 280 to 500 casualties each. Air ambulances were usually of Russian type, but Catalina and Douglas aircraft, specially fitted for transporting casualties, were also used. The Catalina took a total of 28 cases (11



stretcher and 17 sitting); the Douglas could take between 18 and 20 cases (8 stretcher and the remainder sitting). The Catalinas took off from the bay at Griasnij, about ten miles from Murmansk and four miles from Vaenga; the Douglases started from either of the two aerodromes at Vaenga.

#### HOSPITALS

The following notes comprise impressions gained at half-a-dozen hospitals in the area in which the R.A.F. wing was operating.

The hospital at Vaenga was very small, situated in a block of flats in the village, with a capacity for twenty or thirty beds. It had a small operating theatre, but this was in another building and patients had to be carried outside to their beds after an operation. Sanitation and ventilation were inferior, judged by western standards, and both medical attention and conditions in the dental surgery were not of a high order. There was no X-ray. Griasnij hospital was much better, being in a new building which had just been taken over and completed. It was clean, with fair ventilation but poor sanitation. There was an operating theatre with two tables, and medical attention was satisfactory. X-ray plant had just been installed—one movable table, but no portable. The dental department here was greatly lacking in cleanliness, but was on the point of being moved into another building.

Murmansk Naval Hospital was situated on a hill, overlooking the town, and in peace-time was a school. Its capacity was 200 to 300 beds, and it was a two-storey building of brick. The wards were generally large, with high ceilings, the biggest ward containing about 60 beds. The beds were very close together, with only a small locker separating them, and on occasions were actually touching. Each had a spittoon at the side on the floor containing water or disinfectant. The ward ventilation was poor. Windows were rarely opened, and even when they were only the small 18 inch square ones were used. In most of the wards the smell of stale air seemed oppressive. Electric lighting was installed throughout the hospital, and was generally in use during the daytime, daylight being rarely seen (November). The operating theatres were on the first floor and were spacious. There were two of them, with five tables in all, a dressing room being used for preparing the patient before transfer to the theatre proper. Asepsis was maintained in the theatre. Anaesthetics given were usually open ether and chloroform, and whenever possible, local anaesthetics. Gas and oxygen was not used, except in the large cities, as there was a shortage of apparatus.

The X-ray department at the naval hospital comprised two movable tables and one portable. Screening was employed to a considerable extent. The X-ray photographs taken often showed defects in the length of exposure, and there was a tendency to skimp the size of

the plates used for X-raying given areas. Even in this hospital the sanitation left much to be desired. Though water closets were provided on each floor they were always found to be fouled, smelling strongly of faeces and urine. Newspapers and thick brown paper were used for toilet purposes and when finished with were placed in a container at the side of the pan. The system was often blocked. When visiting the wards personnel wore white coats or gowns. The nurses always had their hair covered, but although they seemed clean themselves their white smocks were far from spotless.

Other hospitals in Murmansk were the Army hospital, situated to the north of the town, with a bed capacity of 1,000; and the infectious diseases hospital, also outside the town, with a capacity of 70 beds. Facilities seemed adequate for the treatment of these diseases, and of venereal disease which was also accepted.

Polyarno Naval Hospital lay at the mouth of the Murmansk inlet on the west side of the river and was a converted school with a capacity of 200 to 300 beds. Conditions in the wards, ventilation and sanitation were much the same as in the other hospitals. One saw many flies here (about the middle of September), with apparently no attempt to control them either in the wards or in the theatre. Surgical and medical cases were mixed in one ward, although the hospital was less than half full. One operating theatre with one table and a dressing room seemed to have inadequate space. Asepsis was not 100 per cent. and although a great effort was made to maintain a high standard, clean cases were often operated on without gloves, even when the peritoneum was exposed. There was no X-ray installation at the time of visiting, though a portable set was on order. In emergencies a portable set was obtained from Murmansk, 1½ hours by boat.

There was another naval hospital (500 beds with X-ray facilities) at Kandalakcha, while at Archangel there were four or five Naval and Army hospitals with a capacity of 200 to 300 beds each and possibilities of expansion.

#### NOTES ON TREATMENT AND NURSING

In surgical treatment Bohler's methods were adhered to in all the hospitals visited. Thomas splints were only used for transporting casualties. In the cases of the two fractured femurs—sustained respectively by a pilot treated in Murmansk, and a naval doctor treated at Polyarno—the treatment did not seem satisfactory. The use of Fowler's position for abdominal cases did not appear to be fully recognised. Anaesthetics generally were not well administered. Novocaine was used wherever possible, preceded by morphia. Evipan was also used, but pentothal-sodium was not encountered, nor was N<sub>2</sub>O gas seen, even in the dental surgeries. It appeared that only the large hospitals in the big cities had

it. Blood transfusion was mainly direct, blood donors being available at Murmansk.

The sulphonamide group of drugs was employed as much as possible, although at the time they were very short of both sulphanilamide and sulphapyridine. Sulphapyridine was given to cases of pneumonia, gonorrhoea and other infections; in gonorrhoea a total dosage of 17 g. was given over eight days.

The standard of nursing was not high. Methods of handling the patient seemed somewhat rough and ready, and this also applied to the washing of the patient and the making of the bed when he was in it. Prevention of pressure sores did not seem to be fully understood.

Everyone in the service carried his or her gas-mask, but no actual anti-gas personnel clothing was seen except in the squads actually employed on anti-gas duties. Decontamination centres were organised on R.A.F. lines and there were also mobile units on aerodromes and at main centres. These included lorries with portable showers and water tanks, bleaching powder and water being used, and also a special mixture (the composition of which was not disclosed) for spraying or peppering on contaminated skin for lewisite and mustard-gas cases.

#### DISEASES PREVALENT IN THE NORTHERN AREA

Mosquitoes occur mainly in the Archangel region between May and September, the worst months being June and July, and finally disappear in August and September. They are said not to be malaria carriers. In the Murmansk region they are less prevalent. Black flies are a nuisance in Archangel in the summer, causing small scratches of the skin and subsequent septic sores. Again very few are found in the Murmansk area.

*Malaria.* This disease did not occur as a primary condition, and all cases seen were relapses. On passing south to Leningrad one was said to find much malaria.

*Dysentery.* Cases were occasionally met with and were generally of the Shiga variety.

*Pediculosis.* There was very little of this in the Armed Forces, and if a case was found a very serious view was taken of it. The civilians were lousy, but, according to reports, not to a great extent. Large disinfection centres were situated in Murmansk and Archangel with mobile units.

*Typhus.* No cases had been reported in the Northern area for many years. All medical officers consulted were emphatic as to the truth of this statement.

*Worm Infestation.* This was occasionally found in the civilians, but very rarely in the Services. Thread-worms and tape-worms were the types concerned.

*Cimex Infestation.* Bed-bugs were a source of much trouble in Archangel and Murmansk. Most buildings were found to have them,

and also trains and boats. They were about the size of a tropical bed-bug and caused large painful bites. Pyrethrum powder was used by the Russians but it was found that paraffin and wintergreen was quite effective in keeping them in check.

*Scurvy.* This did occur in this region owing to the poor supply system from the South (*via* the one-track Murmansk-Kandalakcha railway) of green vegetables, tomatoes, etc. Service personnel were usually given 25 mg. ascorbic acid per day and the civilians were urged to buy supplies from the chemist.

*Veneral Diseases.* Syphilis was very rare indeed. There was only a very low incidence of gonorrhoea in the Services. When a case was discovered, the patient was made to divulge the identity of the suspected female. When she was found, if there was the slightest doubt about her being trusted while under treatment, she was immediately sent away to a base area, work being found for her there. Prostitution was practically unknown and if by any chance a girl was found plying this trade she was immediately removed from the region. The women in the area occupied by No. 151 Wing maintained a high moral standard.

#### FLYING PERSONNEL

On entering either of the Air Arms (Naval or Military) the prospective member of aircrew had to undergo pressure chamber tests. His categorisation when training was completed was either 'fit bomber pilot' or 'fit fighter pilot'. There were no actual gradings of these categories. The medical history was recorded and held as in the R.A.F. Each man had a book in which were placed his photograph, and a record of all his illnesses and medical board findings. A fighter pilot had a full medical examination once every six months and a bomber crew once a year. There was even an attempt to continue these examinations during the war. Normally, if a pilot was off flying for two weeks or more, he had to undergo pressure chamber tests before flying again, but this practice was discontinued during the war. There was a pressure chamber capable of holding three men at Griasnij, but it was unserviceable at the time of the R.A.F. visit.

Bomber and fighter pilots had special diets laid down for them and it was the medical officer's duty to watch the diet and messing of all personnel. He had to examine and taste all food before each meal. Russian emergency rations consisted of chocolate, biscuits, vitamin tablets, vodka, cigarettes, and water in flasks. These were put up in sealed tins. Special interest was taken in flying clothes and prevention of frostbite, and oxygen was given from 12,000 feet upwards.

#### CONCLUSION

This Northern area visited by the R.A.F. wing must, from the geographical if not from other points of view, be considered rather a

backwater in the Russian scheme of things. Consequently one hesitates to regard these impressions as representative of Russian ways generally. It is only fair to state, however, that conditions still seemed to be primitive in many respects. Communications were bad and there was a shortage of some items of medical equipment, such as anaesthetics, X-ray apparatus and sulphapyridine. The general impression of the standard of medicine and surgery was at best only fair, and nursing methods seemed both unorthodox and rough and ready. The medical and nursing fraternity were inconsistent—at times rational in their methods and the next minute quite the opposite. Co-operation all round, from the medical standpoint, was 100 per cent. and every possible assistance was given to the wing medical unit during its three months' stay in the area.

## CHAPTER 6

### MALTA

**M**ALTA is one of a group of five islands lying in the Mediterranean Sea 60 miles south of Sicily between 14° and 16° longitude E. and 34° and 38° latitude N. The main island is rocky, with little soil, much of it imported. The ground rises towards the south-west where it reaches a height of 800 feet above sea level. The coast line is mainly cliff.

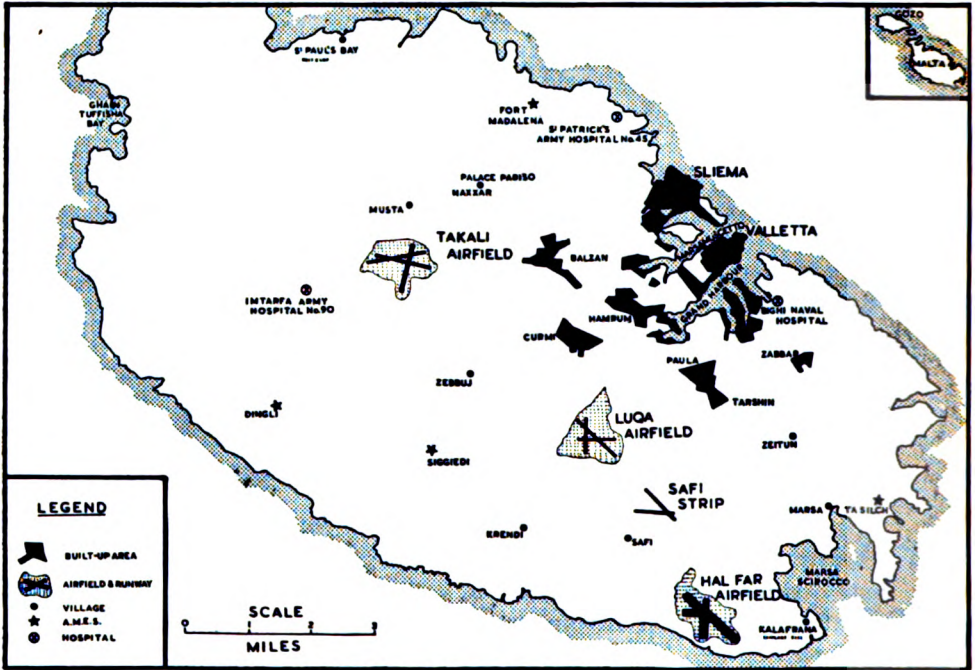
The climate does not differ from that of the Mediterranean in general. A cold wind from the north-east (the 'gregale') blows during the early part of the year for about two months, and during August and September the hot and moist sirocco blows from the North African coast.

#### THE R.A.F. IN MALTA, INTER-WAR PERIOD

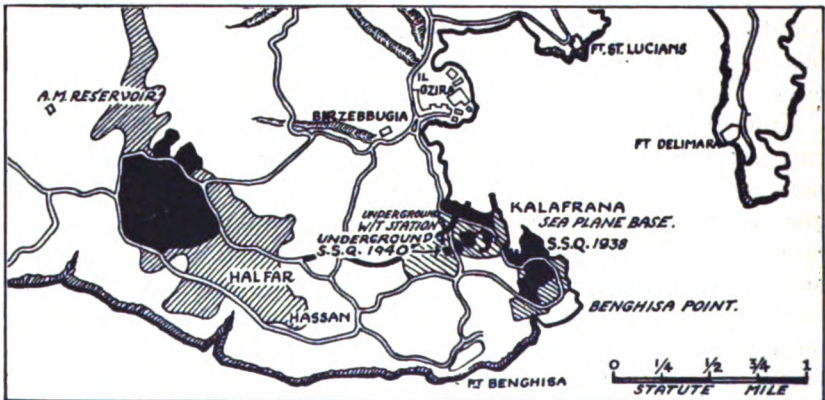
Before the war Malta was the location of 'R.A.F. Mediterranean', a small Command with headquarters in Valletta and a seaplane base, with aircraft workshops, at Kalafrana, which stands on high ground close to Marsa Scirocco Bay at the south-east corner of the island. In 1921, Kalafrana (*see* Maps 1 and 2) provided accommodation for 400 men in good barrack hutments and had a small station sick quarters. An aerodrome at Hal Far, built in 1924, comprising excellent stone buildings, was used chiefly as a shore base for the Mediterranean Fleet aircraft carrier H.M.S. *Glorious*.

From the Service point of view life during the inter-war years was easy and work generally finished at midday. This period was marked, however, by a slow but steady improvement in buildings and barrack and families' accommodation, and a corresponding increase in the numbers of R.A.F. personnel on the island, the strength rising from an average of 330 during the nineteen-twenties and early thirties to between 700 and 800 in 1935 and 1936. In 1936, the civil airport at Ta Kali was taken over, work on the aerodrome and station buildings being completed the following year.

By 1938, increases in personnel were creating a serious strain on the accommodation available, which was often unsuitable in space, layout and sanitation. Many of the older barrack hutments were infested with bed-bugs, introduced by Maltese ratings who lived out of camp in their own homes during their off-duty periods, and this, with the sandfly problem, required the constant attention of the authorities. During 1938, three new barrack huts were built at Hal Far, better quarters were obtained for headquarters at Valletta, a new latrine block with a water carriage system was built on one of the slipways at Kalafrana,



MAP 1. Malta, showing the location of hospitals.



MAP 2. R.A.F. Seaplane base, Kalafrana.

where there were also other improvements to buildings, and a new sub-station, Marsa, was opened on the opposite side of Marsa Scirocco Bay.

HEALTH OF POPULATION

Common conditions such as tonsillitis and respiratory infection, catarrhal jaundice and venereal disease have always figured in the

health statistics of Malta. Among other diseases specially associated with the island are undulant fever and the infantile type of kala-azar, although the latter is now rare. Of the greatest importance from the health point of view are sandfly fever and enteritis (including the special island type known as 'Malta Dog').

The incidence of sandfly fever, which in 1921 was as high as 120 per 1,000, was greatly reduced when the recommendations of a special Commission, set up to study the problem during that year, were brought into operation. Preventive measures included sandfly proofing of buildings and the use of upper floors only as living accommodation; pointing and filling-in of cracks in walls; provision of electric fans; adequate soil drainage; levelling of broken ground and its regular tarring and spraying; and control of vegetation near inhabited areas. The effect of these improvements began to be felt at once among Service personnel and in 1924, when the tarring of all suspect surfaces on stations was completed, other hygienic advantages became apparent; there was now less mud in the wet weather, less glare from reflected sunlight when it was dry, fewer sore throats and a better general bill of health. The expense involved in this preventive work was thus justified by the results, and recommendations for adoption of the R.A.F. procedure were made by representatives of the other Services on the island. Sandfly fever was kept under fairly good control during the ensuing years, the incidence per 1,000 being 17 in 1935 (13 per 1,000 among personnel living on the stations as compared with 39 per 1,000 for those living out), 10 in 1936, 15 in 1937, and 12 in 1938.

During the pre-war years there were few instances of widespread enteritis and only two other diseases require mention here—undulant fever and bubonic plague. Service regulations in Malta have, since 1905, forbidden the consumption of goat's milk, 80 per cent. of which is suspect as being infected with *Brucella melitensis*, and consequently undulant fever has for many years been almost unknown among Service personnel;\* nevertheless, the disease in a mild form was not uncommon among the inhabitants and a scheme for the pasteurisation of goat's milk throughout the island was considered in 1937 and introduced during the following year. By 1939, however, although pasteurisation was enforced at Valletta, it was not carried out universally and risks from infection still had to be reckoned with. The civil population was affected by bubonic plague in 1936, 27 cases being reported, with 11 deaths. No cases occurred among R.A.F. personnel. An intensive anti-rat campaign was subsequently carried out and continued up to 1938, by which time more than 16,000 rats had been killed.

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\* There was a solitary R.A.F. case in 1938.



## HEALTH OF THE R.A.F.

The following figures give some idea of the general health of the R.A.F. in Malta towards the end of the pre-war years. In 1938, with a strength of under 1,000, including Fleet Air Arm, Royal Navy and Royal Marine personnel attached to R.A.F. stations, there were 364 admissions to station sick quarters (at Kalafrana, Hal Far and Valletta) and 171 'less than 48-hours' cases, treated in barracks. One hundred and fifty-four of the station sick quarters admissions were transferred for further treatment to the military or naval hospitals (two-thirds of them to the former). Of the total of 391 R.A.F. patients respiratory infections\* accounted for 82 cases and 'Malta Dog' for 72 (14 of them requiring hospital treatment); there were 81 cases of food poisoning (almost half of which were admitted to hospital), 56 cases of sepsis,† 1 flying accident and 66 injuries (one quarter being treated in hospital); venereal diseases totalled 21 cases, 18 of them urethritis; there were only 12 cases of sandfly fever. Invalidings for the year included 2 General Duties Branch officers, 3 sergeant pilots, 4 airmen, 5 wives of Service personnel and 6 members of the Fleet Air Arm; 127 medical boards were held (at Kalafrana).

General preventive measures during the year included chloramination of the water supply to Kalafrana, fly-proofing, especially of station kitchens, and the usual sandfly precautions already described.

## R.A.F. MEDICAL ARRANGEMENTS

In 1938, medical personnel comprised the P.M.O. and two medical officers located respectively at Kalafrana and Hal Far. A small M.I. room was established at headquarters Valletta and there were station sick quarters at Hal Far, with two beds for crash cases, and at Kalafrana, which had accommodation for twelve airmen and two officers. Cases of a minor nature occurring at either of the units were treated at Kalafrana, more serious cases being sent to the Military Hospital at Imtarfa or the Royal Naval Hospital at Bighi (*see* Map 1). Medical stores, obtained principally from the naval hospital, but also from R.A.F. sources, were allocated and issued by the R.A.F. The P.M.O. acted as President of Medical Boards, whose work included invaliding, and examination of candidates for commissions or for aircrew.

## OPERATIONAL ACCOUNT

This section describes briefly operational conditions in Malta during the war years—particularly after the declaration of war by Italy—and gives some idea of the part played by the R.A.F., first in defending the

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\* Largely attributable to climatic conditions and the unsatisfactory housing on some stations which involved long walks between barracks and ablution and sanitary facilities.

† This was said to be common on the island—especially as a result of insect bites.

island against the enemy and later in offensive operations based on the island. The narrative shows, to some extent, the strain to which all ranks were subjected and the damage sustained and inflicted, thus giving a background to the general medical commentaries which follow.

#### OUTBREAK OF WAR WITH GERMANY

At the beginning of 1939, the strength of the R.A.F. in Malta was approximately 1,000. Of these a number were employed as ground staff in the aircraft carrier, but all pilots were naval officers flying mainly Gladiators.

When on Easter Sunday 1939, Italy invaded Albania, an opportunity was given for a dress rehearsal of local defence arrangements. Aircraft were re-embarked on the *Glorious*, which left the island the following morning, while No. 202 Flying Boat Squadron (forming part of No. 86 Wing, later named No. 101 Wing) carried out continuous patrols. Conditions soon returned to normal, however, and remained so until the end of August. On the declaration of war with Germany, No. 202 Squadron left Malta with the depot ship and proceeded to Gibraltar, in order to form No. 200 Group.

#### DECLARATION OF WAR BY ITALY

Italy declared war on June 10, 1940. The first raid on Malta began in the early morning of June 11 and was followed by a further seven during the day. At this time the only fighter aircraft which the island possessed for operation against the enemy were four Gladiators\* which had been left behind by the *Glorious*. (One of these aircraft was soon damaged beyond repair; the other three were known, and later became famous, as Faith, Hope and Charity.) Such was the state of unpreparedness, that from the local R.A.F. reserves it had only been possible to muster six pilots, none of whom had had previous experience of fighter aircraft or tactics, to fly these machines.† After a hasty training lasting one month, however, these men were ready when the time came and a continuous stand-by of two aircraft was maintained during the daylight hours. In the face of greatly superior numbers‡ their success against the Italian bombers was considerable. Later in June four Hurricanes *en route* for the Middle East were retained at Malta to supplement defences, but as Hal Far was unsuitable for these machines they were transferred to Luqa (*see* Map 1) at the end of the month.

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\* These celebrated aircraft were in packing cases and their assembly was undertaken by scratch crews.

† This situation arose largely because of the view held by the Air Staff that the island could not be defended—a view nearly justified in 1942.

‡ At the declaration of war Italy opposed Malta with a force of over 200 fighter and bomber aircraft based in Sicily. Italian estimates of the fighters in Malta was 25!

Early in August a fighter flight of 12 Hurricanes was flown off H.M. aircraft carrier *Argus* and established on a proper basis of 8 I.E. and 4 I.R. (initial equipment and initial reserve). By October 12, the average number of fighters available daily was 6.5, with ten pilots.

#### EARLY BOMBING ATTACKS ON MALTA

During the four-month period ending October 12, there had been 36 day raids, 13 night raids, 36 enemy reconnaissance and fighter patrol flights and 76 raids 'not materialised'. Enemy operations began with unescorted bombing and reconnaissance raids, but Malta's fighter defence was so successful that for a period of five weeks no bombs were dropped on the island, the Italians concentrating instead on the sending of strong fighter formations to neutralise the R.A.F. fighter defence. This failed and led to the next phase—strongly escorted day raids. These attacks, which were not sustained, were successfully met and gave place in due course to dive-bombing by Ju.87s. After the destruction by Hurricanes of two bombers and one fighter during the third of these attacks there was again a lull. Night bombing, a feature of the early weeks of the Italian attack, was also countered by the island's fighters and, after an interval of several weeks during which there was no night activity at all, was resumed by two pairs of bombers working on moonlit nights. Here again defence was successful and for the six weeks ending in the middle of October there was a considerable diminution of enemy activity.

Of station attacks there were, from mid-June to mid-October, 13 on Luqa, 12 on Hal Far, 8 on Kalafrana, and 3 on Ta Kali; dockyard and ships received 24 attacks. Material damage was considerable at all these places and included six aircraft of various types 'written off' on the ground. Losses among fighter pilots in the air were two killed and one severely injured in action, with three aircraft destroyed in the air.

#### OCTOBER 1940—DECEMBER 1941

As time went on and enemy air attacks were intensified, operational reinforcements to the island increased and towards the end of 1940, Wellingtons, Blenheims and Glenn Martins were operating from Luqa and two Hurricane Squadrons (some of the aircraft equipped with cannon) from Ta Kali, while Hal Far had Swordfish aircraft of the Fleet Air Arm (No. 830 Squadron). Air reinforcements for the Middle East were fairly frequent during the year, the aircraft being flown off carriers to the west of Malta, landing, and continuing, after various intervals, to Egypt, led by Wellingtons and Skuas.

Offensive operations during this period included attacks, mainly by Wellingtons (No. 148 Squadron) on Tripoli, Naples, Bari, Brindisi and

Catania, in Sicily, and anti-submarine, search and photographic reconnaissance by Sunderlands, Swordfish (No. 830 Squadron), Glenn Martins and other aircraft.\* Losses in aircrew amounted to 26 personnel listed as killed or missing and a further 11 wounded.

During the winter (from mid-October 1940 until mid-February 1941) there were 40 high level bombing attacks (28 of them at night), 7 instances of dive-bombing and 5 of low-flying machine-gunning. Enemy reconnaissances, patrols and 'not materialised' raids made up the total of 138 alarms. Tactics underwent a change with the arrival, in January, of the Luftwaffe in Sicily, and there seemed to be more determination, particularly in dive-bombing. Large formations of Ju.88s and 87s were used, but a four-day defence record of 40 enemy aircraft claimed destroyed, with 5 unconfirmed and 12 damaged, led to a progressive falling-off in determined attacks. Excellent anti-aircraft results were also obtained during this period. Ground targets attacked were much the same: Luqa had 12 attacks, Hal Far 6 (both including dive-bombing) and Kalafrana 2. Ta Kali was near-missed twice, the dockyard had 8 attacks and ships elsewhere 6. Damage to stations was considerable. Kalafrana fortunately only suffered superficial, though widespread, damage; at Luqa, however, the position was serious as the officers' mess and living quarters, the signals centre, two hangars and the airmen's barrack block were wrecked and the domestic and operational efficiency of the station impaired. Ta Kali was fortunately unscathed. Five of our fighters were shot down, with the loss of four pilots, and two fighters were destroyed on the ground.

During these winter months offensive operations against the enemy from Malta were increased; Wellingtons which had arrived at the end of October 1940 attacked 18 Italian targets—mainly harbours, but also aerodromes, railways, factories and an arsenal—up to mid-February. Swordfish aircraft continued harbour and shipping attacks, while extended reconnaissances, submarine patrols and searches were carried out by these and other aircraft. Approximately 20 aircraft were lost in these operations and on the ground, and casualties to aircrew (39 killed or missing and 11 wounded) rose considerably. These, coupled with a high accident rate, had a depressing effect on morale, especially as the Wellington squadron was already 'war-weary' and enemy attacks on Malta continued to be severe. Up to the middle of February, 60 aircraft (mainly Blenheims, and Wellingtons) passed through the island on their way to the Middle East.

Maintenance difficulties of this period are evidenced by the fact that at various times there were 18 different types of aircraft with 11 different types of engine. There was also a shortage of spares and a lack of

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\* No. 148 Squadron carried out a total of 217 sorties and No. 830 Squadron 41 sorties.

trained staff which necessitated the training and use of semi-skilled men.

From March until the end of 1941, offensive operations from Malta were maintained and included a great deal of reconnaissance work, the covering of enemy convoy routes with attacks on his shipping, anti-submarine patrols, mine-laying and raids on enemy territory in Sicily, Italy (including Naples and Tripoli) and Sardinia. Attacks were made by several different types of aircraft, Wellingtons being used chiefly for land targets and Blenheims, Swordfish and Albacores against shipping. Hurricanes were used in low-flying attacks on enemy aerodromes. Some Beaufighters arrived for a local operation in May and a large number of Hurricanes in June. July seems to have been a peak month of activity, with 10 squadrons based on the island, 135 aircraft arriving during the month and 90 leaving. During this month Marylands were operating from Malta and it was also the time when the Italian surface vessel attack was repelled with such heavy losses to the enemy. In August a newly formed night flying unit had considerable success in defence. British losses from offensive operations in 1941 were high, particularly during the earlier part of the year when one squadron lost 17 aircraft in three months.

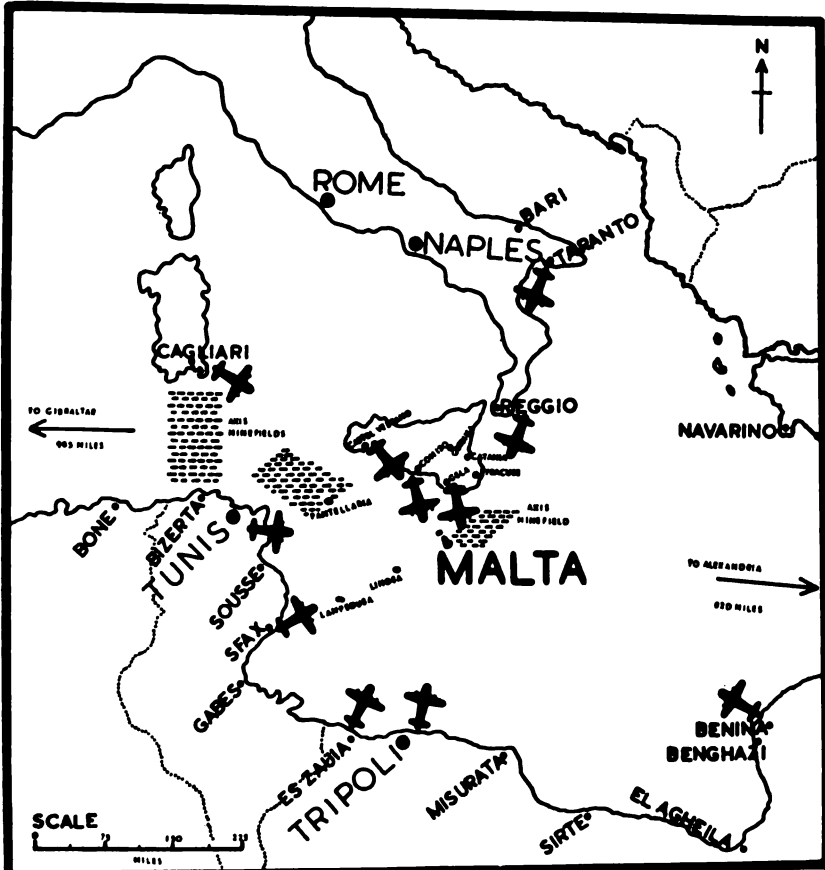
Enemy attacks continued with approximately 100 bombing raids, many of them heavy, during March, April and May, and a number of machine-gun attacks on flying boats at their moorings. From June until the end of the year raiding fluctuated in intensity, but was never very heavy. The number of alerts varied from 30 to 100 per month, bombs being dropped on between 15 and 60 occasions per month. Damage to enemy aircraft seemed to be maintained at a satisfactory level, figures for August being 21 confirmed, 5 probably destroyed and 9 damaged.

#### CRUCIAL MONTHS IN THE BATTLE OF MALTA

The end of 1941 and the beginning of 1942 proved the most crucial of the months of siege which Malta had withstood. The enemy commenced an all out effort to liquidate the island's defences and to render the supply of Rommel's forces in North Africa less hazardous (*see* Map 3). By the end of April this plan had been very nearly accomplished, although the enemy had had to mount as many as 400 sorties per day and in April alone had dropped a total of 6,728 tons of bombs on the island. It is worthy of note that in addition to the already large number of difficulties besetting the defenders, the weather joined forces with the enemy and at one time in January the fighter airfields of Ta Kali and Hal Far were so waterlogged that the aircraft had to be transferred to Luqa airfield.

One factor, which at times almost brought about the grounding of the defending aircraft, was the persistent bombing of airfields and the

difficulty of filling in craters and improvising protective pens for the aircraft. This task of carrying out vital repairs was ably tackled by some 2,500 to 3,000 of the Army personnel on the island and in three months over 27 miles of dispersal runways, 14 large bomber pens, 240 fighter and



MAP 3. The bases from which enemy aircraft operated during the intensive attacks on Malta. Winter and Spring, 1941-2.

reconnaissance aircraft pens and 31 naval aircraft pens were constructed and innumerable craters filled in.

With March began the most critical period in the Battle of Malta. The February convoy to the island had been totally lost and the vital convoy of March (the Vian convoy) produced only three surviving ships.\* Throughout April the island literally fought for her life. The following figures show the estimated tonnage of bombs dropped during the

\* These were unfortunately sunk while lying at moorings within a few days.

month and give an indication of the ferocity of the enemy's attack:

Dockyard area	.	3,156 tons
Luqa	. . .	805 "
Ta Kali	. . .	841 "
Hal Far	. . .	750 "
Kalafrana	. . .	196 "
Elsewhere	. . .	980 "

Army personnel and Air Force ground crews worked incessantly to keep the remaining defence aircraft airworthy and the airfields clear for flying. It had been realised at the beginning of March that the rate of loss or damage to aircraft, particularly on the ground, was exceeding that of repairs and the situation was becoming desperate. It was apparent that only speedy reinforcements of aircraft could save the gallant island which had so long defied the Axis might.

#### THE TIDE TURNS

On Thursday May 7, 1942, the heads of the three Services on the island were informed that 64 Spitfire aircraft were due to arrive two days later and that no effort was to be spared in assisting the safe landing of the aircraft, which would be flown from carriers. It was fully realised that the enemy would attempt to destroy the Spitfires as they came down for refuelling and every available person was pressed into the organisation which was set up to ensure the most efficient servicing of the aircraft. That the operation was a success is common knowledge and the efficiency of the organisation is best judged by the fact that on one occasion six Spitfires were refuelled, rearmed and airborne again within nine minutes of landing!

The advent of the Spitfires coincided with a lessening of enemy action. In April, Field Marshal Kesselring considered that air attack had effectively neutralised Malta and the German Air Force units on Sicily were accordingly withdrawn. The Italians were unable to sustain anything like the impetus of attack and by July, when the Luftwaffe returned to Sicily, Malta's defences were superior to the offensive power of the enemy. Another concentrated attack on the island—the third and last—took place in October, just before the battle of El Alamein. Again Malta's defences were proved too strong and the attack was called off after the enemy had sustained heavy losses.

In August a convoy (Operation 'Pedestal') of five ships reached Malta, including the renowned tanker *Ohio*, but although the supplies brought by these vessels relieved the economic situation considerably many articles, including bread, were still strictly rationed and it was not until the November convoy arrived that the island's position was firmly

secured. From this date the tide of war swung in our favour and Malta assumed an entirely offensive rôle.

#### PREPARATION FOR ITALIAN CAMPAIGN

In the preparatory 'softening up' for the Italian and Sicilian campaigns Malta played an important part, which gathered in impetus until the assault was launched on Sicily in July 1943. Increasing numbers of both heavy and light aircraft were based on the island and these, combined with our naval forces, launched continual attacks on the enemy and effectively disrupted his communications, both land and sea. The ease with which the Allied forces occupied Lampedusa and gained a foothold in Sicily reflected the striking power of the island in its new rôle of assault.

Following the opening of the Italian campaign the island reverted to a quieter rôle, and the strategic importance of Malta declined as far as active operations were concerned. (*See General Medical Narrative—1944-5, page 267.*)

#### GENERAL MEDICAL NARRATIVE

##### CONDITIONS AFTER SEPTEMBER 1939

Soon after the outbreak of war, the medical officer of Hal Far accompanied a number of other R.A.F. personnel when they sailed for Alexandria to form the nucleus of a new Group, leaving the medical officer at Kalafrana in medical charge of his own station and Hal Far, with only one other medical officer—the P.M.O.—on the island. The consequent strain on the medical resources of the R.A.F. was relieved later in the year by the return from the Middle East of the medical officer of Hal Far and in November, by the posting of an assistant medical officer from the United Kingdom to Kalafrana. Families were looked after by a civilian doctor. Dental work was undertaken by the Royal Navy.

During this year health was, on the whole, good, despite increased breeding of mosquitoes, flies and sandflies due to building operations and consequent pools of water following the rain. Sandfly nets were available for all personnel and electric fans provided a further safeguard. Improvements were made to station buildings and increased accommodation provided at Kalafrana and Hal Far, while reconstruction was undertaken at Marsaxlokk. The water supply at Kalafrana still had to be chlorinated for the barrack blocks and boiled in messes and married quarters. Nineteen persons were invalided during the year.

In September 1939, plans had already been made for the evacuation of all R.A.F. officers' and airmen's families to the Palace Pariso, Naxxar (*see Map 1*), which was loaned by the Marquise Scicluna. It had been intended that some 400 women and children should be housed



in this building, which, however, although large and ornate, was poorly adapted for the purpose for which it was required. Actually the move did not take place until May 1940, when all families were ordered to this centre, where they came under the care of a civilian doctor who visited it daily. One nurse and a medical orderly were also provided. Sanitation, overcrowding, fly infestation and general conditions were most unsatisfactory, even though only 200 out of the intended 400 persons were accommodated there. Beds consisted of three-tiered bunks, made up from airmen's beds, and washing arrangements involved the communal use of a corrugated iron shed. Catering was undertaken by the N.A.A.F.I. After a period of some ten days, the international situation having apparently improved, the centre was closed and the families returned to their own homes. On the outbreak of war with Italy, however, they were again ordered to the evacuation centre and, as before, much difficulty was experienced in obtaining a smooth-running organisation. Gradually, after repeated requests, some officers were allowed to remove their families and by the end of 1940, the centre was again closed, families having been transferred to 'reasonably safe' areas in Sliema (*see* Map 1) and elsewhere.

#### HOSPITAL AND SICK QUARTERS ACCOMMODATION, 1940

After the declaration of war by Italy and the commencement of air attacks on Malta, the Royal Naval Hospital at Bighi was closed to in-patients because of its exposed position on the edge of the Grand Harbour; it was still, however, prepared to treat out-patients. Luqa, which had previously been used as a civil airport, was opened as a R.A.F. station in June 1940 and became the fighter station from which Gladiators operated in preference to Hal Far. Ta Kali, another civil airport, was taken over as a R.A.F. fighter station in October, an old pottery being converted for living accommodation, an old garage as station sick quarters and an old bus as pilots' rest room. Medical arrangements at Kalafrana were improved by the completion of underground accommodation, previously intended for a W/T station and having 30 feet of solid rock above it, as station sick quarters. Three rooms were prepared for this purpose, being converted into a medical stores, operating theatre and casualty ward, capable of taking twelve patients on stretchers. Additional equipment for the theatre was obtained from Bighi Hospital, by arrangement with the Surgeon Rear Admiral, who was prepared to provide a theatre sister and operating room assistant on request together with a mobile X-ray apparatus on a trolley. This underground hospital was used to deal with all casualties, flying or ground, occurring at either Hal Far or Kalafrana. A search and rescue service with high speed launch and, later, a float plane, operated from the station and many pilots who were shot down or made forced

landings in the sea were received for early treatment at Kalafrana, being subsequently transferred, if necessary, to the Military Hospital at Imtarfa.

Four new radio units were installed during the year. (*See Map 1.*) The first, at Dingli, comprised three Air Ministry Experimental Stations (A.M.E.S.) accommodated in temporary, later permanent (stone), buildings near the Naval wireless station, water being carried in drums from Valletta and stored in a 150 gallon trailer. The second unit (one A.M.E.S.) was located at Ta Silch in barracks loaned by the Naval Authorities and the third at Fort Madalena in rather overcrowded conditions until the stone barracks at the Fort were completed. The fourth was at Siggiedi. Alterations at Marsaxlokk were completed in December when this sub-station was able to accommodate personnel of flying boat squadrons in four new barrack blocks. Aerodrome extension, new buildings and underground operations room and dressing station were also completed at Hal Far during the year. St. Paul's Bay was used as an alternative mooring for flying boats and three houses were taken over for personnel doing various duties.

Health during 1940 was moderately good, but there was an increase of sandfly fever, especially at Kalafrana (75 cases). Injuries were remarkably low, there being 11 flying accidents, 5 enemy action cases and 45 'all others'. The venereal disease rate was low at 8 cases, dysentery only accounted for 12 and tonsillitis for 24. Admissions to the Military Hospital, Imtarfa, were 355 with 82 'families' and the Naval Hospital, Bighi, took 20 cases before it was closed to in-patients. A R.A.F. travelling dental unit visited stations from June onwards, a dental officer and orderly having arrived from the United Kingdom in January. Approximately 180 Army personnel came under the R.A.F. for medical care.

#### 1941

The year 1941 found the island fighting for her very existence, Luftwaffe attacks being intensified in the early and latter parts of the year, with the Grand Harbour (*see Plate XXVII*) and Luqa as the main objectives. Although there were comparatively few casualties, very considerable damage was inflicted, while the adoption of night raids disturbed the rest of all personnel and did not contribute to efficiency. On the other hand, 'strikes' from the island increased throughout the year and, although these were not carried out without loss, they did much to bolster morale.

The most serious medical problem was that arising from the increase of personnel on the island. The total R.A.F. strength by September was approximately 4,000 flying and ground staff and there was an Army garrison of about 25,000. Naval personnel were not numerous and did

not exceed 1,000, including civilian labourers and stevedores located at their headquarters at St. Angelo.

It was necessary to press all accommodation, suitable and unsuitable, into use, allowing the maximum dispersal possible. Building, primarily the repair of bomb damage, went on continually. Accommodation at Ta Kali was finished during the year and that at Luqa virtually rebuilt.

By January 1941, the number of R.A.F. medical officers on the island had increased to eight. They were distributed as follows:

Headquarters	. 1	Wing Commander (P.M.O.),	1	Flight Lieutenant.	
Kalafrana	. 1	Squadron Leader,	1	Flight Lieutenant.	
Luqa	. .	1	Squadron Leader,	1	Flight Lieutenant.
Ta Kali	. .	1	Flight Lieutenant.		
Hal Far	. .	1	Flight Lieutenant.		

Medical man-power was below requirements but the R.A.M.C. lent staff to fill gaps caused by sickness. As Hal Far was the base for the Fleet Air Arm and as the whole island was well salted with the Army, there was considerable overlapping of medical provision and the already close liaison between the three Services became even closer during the year. Sick parades and F.F.Is. were undertaken by the R.A.F. for both the Army and the Navy and hospital accommodation continued to be provided by the Army hospitals—principally 90 B.G.H. at Imtarfa, but also 45 B.G.H. at St. Patrick's (*see* Map 1). R.A.F. medical clerks were provided at both to assist in documentation. Permission had also been obtained for the Military Hospital, Imtarfa, to be used by officers' families owing to the absence of suitable accommodation in the way of civil hospitals and nursing homes on the island.\*

The completed sick quarters at Kalafrana, built into the side of a rock, proved a considerable boon and little difficulty was experienced in its working. The rest camp at St. Paul's (*see* Map 1), with accommodation for 172 officers and 750 other ranks, helped considerably in providing facilities for rest and relaxation; efforts were also made to provide as much sport as possible, but this was hampered by lack of games equipment.

Sickness rates for the year were comparatively high, the principal diseases being those favoured by the continued bombing and disruption of health services—i.e. sandfly fever (322 cases) and gastro-enteritis (177 cases). Injuries from enemy action totalled 67, flying accidents 50 and all other causes 115.

Air sea rescue personnel rendered valuable service both in the actual rescues accomplished and in the sense of security that their availability engendered in pilots who habitually flew many hours over the sea.

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\* The only civilian alternatives were a hospital dangerously situated on the edge of the Harbour and a Roman Catholic nursing home.

During the year 54 members of aircrew were rescued alive and 7 bodies recovered from the sea.

1942

Conditions for the first five months of the year showed a steady deterioration, the Luftwaffe having virtual air supremacy and bombing largely at will. The Grand Harbour and R.A.F. landing grounds (*see* Plate XXVII and Map 1) were again the main targets and much damage was inflicted on materials and buildings. R.A.F. casualties were 62 killed and 320 injured.

Concomitantly the general health showed a decline which, though not serious, put an increased load on an already overworked and understaffed medical service; this was true of civilian as well as Service medical arrangements. The diseases of importance were again headed by sandfly fever, the conditions for breeding becoming more ideal as the bombing continued. Upper respiratory diseases, though of a minor nature, increased directly in proportion to the need to spend many hours in poorly ventilated shelters. Small epidemics of the more serious diseases were typified by 28 cases of diphtheria, 13 of typhoid, 24 of polio-encephalitis and 142 of dysentery. Although no serious disruption occurred in water supplies care had to be exercised in its use and this, combined with a shortage of soap, was probably partly responsible for the increase in skin diseases, of which scabies (common among the Maltese) was predominant.

Accommodation, which had caused considerable concern in the previous year, became even worse and such living quarters as a poorhouse near Luqa previously considered unfit on medical grounds had to be used to house 890 airmen. This poorhouse, in addition to being badly damaged through bombing, adjoined a Leper Colony, the inmates of which roamed the district at will; the use of such accommodation illustrates the extreme seriousness of the position. It was also necessary to condone the use of three-tiered bunks—an undesirable measure as with these sandfly nets could not be used.

While hospital accommodation continued to be provided by the two R.A.M.C. hospitals, the offer of beds for convalescent officers at the Naval Hospital, Bighi (*see* Map 1), was gratefully accepted and helped considerably. The underground station sick quarters at Ta Kali (*see* Plates XXVIII and XXIX) and Luqa, the latter opened in November, proved very useful, particularly that at Luqa, which station received much attention from German bombers. A ground plan of the station sick quarters at Ta Kali will be found in Fig. 1 overleaf.

By 1943, the sick quarters at all the R.A.F. stations had been accommodated underground. This, apart from being necessary, gave a sense of security in the knowledge that the wounded would receive attention

in safety. It was possible by the endeavours of the works services and individual ingenuity to transform these rock caves into very serviceable and well appointed sick quarters with all the normal amenities.

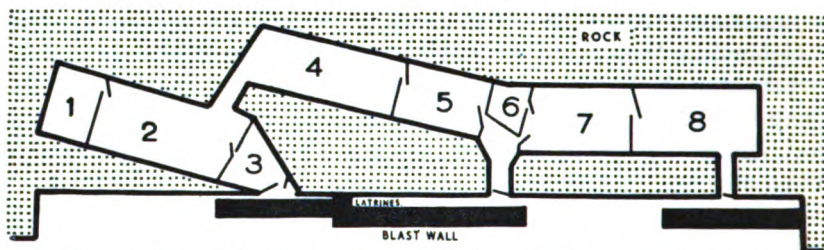


FIG. 1. Plan of the Underground Station Sick Quarters, Ta Kali.

- |                       |                      |
|-----------------------|----------------------|
| 1. Nursing orderlies. | 5. Crash theatre.    |
| 2. Treatment room.    | 6. Small store.      |
| 3. Consulting room.   | 7. Dispensary.       |
| 4. Emergency ward.    | 8. Duty M.O.'s room. |

*Note.*—Constructed under 13 feet of solid rock.

Morale in aircrew showed some falling off, the tour\* of 70–100 hours for fighter pilots proving too much for certain members, who showed signs of tiredness or over-caution towards the end of this time.

1943

This year saw a complete change for Malta in the character of the war. The siege had been raised and the build-up for the attack on Italy had commenced; this involved a great increase in the numbers of personnel on the island, and, to provide accommodation, it was necessary to build temporary transit camps, as the battered buildings of Malta could offer no additional space. These camps were of sound construction with mains conservancy and provided little difficulty from the medical aspect. The number of personnel on the island, which in January was approximately 6,600, rose to 9,600 by May and reached a peak of 14,500 in June; after the invasion of Italy had begun numbers declined to something like 7,000 by the end of the year.

The cessation of the enemy's bombing attacks afforded an opportunity for 'cleaning up' the island and serious efforts were made to remove the accumulations of rubble, firstly from living areas and later from all R.A.F. property, this being essential to minimise the risk of sandfly breeding, as the larvae found the rubble-strewn sites ideal.

In previous years the main danger from epidemic diseases had been bound up with the difficulties of life under continual bombardment,

\* *Tour*: Aircrew were required to complete a specified number of hours on aircraft in an operational capacity. The length of time varied with the aircraft and the particular campaign. See R.A.F. Volume II, Chapter 3, page 296.

but with this menace past more spacious living accommodation could be used and less time spent in the medically suspect underground shelters. Unfortunately a further problem was presented by the numbers of men arriving in the island and bringing diseases with them—notably hepatitis, of which 254 cases occurred during the year.

General health rates remained approximately the same. In the first two months of the year there was an outbreak of poliomyelitis causing 18 cases with 5 deaths. Amoebic dysentery provided 49 cases in the year and bacillary 119; enteritis showed a low incidence at 14 and diphtheria 27. Malaria and venereal disease both increased considerably: malaria claimed 152 cases, mainly benign tertian of which a large proportion were relapses due to the discontinuance of suppressive treatment; the venereal disease figure of 108 cases, 83 of which were contracted in Malta, was a considerable increase on the figures shown during the siege conditions and every possible step was taken to discourage this rise. It is of interest to note that two cases of murine typhus were recorded among the civilian population, although none occurred in the Services—possibly due to the immediate steps taken to isolate the suspected areas. (*See also* section on Diseases.)

#### 1944-5

In the following two years of the war, the history of the island was largely one of reconstruction and continuance of the measures to remove the scars of war and bring the accommodation back to its pre-war standard.

For a time, certain casualties were flown from the Sicilian battlefields and were mostly accommodated at Luqa sick quarters before being ferried to North African hospitals. The patients thus received were not numerous, however, and this policy was largely abandoned after the first month of the assault. (*See* Chapter 8, Italy and the Balkans.) In the closing phases of the war, Malta became an important staging post for aircraft flying to or returning from the Far East and once again the island was used to accommodate invalids in transit, utilising the adequate sick quarters facilities available there.

A relatively high rate of sickness was recorded for the year 1944 and included:

Gastro-enteritis	. 307 cases
Sandfly Fever . . .	. 352 „
Malaria . . . . .	. 70 „
Infective Hepatitis . . .	. 50 „
Venereal Disease . . . . .	. 15 „

Of the total cases for the year it was necessary to admit to hospital 812 (130 officers, 682 other ranks), R.A.M.C. hospital accommodation being used.

Sanitation and hygiene in general improved as the rebuilding plans were carried out and with the improvements many of the more serious medical problems disappeared, while those which remained were more easily dealt with under the better conditions.

#### SPECIFIC PROBLEMS OF MEDICAL IMPORT BILLETS AND OVERCROWDING

Peace-time billets in Malta were excellent and ideally suited to the type of climate encountered, but as soon as siege conditions began to develop difficulties were experienced with accommodation. Many buildings were rendered uninhabitable through bombing, and others, after being patched up from the effects of near misses by bombs, received direct hits and were rendered useless. Moreover, while the original billets were decreasing, the number of Service men on the island steadily increased, making the problem still more acute.

In such circumstances the normal rulings concerning minimum floor space per person had to be abandoned and every device adopted to increase the available accommodation. The use of three-tiered bunks was countenanced and many buildings not normally used as dwelling-places were pressed into service. Billets had to be found in the region of the airfields for those working there, for, however undesirable this might be from the safety point of view, it was impracticable for living quarters to be situated at any distance from working sites because of the fuel and transport shortage. Much of the civilian accommodation taken over did not come up to the standards normally demanded by Service health authorities but this had to be accepted in view of the seriousness of the situation. Tentage was employed to some extent but its use was limited by bad weather and in any case tents could afford no protection against bombs or shrapnel.

The moving of personnel off the airfields wherever possible had the disadvantage of bringing them into very close contact with the civilian population and at the same time made it impossible for medical officers to supervise the billets as they would have wished. However, in spite of the continual minor epidemics suffered by the civilian population, few Service men became infected.

Overcrowding was at its worst during the latter half of 1942, when more buildings were demolished than at any other time, and the situation was aggravated by the arrival of reinforcements. The position became easier in 1943 when both petrol and transport became more plentiful and it was possible to provide billets farther away from airfields but it was not until 1945 that the position became wholly satisfactory, when it had been possible to effect widespread repairs to damaged buildings and the number of Service men on the island had decreased considerably.

## HYGIENE AND SANITATION

The position of Malta with regard to hygiene was unique. The island was small and the population relatively large and so concentrated that civilians and Services were in close contact with each other, R.A.F. stations not enjoying their usual isolation from a geographical point of view. The protracted siege increased this proximity and definitely precluded any attempt to segregate Service personnel.

It will be seen from a study of the section on diseases, that cases of nearly all the more important and serious contagious and infectious diseases occurred in small numbers during the period 1939-45, with the notable exception of cholera. That these outbreaks were liable to occur had been foreseen by the medical authorities, who realised that under a state of siege all domestic utilities would be of a low standard and probably non-existent for short periods until repairs could be effected; it was also appreciated that disease was liable to be imported by re-inforcements, as indeed was the case. With these facts in mind the medical and civil authorities made careful plans at least to minimise the dangers.

Normally sanitation can be considered under separate headings such as water, disposal of refuse and such-like, but on the island with its relatively confined area and the continual bombing a breakdown in one section immediately affected one or more of the others. For example, any sudden influx of bombed-out persons into other already overcrowded accommodation had an immediate adverse effect on conservancy. In the following sections, therefore, although various aspects of sanitation have been dealt with individually, it should be remembered that the whole picture had to be continually borne in mind by the authorities at every stage.

## WATER

All R.A.F. establishments were served by piped water supplies which were chlorinated at source. The water was obtained from deep wells and natural rock galleries and thence transferred to reservoirs which, although hit several times, did not give the authorities much cause for concern. The damage to pipe lines created a considerable problem, for no sooner were they repaired than further damage occurred, and great credit is reflected on the repair gangs who worked throughout the raids to make the pipes serviceable.

By 1942, the greater proportion of Service buildings had been damaged by bombing, so that the normal forms of water storage had suffered and emergency storage in tubs and large metal drums became necessary. This problem was complicated by the scattering of airmen in shelters, and by the fact that ground crews remained at dispersals servicing planes throughout the hours of daylight, necessitating supply



by water cart. The storage of water became a many-sided problem, aggravated by the continual need for economy of mechanical transport.

Nevertheless, though strict economy of water had to be practised, the island was never in danger of serious shortage and no major epidemic could be traced to the unavoidably makeshift arrangements, all of which medical officers endeavoured to keep under supervision.

#### CONSERVANCY

The great majority of R.A.F. stations enjoyed waterborne conservancy, which was general throughout the island. There were, however, certain exceptions, such as the billets at Sliema where cesspits were used and other instances where bucket latrines had to be used, as the local authority would not sanction the use of deep trench or Otway pit systems.

When these waterborne systems were damaged by enemy bombing, bucket latrines had to be used, disposal of the contents being undertaken by local contractors. Provided that the latter kept to the terms of their agreements, this system was satisfactory, but difficulty was experienced both from slackness on the part of the contractors and from the shortage of suitable vehicles and petrol.

In shelters, bucket latrines were used and a very strict supervision was maintained by medical officers. Though the conditions in Service shelters were reasonable, many of the shelters for the civil population left much to be desired, and as the Services and civilians were in such close contact, considerable anxiety was felt at times during the more concentrated and prolonged bombing attacks. Nevertheless, the amount of disease attributable to this cause was slight compared with what might have been expected in such difficult circumstances.

#### REFUSE

Refuse disposal was conducted on normal lines, but as the intensity of the enemy's attack increased, regular disposal became progressively more difficult, the efforts of the local authorities being handicapped both by shortage of vehicles and fuel and by the disruption of road communications due to bombing. As personnel became more and more dispersed so did the number of places in which refuse accumulated increase, adding to the difficulties of collection, and units had recourse to local burial as the only satisfactory and practical method when direct dumping into the sea was not possible.

#### RUBBLE

One of the greatest problems encountered on the island was the clearing of rubble consequent on enemy raids. The majority of buildings on the island were constructed from local stone which was remarkably

friable, so that the blast from bombs created large quantities of dust. In addition to its nuisance value, this dust created the very conditions which favoured the breeding of the sandfly, hence the importance of clearing and tidying up as much as possible after each raid—apart from the need to remove rubble so that traffic could proceed and normal work be resumed.

The task of clearing rubble was shared by everyone on the island, but at R.A.F. establishments the larger portion was undertaken by the Army, who also filled in craters on the runways and used petrol cans filled with rubble and earth to build shelter pens for aircraft. (*See Operational Account—Crucial Months in the Battle of Malta.*) Over 3,000 troops were employed at times, including men from the Royal West Kent Regiment, the Buffs, the Manchesters and the Devons; these men worked 12 hours on and 12 hours off and only scattered while raids were actually in progress. The remarkable serviceability of the runways was largely due to their prodigious efforts.

Whenever possible, the Services gave assistance in clearing rubble from civilian areas and the all-important harbour area. (*See Plates XXVII and XXX.*) It was usually only possible to clear the roadways and no reconstruction of dwelling-places could be undertaken. Apart from the operational necessity and the medical importance of clearing away rubble after raids, it was of value to morale to clear damage as soon as possible and the manner in which this was carried out was in keeping with the high standards set by the defenders of Malta.

#### MESSING AND DIET

The food situation was moderately satisfactory during the whole period, but discontent was evident when the defence scale of rations was instituted in June 1940. The Service dietitian in Malta had worked out a diet which, while possibly adequate for sedentary workers, did not seem sufficient for refuellers, armourers, fitters and riggers, bomb disposal squads and night-shift workers. Defence rations also meant lack of variety and the serving of so-called 'unsupported' meals (*viz.* bread at breakfast, but no butter to go with it, or tinned salmon without accompanying salad and potatoes). Some wastage resulted because the men would not eat their two morning slices of bread without butter or with unpalatable margarine; and they were aggrieved because in the evening, when they were hungry after the day's work, they were unable to obtain more than the two slices then allowed.

In addition to the fact that the food was mainly tinned and verging on insufficient, lack of cooks, limited accommodation for cooking and bomb damage to kitchens considerably lowered the standard of preparation and caused the majority of the men to supplement their rations with N.A.A.F.I. purchases, often out of proportion to their income.

Rations on the island showed a continual variation in quantity and calorie value. In April 1942, the average intake was 2,240 Calories, dropping to 2,100 in August; it was possible to improve the intake in December to 3,200 and 3,800 by April 1943. From this date the ration approached normal Service standards.

It was observed that in the worst period, men lost up to a stone in weight; apart from a tendency for skin infections not to heal, however, no diseases could be attributed to lack of vitamins. Certain messes provided vitamin tablets as a substitute and every endeavour was made to acquire green vegetables or fruit from local sources. At the end of April, a survey was made by dietitians who considered that a lack of vitamin A as estimated by visual standards for night adaptation had occurred and that it was likely that a deficiency, though only slight, had occurred in vitamins B and C. (*See Diseases—Skin Conditions.*)

There were certain factors influencing diet and messing that were typical of the siege period. Firstly, apart from the shortage of food itself many men could not be spared from their work to attend messes for meals and it was necessary to bring the food to them by lorry. This arrangement, though unavoidable, did not make for a high standard of messing and of necessity led to a monotonous diet. Furthermore, the actual preparation of food was difficult as cookhouses suffered in the bombing and any equipment that was damaged could usually not be replaced, so that the standards in the cookhouses gradually deteriorated. Fly-proofing became impossible and even such items as cook's linen, scrubbing brushes and soap became scarce or unobtainable.

Special mention must also be made of cooking stoves. Such equipment, when worn out or damaged, was irreplaceable and in view of the shortage of solid fuel recourse had to be made to flash burners, a form of stove which, though excellent in many ways, was not conducive to cleanliness in the cookhouse.

Special diets ordered on medical grounds presented difficulty but fortunately the numbers requiring such treatment were few. It was usually only possible to allot increased quantities and to provide, on the rare occasions when they were available, fresh fruit or vegetables, eggs and fresh cows' milk.\* A catering officer was appointed in 1941, but this brought about little change as the main difficulty of supply still remained.

To sum up: although the amount of food was below the desired scales for some time during the siege, apart from a general loss of weight no medical troubles directly attributable to the low diet were ever substantiated.

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\* Cows' milk was obtained very occasionally from ships or transit aircraft.



PLATE XXVII : The Grand Harbour, Malta

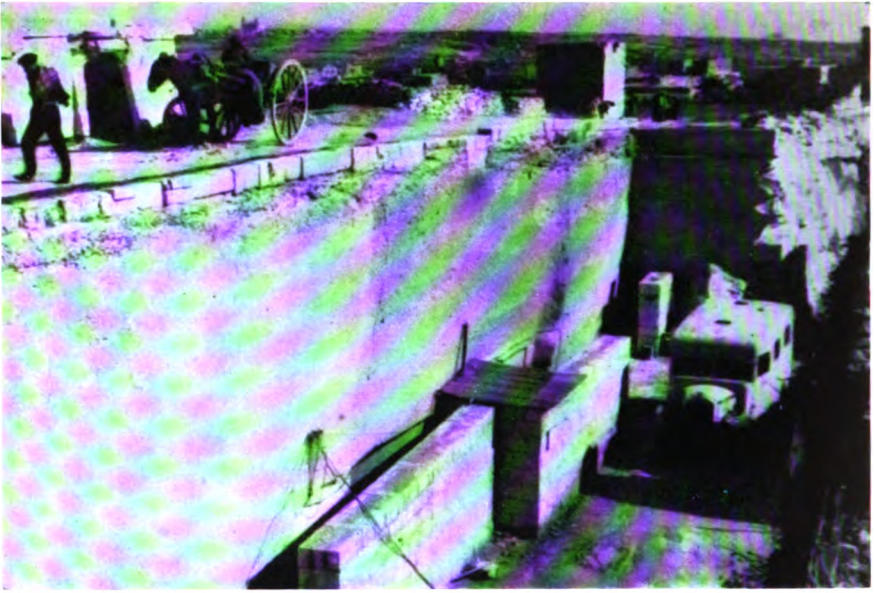


PLATE XXVIII: R.A.F. Station Sick Quarters, Ta Kali, 1943. View from top of quarry showing entrance and brick blast walls which replaced the original sandbags

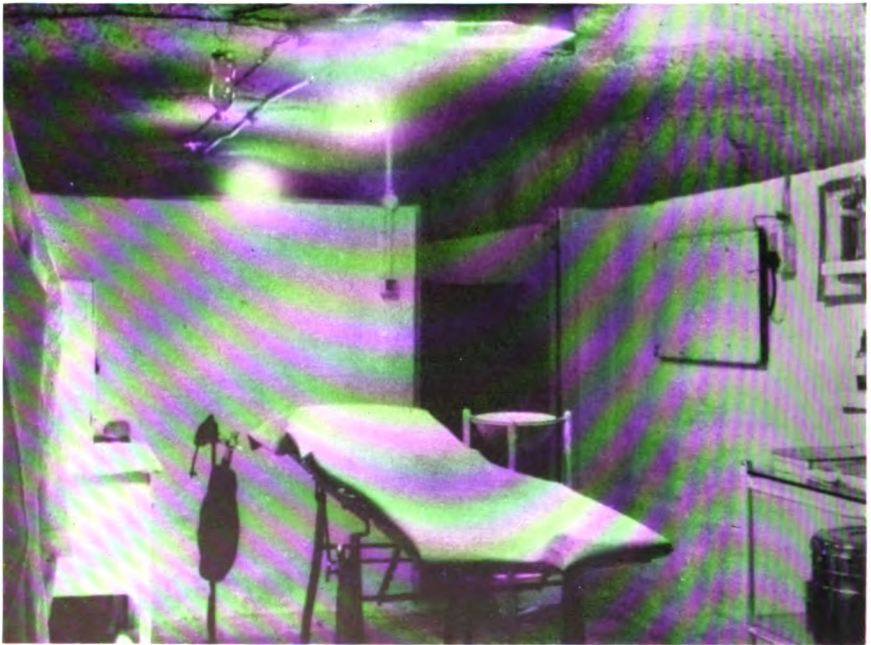


PLATE XXIX: Operating Theatre. S.S.Q. Ta Kali showing the rock roof and temporary partitions





PLATE XXX: Bomb damage in Valletta



PLATE XXXI : Maltese sheltering in a cavern

## AIR RAIDS

In the first few days after Italy's declaration of war the air raids created considerable anxiety—not so much because of the material damage caused, but because of uncertainty as to whether sufficient warning would be given before bombs dropped. At first it was the practice to go to shelters as soon as the warning sounded, but by February 1941 the improvement in the general warning system in the island (giving 10 minutes warning of approaching enemy aircraft) and the adoption of a policy of 'Jim Crows' made it possible for the normal work of a station to continue until enemy aircraft were seen to be approaching it as a specific target, when all men went to the shelters. This practice originated at Kalafrana and was eventually adopted by all stations. Later, the importance of keeping aircraft serviceable by both day and night meant that work on them had to be continued except when the station was actually being bombed. In course of time the general attitude towards bombing attacks at night could be summed up in the phrase 'If more tired than frightened we stayed in bed, if more frightened than tired we went to the shelter'. Buildings on the island, which were for the most part of solid construction, were found to stand up very well to high explosive bombs. Thus, a direct hit from a 250 lb. bomb would penetrate roofs and floors but generally leave the outside walls standing. To all intents and purposes incendiary bombs proved useless.

There were two striking features of these raids, the first being the astonishingly small number of casualties. Considerable damage was, of course, done to buildings, as for example to the mess at Hal Far, but here as in many other places there were often no casualties at all. This was felt to be largely due to training in taking cover at the right time in the large rock shelters or in slit trenches and not running in the open while bombs were falling. The second striking feature was that of the casualties which did occur the majority were of a minor nature. The few serious cases received little more than first-aid treatment on the stations before transfer by ambulance to the Military Hospital, Imtarfa, *via* the allotted A.D.S. Civilian casualties occurring on R.A.F. stations were treated in the same way, except that they were evacuated to civilian hospitals. (*See Fig. 2, page 279.*)

A good deal of the comparative safety enjoyed during the raids was due to a sufficiency of shelters. Many of these had already been built when hostilities commenced and more were added as time went on. The relatively small amount of damage which followed the dropping of so great a weight of bombs on and near R.A.F. stations played no small part in fortifying morale. There had at first been much anxiety, particularly among the civilian population, who, when situated near R.A.F. stations, evacuated *en masse*. At this time civilian workers on



R.A.F. stations could only with great difficulty be coaxed out of their shelters to continue work and often produced medical certificates to the effect that they were suffering from shock and were unable to continue in their employment. Very quickly, however, this attitude changed and civilian absenteeism was reduced to a negligible amount.

Some points of interest arise in the matter of the effects of bombing on flying personnel. As a group, pilots and air crew in general stood up to bombing well. They were of the right age; they were selected men; they had a keen professional interest in what was going on; and they seldom stayed long enough in Malta to get bored with it. Most important, however, they were in a position to repay the enemy directly for what he was doing. Speaking generally, the effects of continued air raids on individuals resulted, in the experience of one medical officer, in about 2-3 per cent. of flying personnel 'cracking up' under the strain and having to be taken off flying. The remainder were not noticeably affected and pilots showed every keenness to get on with their work and give back as good as they got. On bomber crews, who often did long stretches on the offensive making night raids on targets in Sicily and North Africa, the strain seemed to be more telling than on fighter pilots. On return from these raids they might often have to land on aerodromes while an enemy raid was in progress and having accomplished this hazardous feat would have to spend the remainder of the night in a shelter in crowded and uncomfortable conditions. It was not surprising, therefore, if these aircrew began to show evidence of strain and fatigue sooner than would normally have been the case. (*See also* Health of the R.A.F. in Malta—Care of Flying Personnel.)

As far as the R.A.F. was concerned, it was the workers on aircraft maintenance who had the 'rough end of the stick'. They often worked with little protection and the areas (dispersal points) where they worked were subject to continual attacks; the work was exacting and extremely responsible and their chance of a change was small,\* which they well knew. Their worst time was in April 1942, when many of them were bored and had lost their resilience and keenness. One demoralising factor due to the small size of the island was that owing to the continuity of the attacks there was little chance of restful periods of leave, it being almost impossible to escape the auditory effect of raids in any part of the island.

The effect of the raids on children is worth mentioning. Observations of one medical officer on his own family showed that very little harm was done provided that the children were dealt with 'firmly and sensibly'.

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\* Whereas flying personnel stayed on the island only long enough to complete their specified number of operational flying hours (*see* General Medical Narrative—1942), ground crews were posted to Malta for the period laid down as the normal overseas tour for that area—at least two years and in practice often longer.

Taken to the shelter as a routine matter, they came to regard the procedure as something of an adventure and to look forward excitedly to release after the raid and to the collecting of shrapnel and other souvenirs. Many children seemed to scream with the siren, less because of fear than because they wished to become the centre of attention. In only a very small percentage of cases, in children over five years old, was there evidence of real fear.

Interruption of sleep, however, had its effect on everyone and there were often signs of fatigue. Conditions in some of the larger shelters used by civilians, where lice, fleas and other parasites of man were to be found, proved something of a menace and provided a problem for the medical profession in the island. (*See* Plate XXXI.) It is to the credit of the civilian health authorities that there was very little spread of serious infection considering the somewhat primitive conditions prevailing and the fact that many Maltese families made a practice of living almost entirely underground.\*

A full account of the arrangements made by the Civil authorities to provide shelters, first-aid posts, hospitals, ambulances etc. to deal with air-raid casualties and to safeguard the health of the civil population will be found in Part I, *The Colonies*, Chapter 2, *Malta*, of 'The Civilian Health and Medical Services', Volume II, in this series.

#### CONCLUSION

In order to give a general idea of the conditions in Malta during the war years, these have been described in some detail in the preceding paragraphs. Operational work was severe, ground crews were understaffed and overworked, enemy attacks were frequent and intermittently (and sometimes progressively) reduced the amenities of life to a low level. There was a shortage of proper accommodation and a shortage of fuel, which during the cold and wet season meant some sickness and much discomfort from incompletely dried clothes; a shortage of mail and a shortage of food. Even the use of the rest camp at St. Paul's Bay (accommodation for 50 officers and airmen) and the Riviera Hotel at Ghain Tuffieha Bay (*see* Map 1), though beneficial, provided little recreation other than bathing and practically no respite from the disturbance of enemy attack.

Despite all this, most stations could claim to be 'contented' and a remarkable *esprit de corps* was shown throughout the most troublesome periods, while on the medical side, the inter-Service liaison which was established over the years, proved of great mutual benefit and stood those concerned in good stead in times of difficulty.

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\* A separate account of the psychological effects of air raids has been included in the following section, in view of the unique opportunity which was afforded by conditions in Malta for medical observations on a little investigated subject.

## PSYCHOLOGICAL REACTIONS IN MALTA

The notes which follow were compiled from observations made by a senior medical officer just after his departure from Malta in 1942, and based on his experiences during almost two years' service in the island following the declaration of war by Italy in June 1940.

It is important to realise that war conditions, and hence reactions to them, were changing every month, every week, every day and every hour of the day. It was not unusual when in Malta to hear B.B.C. statements by people who had returned home and to find them amusing and absurdly incorrect at the time of broadcast, but it is very easily forgotten that what was said was probably true at the time the speaker was in Malta. This brings out the point that it is impossible to administrate for war conditions entirely from an office; one must keep in close touch by visiting the areas concerned as frequently as possible, for the situation changes continually.

## PSYCHOLOGICAL EFFECTS OF BOMBING

From June 1940, to April 1942 (the period covered by these observations), enemy action in Malta was variable, and fortunately began with what might be termed 'kindergarten instruction'. Education in bombing is very important and these 'preliminaries' paved the way for steadiness of outlook when raids became heavy and prolonged in 1941 and 1942.

The usual effect of bombing on individuals appeared to be as follows: At first they were frightened; then they became professionally interested and perhaps even developed a fatalistic outlook; then came a period of endurance; and finally they became 'browned off', this being shown in their work, hygiene and behaviour. After prolonged bombing, concentration on work was diminished and the amount as well as the quality of muscular and mental activity was reduced. Care in personal hygiene tended to slacken—a tendency which, although aggravated by the shortage of water and soap, was primarily due to a change in mental outlook. Behaviour showed rather more frequent alterations and some irregularity, and periods of jubilation and celebration alternated with waves of depression, varying with operational successes and with the blows the island received.

Proximity to (i.e. less than 75 yards from) a big bomb when it exploded had a well recognised effect on individuals, tending to make them more careful for two or three weeks and to create a doubt in the easy fatalistic attitude which was so often adopted as a shield against adverse effects of bombing on morale.

The success of dive-bombers was largely due to the size of the bombs used, to the visible and audible approach of the aircraft, and to the fact that although they might do little material damage, they 'got at' persons in the vicinity, sometimes shaking their morale for a

considerable time. Dive-bombing was, so to speak, a concentrated form of mental poison and continual dive-bombing had cumulatively harmful results. Although few may have been hurt physically, the nervous system was affected when sheer fright was experienced with no possibility of escape from the cause, and it is possible that excess adrenalin was secreted, accounting for the physical signs of tremor, lack of balance in the dark, irritability, impetuosity, and eventually the lowering of muscular efficiency. By contrast, high level bombing, in small doses, acted as a tonic which was actually missed when no such raids occurred.

It is worthy of mention that when the building of aircraft pens and P.T. were carried out extensively, the tone of both body and mind improved. Another interesting physiological point was that alcohol tolerance diminished after prolonged raids.

Some notes on the effects of noise are worthy of being recorded. The individual trained himself to listen for the whistle of a bomb, because he knew that sharp hearing might save his life (although he was also aware that if a bomb landed very close to him he would probably not hear it at all) and everyone kept 'one ear open' during raids. The flash of a bomb, if seen, also prepared one for the sound of the explosion and after a time few people jumped on hearing a loud noise. On the other hand, some people became hypersensitive to noises of certain kinds, such as gears of motor cars that resembled the air-raid siren. Some would concentrate on the raid noises—they did not like the wireless turned on during a raid or did not like people talking; one would hear them say 'put the gramophone off and listen to the Ack-Ack'. Though this state might have been regarded as pathological, it was difficult to make a clear diagnosis, for the mental outlook changed from day to day like a capricious appetite for food.

The disposal of cases suffering from anxiety states presented a unique problem in Malta. It was impossible to send them away from the island, except in very small numbers, and they were a potential source of 'infection' to others. To the station medical officer the problem was a big one, and required patience and great tact and personality in handling. A training camp for such cases was suggested but never materialised, and exercise under supervision, pen building and open air work was the most that could be provided in the way of treatment. Although the last thing one wanted to do was to put such patients in hospital, this was unfortunately the only solution for the worst cases.

#### DISCIPLINE AND THE WORK OF MEDICAL OFFICERS

The ability to maintain discipline was of great importance and depended largely on leadership, personality, capability and respect. The most important work a medical officer could do in Malta was to build up the morale of his station by example, by close contact, by

mixing with the airmen and by knowing and sharing their lives. He had to be a man first, an officer second and a doctor third; he had to go everywhere, both in and out of working hours, for he was never really off duty. He needed to know all the difficulties and dangers which occurred during working hours and what happened and what pitfalls existed in off-duty hours. He had to be prepared, not to write reports about morale, but to discuss the matter freely with responsible officers. He had to be able to stand on his own feet and go anywhere, to the pleasant places and to the 'dives', for the night clubs have done much good and much harm. It was his job to keep in touch with everything and everybody. No one could do this for long without a good physique and broad understanding.

An important factor which should be appreciated about the situation in Malta was the intense interest taken by all airmen in the fighting in North Africa, so different from the interest taken by, for instance, people in the United Kingdom or even in Egypt; for on the success of this campaign depended the island's chances of obtaining food, freedom from persistent attack, or at least easy fighter reinforcements and a lessening of the menace of invasion.

#### THE MALTESE PEOPLE

The Maltese people proved themselves the staunchest of defenders. They quickly got over their initial 'jitters' when Italy declared war and rapidly reorganised their lives to war-time conditions; they retained their sense of humour and were an example to all. The poor farming people in Luqa village—the most bombed district in Malta—stayed there, deeply respected by all Service men, but they got bored with bombing and felt the need for a break as much as did any of the combatants. Many of the Maltese did not 'run' for shelters, even in places warned by the recognised signal as within the target area—they walked, and again set an example. People visiting the island for a few days or a few weeks might have thought at first that the inhabitants spent overmuch time in the shelters, but they tended to change their opinion when raids ceased to be a novelty and an experience and became a daily occurrence. No praise is too high for the behaviour of the Maltese and for their splendid morale. Their inspired leadership and enduring sincerity of purpose were backed by a strong religious faith which upheld them through many difficult months and kept their determination steadfast and unwavering.

#### AFTER EFFECTS

Lastly, an observation on the subject of after effects. On leaving the island many who had felt quite reasonably well while in the thick of things, felt debilitated—as after an attack of influenza. This was more

noticeable in the people who, while there, had shown fewer signs of strain than others; the latter, by contrast, recovered more quickly once they had left the front line. These two types stood out quite plainly, most airmen falling clearly into one category or the other.

### HEALTH OF THE R.A.F. IN MALTA

#### FIRST AID AND INJURIES

The medical arrangements (see Fig. 2) for early treatment of injuries have already been described, such as the specially equipped underground

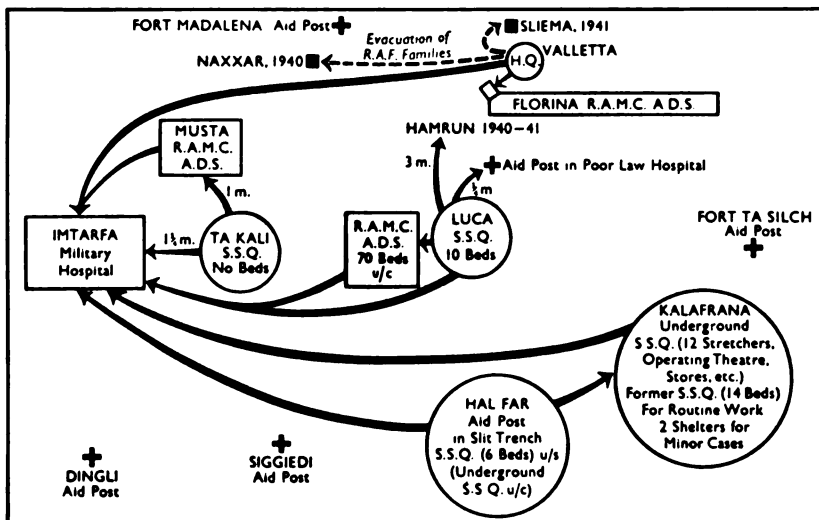


FIG. 2. Diagram showing the medical arrangements for dealing with casualties.

station sick quarters at Kalafrana, where up to twenty badly wounded cases could be dealt with at a time. Sick quarters at other stations had less elaborate arrangements and at first had the disadvantage of being above ground.

Regarding collection of casualties when aircraft crashed in any locality on the island, it was the custom for first aid to be applied on the spot and the crew's own medical officer sent for before the injured were transferred to sick quarters. There, unhurried resuscitation treatment was always aimed at before removal to the Military Hospital at Imtarfa, as the roads were rough and the distance to be covered might be several miles—especially if roads blocked by rubble made diversions necessary. Resuscitation methods at station sick quarters included transfusion of whole blood, blood serum and glucose-saline, and at Luqa casualties were often retained for 24 hours before evacuation to hospital. Official stretcher bearers were sometimes Maltese unused to

the sight of blood and with a limited knowledge of English; as some of these tended to disappear under bombardment they were in course of time replaced by R.A.F. personnel, among whom there were adequate numbers of willing volunteers.

Bombs produced the expected lesions, cases of blast injury were relatively frequent, and a common cause of death was asphyxia from inhalation of dust. Burns were frequent and difficult to treat and they almost always became septic. Quite a number of fractures and minor injuries resulted from falls down air-raid shelter steps.

Among major injuries, a case treated at Kalafrana is of particular interest:

'An Army private while unloading a land mine, sustained multiple injuries when the mine exploded. He had a compound fracture of the right radius and ulna, a compound fracture of the left tibia and fibula and a gaping hole in his abdominal wall, through which prolapsed large and small gut and a large piece of omentum. Anti-shock treatment was administered, and under local anaesthesia, seven large bomb splinters were removed from the abdominal cavity; six perforations of the large gut and four of the small gut were repaired and a large piece of dirty omentum resected. The large excision necessitated by this loss of abdominal tissue rendered it impossible to close the abdomen with the particular brand of catgut or silkworm gut in use, particularly as it had been in stock so long that its tensile strength had deteriorated. The abdomen was therefore closed with safety-pins without drainage. Under pentothal anaesthesia the arm and leg wounds were treated by Trueta's method and some sixteen hours later the patient was evacuated to hospital. He made an excellent recovery except for a residual right ulnar paralysis.'

The main Service hospital in use in Malta was the Army hospital at Imtarfa. This hospital, though doing excellent work, sometimes unfortunately proved a bottleneck for Air Force personnel, as patients admitted for minor illnesses and during minor epidemics, such as of sandfly fever, were often kept in hospital for weeks. This often left operational stations short of key men.

#### CARE OF FLYING PERSONNEL

Quite apart from the effects of bombing, aircrew in Malta were subjected to heavy operational strain at all times during the first eighteen months of the war. Perhaps in no sphere of R.A.F. activity was the close and successful contact of the squadron personnel with their medical officer more important. At the best of times the island was a hazardous base to work from and when, as during the period under review, sorties resulted in heavy casualties, especially among squadron and flight commanders, and the survival rate seemed low,

it was not surprising that operational fatigue became obvious and had an adverse effect on morale. Thus, one Blenheim squadron operating against enemy convoys sustained 50 per cent. casualties in six sorties and on one occasion one member of the crew of each of the remaining six serviceable aircraft reported sick, thus virtually grounding the squadron. As there was a shortage of flying personnel, replacement crews from the United Kingdom intended for the Middle East found themselves retained for operations on the island for periods of up to a month or longer. These men, insufficiently kitted out and new to hot weather and to the operational conditions in Malta, often became nervy and easily tired, and not infrequently succumbed to sandfly fever, to which, as newcomers, they naturally had little resistance.

Flying stress was high among all groups of aircrew at the peak of operational strain, showing itself in various clinical symptoms, among which the complaint of 'Malta Dog' was prominent, and often in a tendency to bouts of immoderate drinking at night. Despite these manifestations of stress, depression of morale was in many instances evanescent, and an incident such as an operational turn of fortune for the better, the grounding of a squadron for a short time or the medical officer sharing the risks of the crew by flying with them, would speedily restore conditions to normal. In other instances, however, there was a feeling that some operationally exhausted, war-weary aircrew would never be fit for operational flying again unless immediate steps were taken to provide a prolonged rest. The fighter pilots' morale was for the most part excellent, their successes against the enemy and the steady improvement in the air sea rescue service no doubt contributing to this in no small measure.

It should be mentioned that at no time during the period of active hostilities was a flying personnel medical officer or a psychiatrist posted to the island, although visits were paid by a medical officer experienced in flying on his way to and from the Middle East on a tour of inspection. However, though a few cases of flying stress did occur, particularly in 1942 and early 1943, the numbers never presented a serious medical problem.

#### DISEASES

As has been mentioned earlier in this narrative the climate of Malta is typically Mediterranean and the island has always been considered to present few diseases of special interest, with the exception of sandfly fever and Malta fever, the latter being of academic rather than practical interest. In the war years, however, the island was subject to what amounted to siege conditions, with disruption of normal health services and lack of medical equipment in its broadest sense, and in such circumstances, as might be expected, disease flourished to some extent.



A further factor of importance was that diseases not normally encountered might well be imported into the island by reinforcements and particularly by members of aircrew arriving by air from endemic areas. In the following paragraphs the most important diseases which occurred will be discussed.

#### SANDFLY FEVER

This disease, which was epidemic in Malta before the war, occurred mainly in the months of May to October, the period when the weather best suited the breeding habits of *phlebotomus papatasi*. Although the disease was normally of minor medical consequence it became of the greatest importance in war-time, when there was a shortage of man-power and sick quarters' accommodation could ill be afforded; the average period of non-effectiveness was in the region of 10 to 14 days. In the early days of the siege certain cases were complicated by epididymo-orchitis and in the latter years by a diaphragmatic myalgia, the reason for these changes in the clinical picture not being apparent.

From the first air raids in June 1940 until the last months of 1942, the island was continually under attack, the aftermath of bombing providing ideal conditions for the sandfly to flourish (*see* Plate XXX). Both civil and Service authorities did all that was possible to clear rubble and refuse and also to spray buildings in an attempt to minimise the risk of sandfly fever—work which was often no sooner completed than it was rendered useless by further enemy attacks. All repellents and spraying preparations such as pyrethrum were very scarce and the man-power situation did not allow sufficient staff to carry out the work. Airmen were warned of the importance of sleeping in sandfly nets, but, as the supply of these was limited and reinforcements rarely brought their own, the warning was often pointless.

New arrivals on the island were most frequently affected—as shown by the fact that among those who arrived in July–December 1943, an incidence of 40 per 1,000 was noted (244 cases). The seriousness of such a high rate of non-effectiveness is obvious.

In November a marked rise was noted, due partly to the increased population on the island and the vast accumulation of rubble resultant upon continued enemy bombing. The areas most affected by sandflies were those in which the devastation was most severe, and the sickness rates for sandfly fever, shown below, were proportionate to the amount of actual bomb damage sustained.

	<i>per cent.</i>
A.H.Q. . . . .	20
Kalafrana . . . . .	18
Hal Far . . . . .	9
Luqa . . . . .	4

Matters improved after authority was given for the issue of D.D.T. powder; this was at first refused on the ground that the island was considered non-malarious, for D.D.T. could initially only be spared for malarious areas.\* It is again stressed that the task of rubble clearing, which was perhaps the most satisfactory method of discouraging breeding of the sandfly, was, during the siege period, beyond the powers of the limited labour available, a total of 24,000 buildings having been either destroyed or damaged by enemy action.

The marked seasonal increase in the disease during the breeding period of the sandfly is well shown in the graph for 1944 below:

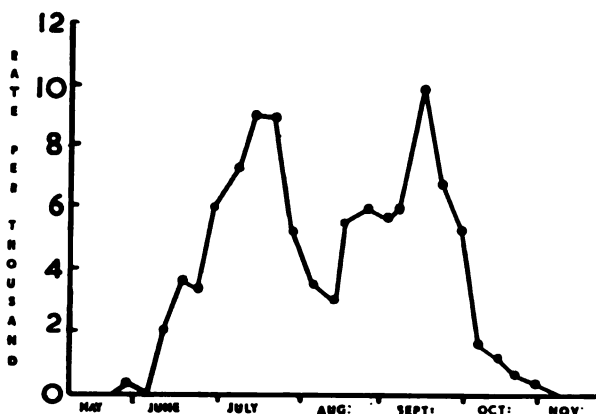


FIG. 3. Graph showing the incidence of Sandfly Fever, 1944.

#### MALARIA

According to peace-time health records, anopheles mosquitoes had been identified in certain swampy districts on the island from time to time, but from a practical point of view Malta was considered to be non-malarious; nevertheless, the medical authorities were always alert for the occurrence of the disease. This vigilance was increased during the period of siege, for it was felt that the lack of supervision of general health measures on the island would favour the breeding of mosquitoes and at that time any epidemic of malaria would have been serious in view of the shortage of both personnel and sick quarters accommodation.

During the war period a number of cases of malaria did occur, mainly in aircrew, but all were proved to have been imported, particularly from Sicily in the later years of the war; many cases were traced to airmen stopping their suppressive mepacrine without medical advice.

\* Priority for the issue of D.D.T. was obviously given to units in the Far East until supplies were sufficient for general issue.

## VENEREAL DISEASE

This disease, which must rank as one of the most important causes of non-effectiveness during the war years, if only because it is one for which individuals are themselves solely responsible, presents a happier picture in Malta than in most areas in which Allied troops were concentrated.

At no time did the infection rate give concern to the medical authorities but it would appear that this satisfactory state of affairs was probably due less to intention than to force of circumstances. In the days of heavy enemy activity the movements of personnel were restricted both by the shortage of transport and by the actual impossibility of moving during raids; few places of entertainment were functioning and the supply of alcohol on the island was severely limited; to this must be added the high moral standards of the Maltese, as a result of which prostitutes were very few in number. Nevertheless, precautionary measures included the issue of warnings on the dangers of V.D. by lectures and posters, for both of which the medical branch assumed responsibility.

This satisfactory state was maintained until the siege was broken; only then do the records show an increase in the rate; an important cause of this was the importation of the disease by troops posted to or in transit through the island—the main source being those returning from Sicily, where a high rate was encountered.

## ENTERITIS

This disease, known locally as 'Malta Dog', was common among new arrivals and was characterised by diarrhoea and malaise of a few days duration. Though mild in itself it was a continual nuisance and rendered nearly all new arrivals non-effective for a period of about a week. The aetiology of the disease was obscure, but it was considered to be due to a change of intestinal flora resulting from a combination of the new diet and climate. It was parallel in every way to the clinical pictures encountered under geographical titles such as 'Gippie Tummy' and 'Delhi Belly'.

## DYSENTERY

Although cases of both bacillary and amoebic dysentery were recorded throughout the war years, it was not until 1942 that the incidence showed any marked rise—and even then the figures included a proportion of imported cases. Between July and December 1942, 74 cases of dysentery were recorded—10 amoebic, 23 bacillary and 41 clinical. Despite investigation no carrier was discovered and the outbreak was finally attributed to the local government's decision in early 1942 to manure the fields with untreated sewage. This policy, though naturally

deplored by Service health authorities, was one with which certain sympathy must be felt, for the island's soil, normally scanty and poor, had been deprived of any artificial manures during the siege. A point of interest was that the civil health authorities in Malta did not require notification of dysentery and consequently records of its incidence were not available for comparison.

Active measures to combat dysentery and allied diseases were taken by both the civil and Service authorities on the island and were mainly directed to high standards of cleanliness and regular stool testing of Maltese labour in the cookhouses. It is interesting to note that few positive dysentery stools were detected, though a considerable number of chronic helminth carriers were eliminated during the investigations. All health measures such as fly-proofing and hand-washing were severely curtailed by continuous bombing and by the lack, almost complete in 1942, of fly-proofing materials, soap and nail-brushes, but everything possible was done with the limited supplies available. It is considered that the island was indeed fortunate to escape a formidable epidemic of these diseases.

#### SKIN CONDITIONS

Skin conditions, though not normally of major medical importance, added to the discomfort of those afflicted. All the affections associated with the Mediterranean area were present, the most important being *otitis externa* and the tinea group of diseases, while there was a tendency for all small abrasions to become chronically infected—such scratches being unavoidable owing to the necessity for all personnel to take a hand in rubble clearing after enemy attacks. Little could be done to improve these conditions until the siege was raised.

It was suggested that lack of vitamins was probably a factor influencing both the occurrence and the healing of such lesions and this may indeed have been so, for the diet on occasions contained only 2,100 Calories and very little in the way of fresh fruit or vegetables. This theory was strengthened when a dietetic survey of the island revealed that a vitamin A deficiency did in fact exist, with a very low, and possibly deficient, intake of vitamins B and C. In addition, the water shortage and the dust from bombed buildings combined to provide ideal conditions for skin complaints to flourish. When both diet and living conditions improved after the siege there was a marked decrease in the incidence of skin infections.

#### INFECTIVE HEPATITIS

In the first two years of hostilities this disease was responsible for a small but steady trickle of cases, but never in proportions that could be considered epidemic or alarming, the average being approximately 2·4

cases per month until September 1942; in that month the figure was 10. It rose to 12, 35 and 71 respectively in October, November and December, this sharp rise coinciding with the arrival of reinforcements from the Middle East. Twenty-nine of the 58 cases which occurred at Luqa were among aircrew, a severe blow to the island's defences at a time when all flying personnel were urgently needed.

After these 128 cases the rate dropped again, although never to the previous low figure of 2.4. The higher incidence was accounted for by the fact that the majority of the additional personnel now on the island came from either Egypt or North Africa, where the disease was common. No information of clinical significance could be drawn from the distribution of cases, though the disease did appear to occur in small groups of 5 to 8 cases on separate stations.

#### DIPHTHERIA

There was a diphtheria epidemic among the civilian population in the autumn of 1942 and 21 cases were recorded in the R.A.F. up to Christmas of that year. The outbreak was not surprising considering the conditions under which civilians were living and particularly in view of the amount of time spent in shelters, where conditions were ideal for the spread of droplet infection (*see* Plate XXXI). The R.A.F. cases were mainly among men at Hal Far who were billeted in close proximity to the civilian population, from whom they undoubtedly contracted the disease. After this small outbreak preventive measures were intensified and there was no further epidemic, although odd cases occurred sporadically during the remaining war years.

#### TYPHOID FEVER

In a rather similar manner to the diphtheria epidemic, a sharp rise in the incidence of typhoid started among the civilian population in July–December 1942, and it was only a matter of time before Service personnel were affected. From July to October 23 cases were recorded in the R.A.F., the outbreak being traced to carriers in the cookhouses.

There was a more serious outbreak among the civil population during the autumn of 1943, and a less extensive one in 1944, but although odd cases occurred on R.A.F. stations, there were no outbreaks which could be considered epidemic until the autumn of 1944, when thirteen cases were diagnosed in August at Valletta and six at Hal Far in October; these outbreaks again were traced to cooks.

#### TYPHUS

Fortunately no cases of this most serious disease were recorded on the island until November 1943, when two Maltese soldiers contracted murine typhus; these cases were not thought to be connected, as the

individuals concerned lived two miles apart. The R.A.F. medical authorities took immediate steps to inoculate all Air Force personnel and this proved to be a wise policy, for although no further cases were recorded until December 1944, an epidemic at that time affecting over 100 civilians claimed no R.A.F. victims.

It was indeed fortunate that this latter outbreak did not occur earlier in the war, for the seriousness of a widespread epidemic in the chaotic conditions prevailing during the siege can well be imagined. By 1944, Service conditions were greatly improved and it was possible to minimise contact with civilians—a step which in the earlier years would have been impossible.

#### PLAGUE

The possibility of an outbreak of plague on the island was recognised by the medical authorities, for it was known that cases had occurred along the Mediterranean littoral during the war years—always in small numbers and considered to be brought by shipping from India or farther east.

In July 1945, the R.A.F. medical authorities on the island were informed by the civilian health authorities that a case of plague was suspected and by the end of the month it was confirmed that four cases had been diagnosed among civilians. Immediately the normal health regulations were tightened up and Service personnel were made aware, by lectures and posters, of the danger and the elementary precautions to be taken. Fortunately a particularly resolute campaign had been waged against rats in the previous months, which may have accounted for the fact that no Service men became infected.

#### PETROLEUM POISONING

In December 1942, an unusual series of cases of poisoning due to petroleum vapour occurred. At this period petrol supplies were vital and it was essential to conserve all aviation fuel; in the interests of safety, therefore, a consignment of R.A.F. petrol tins containing 100 octane aviation fuel were being moved into a disused railway tunnel, the task being undertaken by Maltese labourers working under contract to the civil Government. The men had been working for some four weeks in 12-hour shifts, with an hour's break for a meal and two other half-hour breaks during each shift. Many of the tins had, unfortunately, become damaged in transit to the island and in consequence leaked slightly at seams, exuding fumes which became dangerous in the enclosed space of the tunnel and eventually caused petrol poisoning in a considerable number of the men.

Those employed on carrying the petrol tins along the tunnel (a journey taking about 10 minutes) and then returning to the open air to

collect further supplies were less severely affected than those responsible for stacking the tins at the end of the tunnel, for the latter were working constantly in a confined atmosphere except for the three scheduled 'breaks'.

In all some 70 persons were affected and of this number four died. Symptoms varied in severity but were roughly proportionate to the length of time spent in actual contact with the petrol fumes. Most of the reported cases were said to have had a prodromal period of anorexia, insomnia, headache, increasing salivation followed by general fatigue, tremors and pins and needles in the limbs. This was followed in the more serious cases by mental confusion and delirium, incontinence, rapid loss of weight and, in the fatal cases, a progressive mania leading to coma with convulsive athetoid movements. The milder cases complained of headache, sore throat, dyspnoea and coughing, while many fell unconscious but recovered after being in the open air for about half an hour. In all cases a lowered blood pressure was demonstrated.

Treatment consisted of sedatives to allay restlessness and, in the more severe cases, lumbar puncture and hypertonic salines. Post mortem findings in the four fatal cases were brain oedema with acute capillary hyperaemia and petechial haemorrhages in the subthalamie region; lungs exhibited fibrinous exudate or actual hepatitis.

It was agreed that the cause of the poisoning was excessive hours of work in an atmosphere heavily loaded with fumes from 100 octane petrol, combined with a lack of proper ventilation.

## CHAPTER 7

# WEST AFRICA

### General Narrative

#### INTRODUCTION

FOR A PROPER UNDERSTANDING of the medical problems encountered in West Africa Command it is essential to have some knowledge of the geographic and climatic background, for these factors were directly responsible for the majority of the difficulties which had to be faced; the following paragraphs, therefore, will outline briefly the topography of each Colony and the weather conditions experienced by our forces in their several locations.

#### GEOGRAPHY

The four British West African Colonies—the Gambia, Sierra Leone, the Gold Coast and Nigeria—lie along the south-western and southern coasts of the bulge formed by North-West Africa, and are separated from one another mainly by French possessions. The colonies are wet and fertile in the coastal regions, but become more arid and barren inland as the Sahara is approached.

*The Gambia* is a narrow, flat and swampy strip, about 30 miles wide, running inland for about 250 miles on each side of the River Gambia. It is surrounded by French Senegal, which separates it on the southern border from Portuguese Guinea. Bathurst, the capital of the colony, is situated on St. Mary's Island on the southern bank of the mouth of the River Gambia.

*Sierra Leone* covers an area about 250 miles square and is divided into the Sierra Leone Peninsula or Colony, and the Sierra Leone Mainland or Protectorate. The peninsula measures about 25 miles by 10 miles and has a range of thickly wooded mountains running throughout its length. The mountains fall sharply to the sea on the west side, but to the east they slope gradually to poorly drained grass fields, creeks and mangrove swamps. Sierra Leone is bordered by the African Republic of Liberia in the south-east, but the rest is bounded by French Guinea. The capital, Freetown, is situated on the southern bank of the River Bunce at the northern tip of the peninsula, with the residential area spreading up the northern slopes of the mountains behind. It possesses a fine, deep, natural harbour, but at the period covered by the present narrative this had not been fully developed and as no deep water wharves had been built, all cargo was handled through lighters (*see* Map 4).



*The Gold Coast* measures about 500 miles by 700 miles and is mainly flat to the east, rising to some 1,000 ft. to the north-west and west. The coastal strip is a mixture of swamp, heath-land and thick bush, with hills rising to about 1,000 ft. in some areas. It is bounded on the west by the French Ivory Coast, on the north by French Upper Volta, and on the east by French Togoland, the coast line facing almost due south. The only good port is at Takoradi about 170 miles west of Accra, which is the capital of the colony. Takoradi harbour is artificial, built in 1928, and has one deep water wharf and fair harbour facilities. Apart from harbour and railway officials, few Europeans lived in Takoradi, most of the administrative and commercial activities of this area being based at Sekondi on the coast about 8 miles to the north-east (*see* Map 1).

*Nigeria* is the largest British West African Colony, about 1,000 miles square, with the northern border reaching almost to the Sahara, and the River Niger and its tributaries flowing through the centre. The country is flat along the coastal strip and river area, but the intervening portions rise to 1,500 ft., and in the north some of the mountains are 3,000 to 6,000 ft. high. It is surrounded by French territory—to the west by Dahomey, to the north by the Niger and to the east by the Camerouns. The capital, Lagos, has a large but shallow natural harbour, the channels of which have to be constantly dredged, and no very large ships can be accommodated (*see* Map 3, page 300).

#### CLIMATE AND TOPOGRAPHY

The Gambia, being closer to the Sahara and farther north than the other three Colonies, has a somewhat different climate from the rest. There are only two seasons—June to October (wet) and November to May (dry). The rainfall averages about 50 in. during the wet season, being greatest in August and September; the humidity is rarely more than 80 per cent. and the maximum temperature 90° F. There is virtually no rain during the dry season when the relative humidity averages 50 per cent. and the temperature 80° F.

In the other three Colonies the climate in the coastal areas is characterised by a high relative humidity and a fairly uniform maximum temperature of 80° to 90° F., except for a rise to about 100° F. in February and March. The wet season lasts from May until November, with a short intervening dry season, usually during August; the average annual rainfall varies from 35–40 in. in Accra to 140 in. in Freetown, Lagos having a rainfall of about 70 in. and Takoradi 45–50 in. Rainstorms, line squalls and low cloud are hazards to flying in coastal areas. The climate in Northern Nigeria is characterised by a few hot months (over 100° F.) at the beginning of the year, followed by a short, wet season with 30–40 in. of rain and then a very pleasant, cool, dry season. The 'harmattan', a parching land-wind off the Sahara, blows

intermittently during December, January and February, bringing with it dust storms which sometimes render aerodromes unserviceable for several days at a time. Its effects lessen towards the coast, but even in Lagos the visibility during January and February may be very poor for two or three weeks owing to a thick 'harmattan' haze.

The soil in the Gambia is mainly sandy with a clay subsoil. Grass grows fairly abundantly during and immediately after the wet season and to the south of the coastal area there is considerable forest; the cultivated land includes rice fields and ground-nut plantations.

The coastal belt in the other three Colonies is green with a mixture of grass land, thick bush and forests. Where Europeans have cultivated gardens, the lawns are almost as green as in England, but the growing of vegetables is difficult, as the soil is mainly laterite. The land gradually becomes more parched towards the north of Nigeria and in Maiduguri, where the soil is a mixture of dust and sand, there is little vegetation in the dry season, apart from small scrub bushes. All these factors militate against the production of food locally.

#### POPULATION

At the outbreak of war, the Gambia was the poorest and the Gold Coast the richest of the West African Colonies; Nigeria was almost entirely agricultural. The Gold Coast and Nigerian Africans show greater intelligence and physical development than those of Sierra Leone and the Gambia. Many of the natives of the Gambia lived on the borders of starvation; increased wages were no incentive to better work since supplies of consumer goods were so bad that there was little on which the money could be spent. The population of Sierra Leone was largely derived from repatriated slaves, who had become sufficiently sophisticated to demand better working conditions, but insufficiently responsible to give value for wages received. The Gold Coast and Nigerian natives were capable of learning to be skilled craftsmen, but even they required constant supervision, without which they would stop work and usually go to sleep.

Apart from Africans the main nationalities were Indian, Syrian and European. The Syrians and Indians were the retail traders of the coast and few Africans attempted to compete; the Europeans consisted mainly of members of the Colonial Government and mining companies. There were a few white members of the United Africa Company which controlled practically all the big scale retail and export trade, and there were a few Swiss and French in the corresponding Swiss and French companies.

#### ENDEMIC DISEASES

*Malaria.* Before the R.A.F. went to West Africa it was known that, although practically every tropical disease was endemic, malaria was

the only one likely to affect the functional capacity of Service units to any major degree. It was certain that the rate of sickness would be high, since the European civilian Takoradi figures in 1935 and 1936, for malaria alone, had been 42 per cent. and 36 per cent. respectively; but the real incidence had certainly been higher, since many Europeans treated themselves, and malaria with no demonstrable parasites was often diagnosed as 'low fever'. The figures for 1938, the last recorded year, provide confirmation; out of a total of 378 admissions to the European hospital at Takoradi, 341 had malaria parasites in their blood, although only 159 were admitted and recorded as cases of malaria. In view of these very high figures among the semi-immune civilian population it was possible that malaria alone would render the reinforcement schemes inoperable, since the R.A.F. personnel would be non-immune and their living and working conditions would be hardly comparable with those of the civilian population. The only similar recent influx of large numbers of non-immune persons had occurred when Takoradi harbour was built in 1928. The European employees, who had been housed on the site, later used for the African Military Camp, were said to have had a malaria rate of 40 per cent., which dropped to 1 per cent. when the accommodation was mosquito-proofed and the tour reduced from eighteen to nine months.

The endemic diseases in Sierra Leone and the Gambia were similar to those of Takoradi, although the clear-cut differentiation between the wet and dry seasons led to a more seasonal incidence of malaria in the Gambia. *A. gambiae* bred prolifically during the wet season even in the smallest puddles, but during the dry season very few mosquitoes were to be found in the Gambia. This was probably due to the low temperature and humidity during the dry season rather than to lack of water, as many of the swamps persisted throughout the year. The salt water breeding *A. gambiae* var. *melas* was very common round Freetown.

*Dysentery.* The incidence of dysentery came next to that of malaria among Europeans in West Africa. According to hospital statistics amoebic was twice as common as bacillary dysentery. Here again figures were almost certainly misleading, as some cases of bacillary dysentery did not reach the hospitals and, of those which did, most were probably given a non-committal label, such as enteritis, since few hospitals had the necessary laboratory facilities to make a more positive diagnosis. Enteric fever was common in Africans, but comparatively rare in Europeans, probably due to the almost universal practice among Europeans of filtering and boiling all water.

*Yellow Fever.* The importance of yellow fever lay not only in the danger of cases among the Services, but even more in the possibility of the disease being spread, through air transport, to previously non-endemic areas, with consequent increased restrictions on aircraft

movements. The signatories to the International Sanitary Convention for Aerial Navigation of 1933, had agreed to regulations for the control of the spread of yellow fever by air transport, but the application of the Convention during war time created problems to which an entirely satisfactory solution was often impossible.

*Dengue and Sandfly fever* were said to be endemic in parts of West Africa, but classical dengue was rare and sandflies had only a very limited distribution; the civilian population was in the habit of referring to midges of the genus *culicoides* as sandflies, which was liable to mislead the uninitiated. There were various unidentified short fevers which were said to belong to the dengue group, but many of them were probably cases of partially suppressed malaria.

*Other Diseases.* Trypanosomiasis was endemic practically throughout the parts of West Africa where there were R.A.F. stations, except in Northern Nigeria, but owing to the strict bush habits of the tse-tse fly the disease rarely affected Europeans. Schistosomiasis had only been reported in districts close to the desert. Cerebro-spinal meningitis was very common among the Africans, especially in the inland territories of each colony, but it was extremely rare in Europeans. Diphtheria, smallpox, filariasis, rabies, various intestinal worm infestations, relapsing fever and flea-borne typhus were all endemic, but only rare sporadic cases occurred in Europeans. There had been an outbreak of plague twelve years before in Lagos, but cholera had never been recorded. Blackwater fever, although important to the individual and liable to affect morale, owing to its high mortality, was unlikely to lead to serious wastage of man-power.

The incidence of venereal diseases was very high among Africans, who had no sense of shame about being infected. Septic and fungus skin conditions and allied ear infections were extremely common, as in all tropical countries with a humid climate.

#### R.A.F. FLIGHTS TO WEST AFRICA—PRE-WAR

In 1929, 1930 and 1931, a flight of R.A.F. aircraft flew from Helwan, Egypt, to the West African coast and back. Data on flying conditions and the state of landing grounds were collected and some remarks were made on the medical aspects of the flight, particularly in the 1930 report. These comments are particularly interesting as they were made by the officer commanding the flight, no medical personnel being included among those taking part.

The members of the flight learned by painful experience that, as a protection against malaria, the prevention of mosquito bites was of more value than the regular use of quinine. The report pointed out that inexperienced personnel taking quinine are apt to consider themselves comparatively secure against malaria and to neglect other

precautions. The report stated: 'The sickness we had on, and subsequent to, the flight only shows that we did not take sufficient care. It is interesting to record that the effects of 30 gr. of quinine taken at Niamey within twelve hours of Sokoto were appreciably to dull the senses of the pilot and to lengthen considerably the apparent time of the flight. The three who took the greatest care to prevent mosquitoes biting them and those with inherently cautious temperaments did not go down with malaria. The other three did. I am satisfied that until pilots and airmen . . . understand that the true prevention of malaria is to keep the mosquito from biting . . . we shall get a high rate of infection among inexperienced personnel.' How very true this prophecy by a non-medical person proved to be will be seen in the later sections of this narrative.

The seriousness of the malaria problem is indicated by the diagram below, which shows the relative incidence of the main causes of sickness during the first year of the Royal Air Force in West Africa:

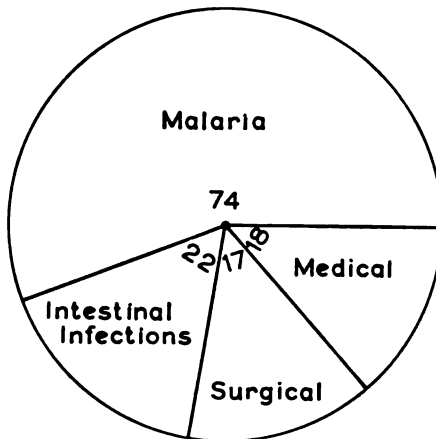
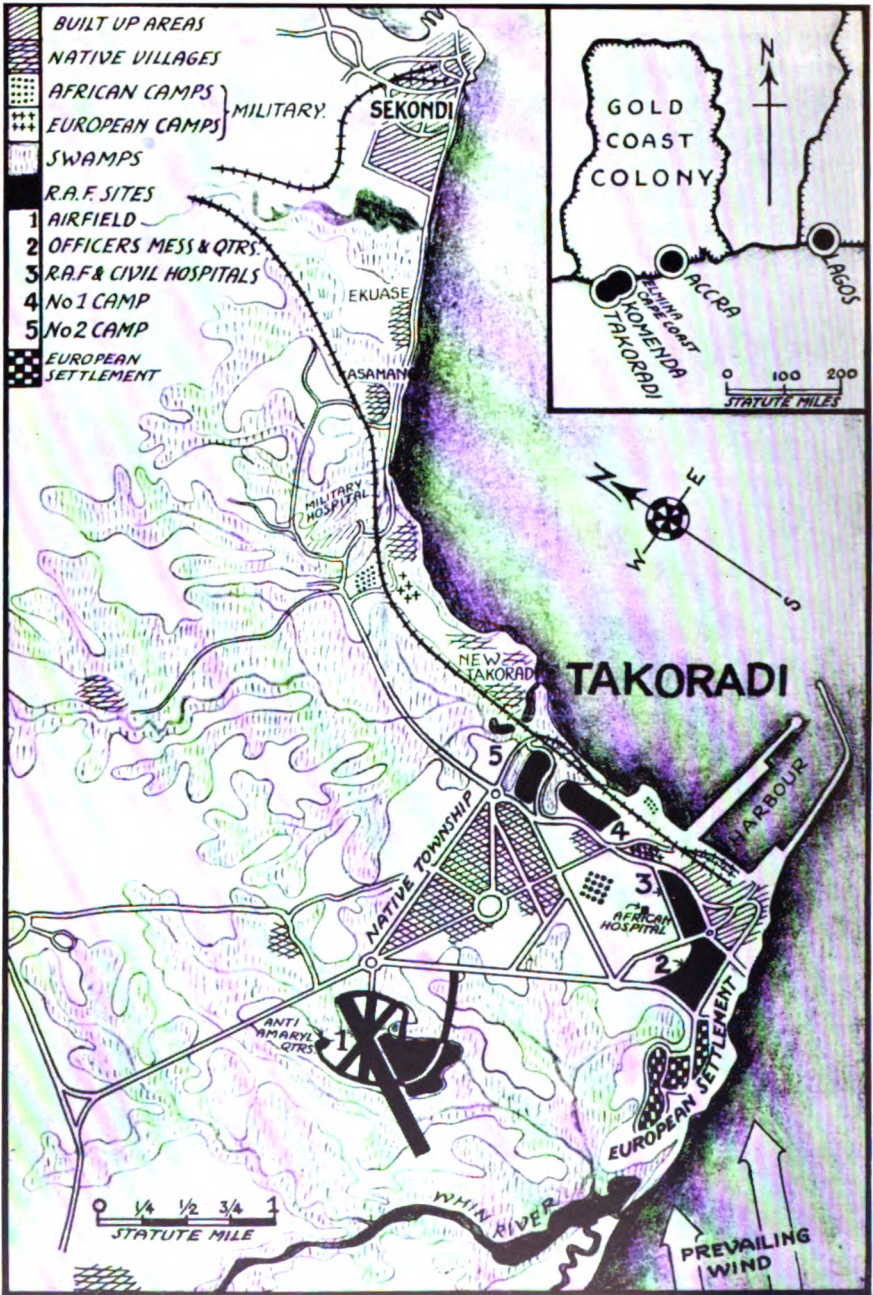


FIG. 1. Diagram showing relative incidence of the main causes of sickness in the R.A.F. in West Africa, 1940-1.

#### AIR COMMUNICATIONS

Inter-colonial communications before the war were mainly by sea. There was little land traffic between the colonies and when, in 1940, the intervening French territories became controlled by Vichy, all land communications stopped. Imperial Airways flying boats had bases at Bathurst, Freetown and Lagos, *en route* for Leopoldville and Stanleyville, East Africa and Egypt. Imperial Airways also ran a service from Accra to Lagos and from Lagos to Khartoum *via* Kano, Maiduguri and El Fasher. Sabena aircraft followed the Belgian Congo route to East Africa. The Lufthansa, based at Jeswang, had a regular service running to Berlin and South America, and the French had established





MAP I  
Takoradi and its environs.

air lines between all their Colonies and France, but called at no British Colonies. Thus the main pre-war airfields in British West Africa were at Jeswang, Accra, Takoradi, Lagos, Kano and Maiduguri. Partly as a result of the R.A.F. flights referred to in the previous paragraph, various small landing fields had been prepared in Nigeria and the Gold Coast. The Elder Dempster Steamship Company had a single 'plane with one pilot, which maintained a rather uncertain service between Sierra Leone and the Gambia, using the small airfield at Wellington, near Freetown.

#### THE ARRIVAL OF THE R.A.F. IN WEST AFRICA

The Mediterranean route to the Middle East became extremely hazardous as a result of Italy's entry into the war on June 10, 1940 and the fall of France on June 17 of that year. A scheme was therefore devised for the reinforcement of the Middle East by ferrying aircraft across Africa, and arrangements were made for the greater safety (particularly from U-boat attack) of convoys proceeding down the west coast of Africa, by increasing ocean reconnaissance from land-based aircraft. French Equatorial Africa and the Mandated Territory of the Cameroons declared for General de Gaulle on August 29, 1940 and this made possible a trans-African air route which did not pass over enemy or neutral territory. The rest of the French Colonial Empire declared for Vichy, thus presenting a potential threat to the British West African Colonies and making an increase in defensive precautions necessary.

The stations and personnel concerned with the assembling and ferrying of aircraft, were initially placed under Middle East Command while the ocean reconnaissance and fighter aircraft were administered by Coastal Command. A separate West African Command was formed in October 1941, but Middle East Command retained control of reinforcement aircraft movements and ferry crews were held on the strength of Middle East Command.

#### MIDDLE EAST COMMAND

##### TAKORADI

The first R.A.F. party to arrive in West Africa disembarked at Takoradi on July 14, 1940. The town was bounded on the south and east by the sea and on the west by the Whin River and the flat marsh land surrounding it, while the country to the north was hilly and, where not cultivated, covered by thick bush. The African township was in the centre of the Takoradi area and the European reservation was on a hill to the south-west, overlooking the Whin River (*see* Map 1). The airport was situated in the swamps between the African township and the Whin River. The runways needed considerable reconstruction, as they were too small and insufficiently strong to take heavy aircraft



where the ground had been reclaimed from swamp. Workshop, office and store accommodation had to be built and was continually being increased, with consequent expansion of the airfield perimeter.

*Accommodation.* The officers were accommodated in the Finsbury Pavement Hostel buildings originally used for miners in transit and situated about a mile to the south-west of the African township, near the European reservation and overlooking the sea. The only building immediately available for the airmen's quarters was an African technical training college on the cliffs east of Takoradi and adjacent to the African township. The siting of the airmen's camps (Nos. 1 and 2 Camps) was unfortunate. The medical officer who accompanied the first R.A.F. party to Takoradi was apparently under the impression that the prevailing wind blew over the camp from the sea to the native town, since this was how he described it in his first report; the prevailing wind, however, was south-west. At the officers' mess it blew from the sea, as the coast line here faced south, whereas the coast line at the airmen's camp site faced east. The Deputy Principal Medical Officer (Hygiene), Middle East, who visited the station in September 1940, reported that as the airfield was surrounded by swamps it had been imperative to build all living accommodation elsewhere and that the nearest suitable site had been used; in fact, the camps would probably have been much better sited on the airfield where the mosquitoes had less chance of becoming infected. Construction on the airmen's camp was continuous until the end of 1942. Until the middle of 1942 ablution blocks were built separately, one block serving six or more barrack rooms, so that many of the airmen had to walk several hundred yards, half dressed, to reach their ablutions. Owing to the constant overcrowding, construction of sleeping quarters was given priority over everything else, with the result that the kitchens and drainage were badly neglected. The kitchens for the airmen's messes had been made by conversion of existing rooms in the African college and by adding wood and corrugated iron shacks as increased space became necessary. An open main drain ran down the centre of one of the kitchens and all the drains stopped short at the edge of the camp site.

*Water Supply and Sanitation.* Both officers' and airmen's camps were connected with the town water supply, which was excellent in quality and at first ample in quantity. Later, owing to the increased population and harbour requirements, the use of water had to be restricted and the pressure frequently fell so low that no water could be obtained at the R.A.F. camps, which, unfortunately, were on the highest ground in Takoradi. A new booster pump was fitted to the water supply system late in 1942 and this greatly improved the supply. Conservancy was at first entirely by bucket latrines, the buckets being emptied and cleaned by a native gang under R.A.F. supervision and the contents taken to

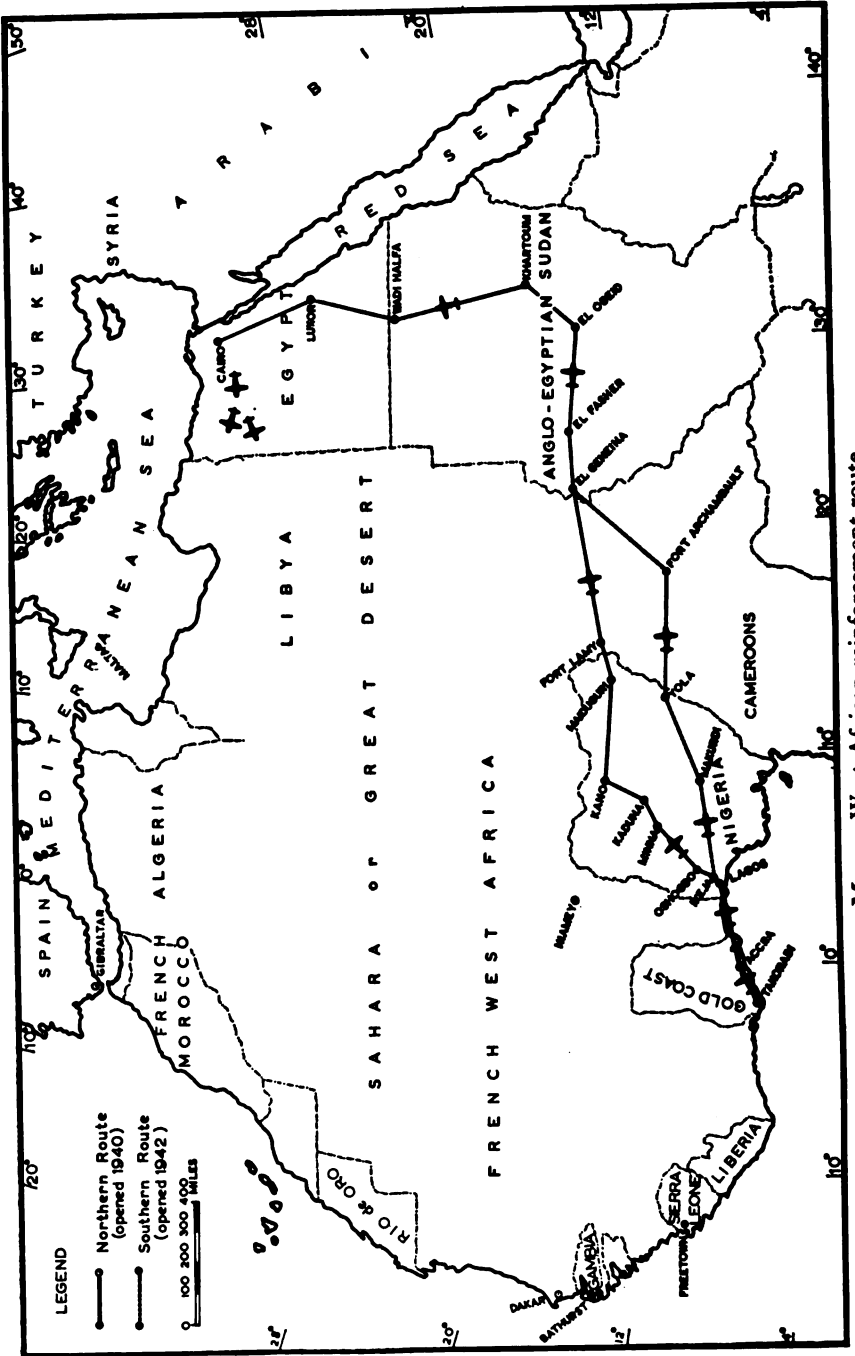
the township disposal pits in lorries. As soon as possible bucket latrines were gradually replaced by the installation of waterborne systems, but most of these had to be reconverted in 1942 when the water pressure failed. The further installation of waterborne sewage systems was prohibited except in hospital and sick quarters buildings.

#### ESTABLISHMENT OF WEST AFRICAN REINFORCEMENT ROUTE

The immediate task of the R.A.F. in West Africa was the reinforcing of air strength in the Western Desert. Because of the distances involved and the risk of air attack, aircraft could not be flown from the United Kingdom, but were to be brought in crates to Takoradi, there to be assembled, tested and flown across Africa to the Middle East. Blenheims, Marylands and Hurricanes were the main aircraft first assembled and these were augmented at the end of 1940 and early in 1941 by Hurricanes flown off the aircraft carrier *Furious*. As the output from Takoradi commenced, the West African Reinforcement Route through Nigeria and the Sudan was opened up, R.A.F. Station Takoradi being responsible for its administration as far as the Sudan border. Junior officers, usually of the technical branch (engineers) were in charge of the Nigerian staging posts, which were at Apapa (Lagos), Kano and Maiduguri, with emergency refuelling posts at Oshogbo, Minna and Kaduna (*see* Map 2). These posts are described briefly in the following paragraphs.

*The Apapa airfield* was the civil airport of Lagos, built on reclaimed land, opposite the town, to the west side of the strait connecting Lagos lagoon with the sea. Although Apapa was only three-quarters of a mile across the strait from Lagos, the distance by road was about eight miles (*see* Map 3). The airfield had water to the north, east and south, and swamps to the west, the only firm ground in the neighbourhood being the strip to the north-west, upon which were built the road and the railway; towards the open sea (i.e. to the south) were a succession of creeks, swamps and low-lying muddy islands, native villages being built wherever there was sufficient dry land. The first R.A.F. personnel occupied the anti-amaryl quarters on the airfield, but when new huts were built alongside, the anti-amaryl quarters became the sergeants' mess. Two sites were obtained in the residential area of Apapa about a mile away from the airfield; on one of these was built the officers' mess and on the other a small camp for transit personnel. All the camps were down-wind of mosquito breeding grounds and native villages!

Conservancy was by bucket latrines, which were emptied into Otway pits on the airfield and cleared under municipal arrangements at the officers' mess and transit camp. Later, waterborne sewage systems were installed on both camps and proved very satisfactory. Water was obtained from the town supply, which was good and abundant.



MAP 2. West African reinforcement route.

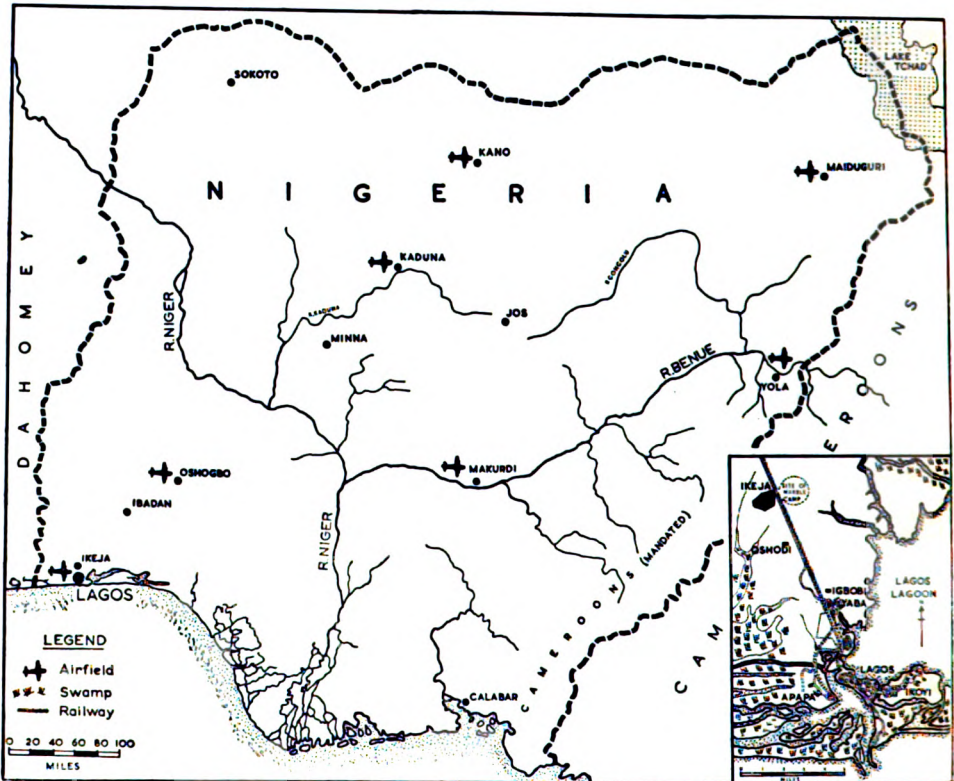
*Kano* was situated about 500 miles inland from Lagos and was the capital of a large area of Hausa territory (Map 3). The native township, in the centre of which the Emir had his palace, was an ancient, exceedingly dirty, walled city, obtaining its water supply from numerous mosquito-breeding ponds. The airfield was about two miles north-east of the native city and had been designed to include a building-free zone, in order to conform with anti-amaryl regulations. There was only one stream nearby where mosquitoes could breed, but this isolation was soon spoilt by the formation of innumerable borrow pits and the siting of Army defence posts, manned by Africans, round the perimeter.

Officers and aircrew were accommodated about three miles to the south-west of the airfield in the Nigerian railway rest house until June 1941, by which time an officers' and aircrew mess and transit camp had been built on the adjacent site; other ranks occupied the anti-amaryl quarters on the airfield and further huts of mud-brick, surfaced with cement, were added as they were required. Water was piped from a supply controlled by the native administration. All drinking water was boiled, as its treatment at the source was unreliable. Domestic drainage was difficult, as there was no natural outfall near either camp site, and soakage pits lasted only for a very short time, owing to unsuitable soil. Long concrete channels leading to broad irrigation systems were eventually installed and this method was fairly satisfactory.

*Maiduguri* was in semi-arid country about 300 miles east of Kano and about 400 miles by an all-weather road from the most easily accessible railhead at Jos. (See Map 3). The airfield was about four miles from the town. The officers were accommodated in the old Residency building, which was riddled with white ants and had already been condemned. The airmen's camp was built nearby of mud and thatch, as there were no other local building materials and wood brought from the coast became so warped as to be practically useless. The kitchens were small, dark, and impossible to keep clean, and much of the food preparation had to be done under thatch shelters outside. Water was at first obtained from a shallow well and was drawn up in an old leather bucket on a rope. It was then treated with clarifying and bleaching powder. The 'Topic' Force, which was stationed here at the end of 1940, left a water trailer behind, but several parts were missing and by 1943 they still had not been replaced. Later, as the supplies of clarifying powder and bleaching powder ran out, all water was boiled.

Maiduguri grew to be one of the principal R.A.F. stations in West Africa and by 1944 a very considerable building programme had been carried out, so that conditions, although never luxurious, were at least of a reasonable standard.

As the strengths of the staging posts increased, additions were made to the original accommodation and, as in other parts of West Africa, the provision of sleeping accommodation outstripped the kitchen, ablution and recreational facilities.



MAP 3. Nigeria, showing airfields.

*Oshogbo, Minna and Kaduna* were on the route from Lagos to Kano. (See Map 3.) Once experience had been gained in the fitting of long-range tanks to fighter aircraft, these intermediate landing grounds became unnecessary for refuelling, so R.A.F. personnel were withdrawn from Minna in the middle of 1941 and from Kaduna early in 1942. Oshogbo still had a small detachment throughout 1942 owing to the bad flying conditions in that area. Fort-Lamy and Ati in French Equatorial Africa were at first maintained as refuelling posts, but at the end of 1941 Ati was closed and there was only one airman at Fort-Lamy.

## WORKS SERVICES IN THE GOLD COAST AND NIGERIA

All building for the R.A.F. in the Gold Coast and Nigeria was carried out by the Colonial Public Works Department, which had to work at first with little knowledge of Service requirements and without expert R.A.F. advice, for up to 1942 the only Air Ministry Works Directorate representative in either of these Colonies was a Clerk of Works at Takoradi, employed exclusively on maintenance duties. The Public Works Department staff, even before it was depleted by enlistment into the Army, had been adequate to deal only with civilian requirements; now the engineers were grossly overworked and there was consequently insufficient European supervision. The work of the engineers was increased by continual changes in plans, due partly to ever-changing requirements and partly to poor Service organisation—plans were often not shown to the departments concerned before being submitted to the Public Works Department, and as few of the R.A.F. officers had any previous training in the design of buildings, their ideas were constantly being modified in the light of experience. As a result, although the general standard of construction was good, many mistakes were made in the plans, details of which were rarely carried out correctly, and the speed of construction soon fell behind the rate required by the increase in personnel.

## 'TOPIC' FORCE

'Topic' Force, composed of Free French and British, was sent to West Africa in October 1940 to co-operate with the Free French. The aircrews were disembarked at Takoradi to take over their Blenheims, and the ground staff went on by sea to Lagos, arriving on November 2. It was intended that the Force should be based at Fort-Lamy, but the accommodation available was found to be quite unsuitable and arrangements were therefore made for assembly at Maiduguri, where they arrived early in December. Officers were billeted in the old Residency and grass huts were provided for the men. In January 1941 the Force was ordered to its advanced base at Ouninga, just south of the Libyan border.

## PERSONNEL STRENGTHS

By October 1941 the strength of R.A.F. Station Takoradi had reached nearly 1,500 and the output of aircraft, to be exceeded later, was nearly 200 a month (see Fig. 2). The total losses of aircraft, from the time they left Takoradi until they reached their destination in Middle East, was under 3 per cent. which was extremely good considering the long distances which had to be flown, the frequent rain storms in the coastal regions and the dust storms in the more arid areas. The

increasing numbers of aircraft to be assembled necessitated an ever greater number of personnel, which in turn made it necessary continually to expand the building programme both at Takoradi and at the route staging posts. The strengths of the staging posts at this time were:

	<i>Officers</i>	<i>Airmen</i>
Lagos (Apapa airfield) . . . . .	11	76
Kano . . . . .	4	70
Maiduguri . . . . .	6	75
Oshogbo . . . . .	2	30
Minna . . . . .	—	— (closed mid-1941)
Kaduna . . . . .	—	8 (including 1 corporal)

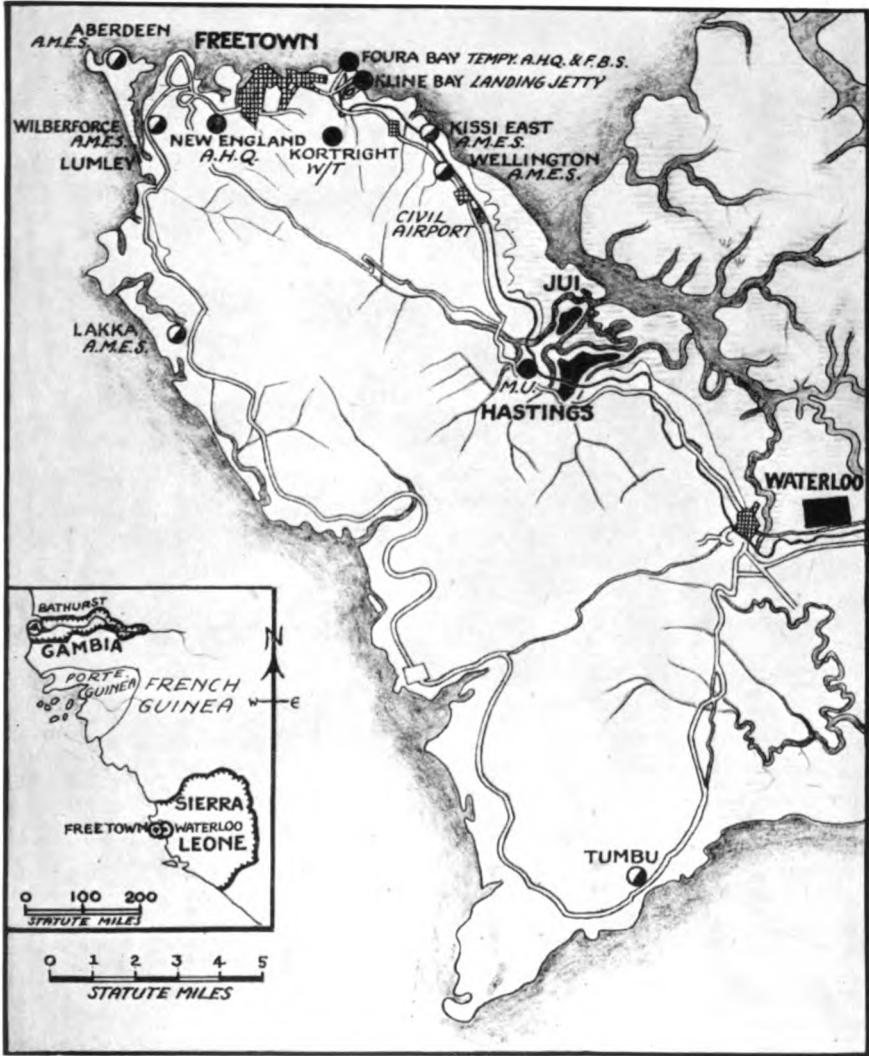
#### COASTAL COMMAND

##### FREETOWN

Ocean reconnaissance was started in West Africa by the Fleet Air Arm at Freetown (Sierra Leone) in September 1939 and operated from the small civil airfield at Wellington pending the completion of an airfield at Hastings. (*See* Map 4.) Living quarters were in part of the Foura Bay College, the rest of which was still being used as a school for Africans. This three-storeyed ramshackle building was situated on a small promontory jutting into the harbour east of Freetown. The two acres of grounds were at first grass-covered, but soon became bare and dusty. Immediately outside the grounds was a cluster of dirty, one-roomed African houses.

Foura Bay College was hygienically very unsatisfactory. There were extensive local breeding grounds for mosquitoes, and the surrounding native villages provided a convenient parasite reservoir. The college itself was in such poor repair that no attempt at screening was possible. The kitchen consisted of a small, dark room with two stoves to cook for nearly 200 men. The preparation room was no more than a part of the concrete yard covered with a piece of corrugated iron supported on four posts.

In February 1941 three Sunderlands of No. 95 Squadron, Coastal Command, left England for Freetown, but one was lost in the Tagus and another at Gibraltar. Another three Sunderlands left England and arrived in Freetown at the end of February to be based at Kline Bay, a small creek in Freetown Harbour near Foura Bay College. The ground crews arrived by sea on March 3 and were housed temporarily in a camp some 10 miles away on the coast at Lumley, which the Essex Regiment had occupied after the 'Dakar Affair'. A seaplane base had been ordered at Jui, near Hastings, but work on it had barely started; another airfield



MAP 4. Freetown and its environs.





had been ordered at Waterloo, but here again little headway had been made in its construction.

By March the Fleet Air Arm had moved to Hastings and personnel of No. 95 Squadron moved into Foura Bay College, taking it over completely from the college authorities in July; the officers occupied the south wing and the airmen were accommodated in the rest of the main building or in tents in the grounds. The aircraft had to be returned to the United Kingdom for major overhauls at about three monthly intervals, as the squadron only had makeshift workshops which the men had made themselves out of Hurricane packing cases. (*See also* Gibraltar—Volume II, page 298.)

#### BATHURST

In the meantime, similar developments under Coastal Command were taking place in the Gambia. An advance party arrived in Bathurst, at the end of November 1940, to form a unit known as R.A.F. Marina or the Flying Boat Control Unit. This unit eventually consisted of the Controller, a W/T Station and Meteorological Office, and by December 1941 its strength had increased to 120 personnel. The camp was situated on a grass-covered, sandy spit on the north side of St. Mary's Island, close to the crowded and insanitary town of Bathurst; the sub-soil water level was less than four feet below the surface and there was a large swamp within 200 yards of the camp. The buildings were of semi-permanent construction with concrete floors, wood and plaster walls, and corrugated iron roofs covered with thatch.

#### JESWANG

No. 200 Squadron, equipped with Hudson aircraft, arrived in June 1941 and was stationed at Jeswang, the old Lufthansa airport on the mainland, 7 miles west of Bathurst. The airfield was situated in one of the most malarious areas of the coast, having six native villages within a radius of two miles and being surrounded by mangrove swamps and extensive rice fields, all fertile breeding grounds for *A. gambiae* during the wet season.

No preliminary arrangements had been made for their reception and the only buildings on the airfield were a hangar, an office, and a petrol store, left by the Lufthansa. The petrol store was turned into the officers' mess and the airmen were accommodated in tents and bush buildings. The nets provided were mainly of the unsatisfactory bivouac type (*see* section on Malaria—Mosquito Nets) and, as all living accommodation was in tents, no screening could be attempted. The bivouac nets were not entirely replaced until late in 1942. (*See* Medical Facilities. Prior to October 1941—Takoradi.)

The kitchens were improvised structures with no fly-proofing and drainage was by means of soakage pits, which needed constant re-digging owing to the lack of proper grease traps and the high subsoil water level. The water supply was drawn from the civilian mains and for drinking purposes was chlorinated in a 400-gallon tank. There were only two water points on the camp, water for the ablution blocks being stored in petrol drums.

#### HASTINGS

In view of the expected arrival of No. 128 Squadron in July 1941 and the delay in the construction of their accommodation, the Commanding Officer of No. 95 Squadron called in the local Public Works Department to erect a number of 'Lagos' huts at Hastings, which was situated south-east of Freetown, about 8 miles up the Bunce River on a peninsula projecting into extensive tidal mangrove swamps (*see* Map 4). The Fleet Air Arm accommodation was built at the base of the peninsula adjacent to the native village, the runways being in the middle and the R.A.F. site at the tip of the peninsula. The runways were relatively short and all had poor surfaces, while the presence of 2,000 ft. hills less than a mile from the end of one made both approach and take off very difficult; the swamps surrounding the other end of the runways made their extension almost impossible.

When the staff for Air Ministry Experimental Stations (A.M.E.S.— Radar Station) and No. 128 Squadron, equipped with Hurricanes, arrived, the accommodation at Hastings was not ready and the ground personnel were sent to Bo, 160 miles inland, for three months, returning to Hastings on October 17, 1941. The officers of No. 128 Squadron shared the mess and accommodation of the Fleet Air Arm. These buildings had been constructed by the Air Ministry contractors and were mosquito proofed. The gauze had been obtained from the United States by the Commanding Officer of 49 Field Hygiene Section, at his own expense, for use in British Army accommodation. His gesture was ignored by the C.R.E. of the area, so he placed the gauze at the disposal of the Air Ministry contractors for use on Hastings Fleet Air Arm accommodation. The only buildings ready for the airmen were the 'Lagos' huts ordered by the Commanding Officer of No. 95 Squadron. The buildings originally planned and ordered by the Air Ministry Works Directorate were not completed until more than a year later; in the meantime some airmen had to live in tents.

#### AIR MINISTRY EXPERIMENTAL STATIONS

Nos. 244 and 513 A.M.E.Ss.\* (*see* Map 4) moved into corrugated iron accommodation at Kissi East, which was situated in one of the most

\* *See* R.A.F. Volume II, Chapter 11, page 643.

malarious areas in Africa. The site was about two miles up river from Foura Bay on practically flat ground only a few feet above sea level. It was about half a mile from the native village of Kissi East and to the north it was limited by a large mangrove swamp. A technical site for No. 244 A.M.E.S. was adjacent to the domestic site, but No. 513 A.M.E.S. operated from Wellington, about a mile away. No. 265 A.M.E.S. had similar accommodation at Wilberforce, about 500 feet above sea level, and about two miles west of Freetown. There was a native village about a mile to the west and a large Army transit camp, accommodating native troops, in between. About 150 feet below the camp was a fair-sized stream but, owing to the steep gradients, natural drainage was good and there was fortunately little stagnant water at any season. Soon after the arrival of these A.M.E.Ss., No. 296 Radio Direction Finding Wing was formed at Wilberforce to administer all A.M.E.Ss. in West Africa.

Two Sunderlands of No. 228 Squadron arrived in Bathurst from Alexandria in July 1941 and their ground crews arrived by sea in the S.S. *Dumana*, which was anchored, to form a base, off Half Die on the southern outskirts of Bathurst. No. 204 Squadron, from the United Kingdom, relieved No. 228 Squadron at the end of September and was also based on the *Dumana*.

#### CONSERVANCY

The water supply at Freetown was piped from a safe source, but, in spite of the 140 inches annual rainfall, there was a water shortage in the town and the mains were turned off for several hours daily.

Conservancy both in Sierra Leone and the Gambia was universally by bucket latrines. In Sierra Leone the buckets were emptied into Otway pits under R.A.F. supervision, but in the Gambia the high subsoil water level made Otway pits impracticable and, after experimenting with various methods of disposal, burial of the excreta in shallow trenches was found to be the most satisfactory. It was difficult in the Gambia to get native labour to empty the buckets as there was a strong prejudice against the occupation of 'sanitary boy'.

#### CONSTRUCTIONAL WORK

Building for the R.A.F. in Sierra Leone and the Gambia was normally carried out by London contractors under the supervision of the Air Ministry Directorate of Works. From the start, construction lagged behind contract dates, and the standard of finish and attention to detail left much to be desired. It was difficult to apportion blame for this unsatisfactory state of affairs because of the many factors involved; for example, there were practically no local building materials, in either Sierra Leone or the Gambia, and delivery from the United

Kingdom and America was frequently delayed; most of the supervising officers had little or no experience in tropical construction or in handling native labour; finally, owing to lack of mechanical facilities nearly all work had to be done by hand, and native labour was scarce and unskilled.

In August 1941 a representative of the Air Ministry Works Directorate arrived from the United Kingdom, with authority to give local approval of constructional work, and with him came a new Chief Engineer. Considerable re-organisation was carried out and work at Jui and Waterloo was urgently put in hand. A site was chosen at New England, half way up the hill behind Freetown, for the projected Air Headquarters. A visit was paid to the Gambia in September 1941 and authority immediately given for the building of kitchens and messes in the form of 'Lagos' huts. Two further airfields, one at Yundum about 8 miles south of Jeswang, and one at Brikama, a few miles farther south, were sited after taking expert medical advice. Unfortunately, Yundum was not ready for occupation by No. 200 Squadron until 1943, in spite of high priority, and Brikama was abandoned in 1943.

#### WEST AFRICA COMMAND FORMATION OF AIR HEADQUARTERS

The staff for the Air Headquarters, West Africa, arrived in Freetown aboard S.S. *Manela* in October 1941, officially taking over from Middle East and Coastal Commands on October 22. The Headquarters was based in Freetown, as close liaison with the Navy was considered to be of prime importance in view of the large amount of ocean reconnaissance required. However, construction on the New England site had not started, so most of the personnel were accommodated in S.S. *Manela*, which was anchored off Kline Bay. Five scattered messes were gradually acquired for the officers and some of the airmen shared accommodation with No. 95 Squadron in Four Bay College; office accommodation was provided in different houses, huts and tents at Four Bay, but until these were ready, some departments had to work from S.S. *Manela* and the Navy loaned the Air Staff a hut about five miles away. The interests of the two Services being rarely opposed, co-operation between the R.A.F. and the Navy was always good, and the social relationships were excellent.

Most of the difficulties of having two Commands interested in the same area were removed by the formation of a separate Command, but, owing to poor communications, problems due to the remoteness of Headquarters Coastal Command and Headquarters Middle East Command were not completely solved. One ship of about a thousand tons was devoted to inter-Colonial service, but its time-table was erratic on account of engine breakdowns. The only regular air services, after

the outbreak of war, were run by the British Overseas Airways Corporation and the Belgian Sabena Company from Takoradi, through Accra and Lagos, to the Middle East. Service aircraft on duty occasionally flew between the other two Colonies (the Gambia and Sierra Leone). Apart from this R.A.F. personnel were able to use Pan American Airways, up to 1942, and later a R.A.F. Communications Flight was established at Takoradi. The civil airways aircraft were normally filled to capacity with freight and high priority 'through' passengers to and from the Middle East, so that medical staff officers from Takoradi or Lagos attempting to visit the staging posts, and Air Headquarters officers on inspection duties, usually had to rely on obtaining a spare seat in one of the convoy aircraft. Many of the officers concerned could not afford the time necessary for this uncertain mode of travel, and consequently the staging posts, manned by junior officers, suffered from insufficient supervision.

#### LIAISON WITH THE ARMY

As Army General Headquarters were in Achimoto College at Accra, close liaison between them and Air Headquarters was difficult. The Army performed many services for the R.A.F., including rationing, the provision of hospital accommodation and the defence of airfields; and it was largely in connexion with these that some inter-Service criticism arose.

The Army found the fulfilment of their R.A.F. commitments made more difficult by the frequent changes in R.A.F. policy and by the lack of up-to-date information, due to poor communications. These facts in some cases inevitably led to an undercurrent of friction in official matters, but nearly everywhere good personal relations resulted in the differences in points of view being treated with good humour, and the general tone of inter-Service relationships was one of good-natured rivalry.

#### ATTITUDE OF CIVILIANS TO THE R.A.F.

The civilians were most helpful in running canteens for the Services and included Service men in all their social activities. On official matters many were extremely helpful and made no complaints at the extra work which they were called upon to do. Some, however, seemed to resent the interference which the presence of the Services inevitably caused in the normal routine of their lives, and it was noticeable that those called upon to do the most extra work, such as the Public Works Department engineers, were also those who showed the most co-operative spirit. The attitude of the Governments was strongly against any interference with the *status quo*, attempts at requisitioning buildings being nearly always initially opposed, so that considerable time was lost in negotiations.

In July 1942, Lord Swinton arrived in West Africa as Resident Minister and from that date he acted as arbiter in all matters of dispute and decisions were obtained more quickly. His coming was of great importance, not only to the R.A.F., but to the whole of British West Africa. He had been sent from England for one purpose only: to keep the Reinforcement Route open and to speed the vital flow of aircraft to the Middle East. This meant, in effect, that his chief aim was to stamp out malaria, for the incidence at this time was menacing the whole Reinforcement scheme. At his first conference with Service chiefs and civilians responsible for the area he made it abundantly clear that he would accept no excuse for inaction or inefficiency in matters concerning anti-malaria measures and henceforward he supported fully all methods whereby his aim could be achieved. Such backing was of the greatest moment to all medical officers and a clear vindication of their early and often unpopular struggles to obtain even a minimum of hygienic discipline.

#### AMERICAN AND FREE FRENCH CO-OPERATION

The Pan American Airways, in October 1941, set up their headquarters at Accra, where they were joined by the U.S. Army early in 1942. Both were most helpful in sharing facilities and in assisting whenever possible to obtain special equipment from America. The British Army had complained that the R.A.F. standard of accommodation was too good, but the Americans set a far higher one. They sent out a complete organisation of constructional engineers, and where local materials were not available, they imported pre-fabricated buildings.\* All their buildings were mosquito-proofed, and they insisted on waterborne sewage in all their camps; where water was not available from a town supply they sank wells. They provided their own electric power plants and installed large numbers of refrigerators. Their kitchen ranges were electric or oil-burning, and the equipment was nearly all enamelled or polished metal, with double draining board sink units.

In order to maintain liaison with the American Forces and with the British Army General Headquarters, a small R.A.F. detachment from Takoradi, consisting of a liaison officer, an embarkation officer and a signals section, was stationed at Accra, initially accommodated in the Pan American Airways camp. Later in 1942, when the American camp became overcrowded, the R.A.F. detachment took over the anti-amaryl quarters on the airfield. The American Army were concerned entirely with ferrying American aircraft to the Middle East and Far East; most of the machines were multi-engined bombers or transports and were

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\* In later years these pre-fabricated buildings were found to have stood the climate badly and much renovation became necessary.

flown out, but in the latter half of 1942, fighters were sent out crated and were assembled mainly at Lagos.

The Free French were at first very willing to co-operate fully as far as their limited resources would allow, but there were one or two unfortunate incidents which caused resentment among the Free French, and after the beginning of 1942 great care had to be taken to ensure that the liaison officer had made arrangements through the correct channels before any Allied officer visited French territory.

#### EXPANSION OF COMMAND

The period from the formation of Air Headquarters, West Africa, until the commencement of the North-West African campaign in November 1942 was one of re-organisation and continual expansion in all parts of the Command; the increasing danger to convoys from submarine attacks necessitated a greater number of reconnaissance aircraft; the danger of attack by the surrounding Vichy colonies made an improvement in defence measures imperative; and the Libyan campaign called for ever greater numbers of aircraft and airmen, many of whom were flown across Africa. All these increased activities meant greater numbers to be accommodated, with the result that the building programme fell even further behind requirements.

In order to extend the range of ocean reconnaissance right along the coast, No. 200 Squadron sent a detachment to Takoradi in November 1941, and another detachment to Hastings early in February 1942. The airfield at Robertsfield in Liberia was used by the Hastings detachment from August 1942, but only a few airmen were stationed there. The detachment at Takoradi carried out sweeps along the coast to Lagos, often undertaking further reconnaissance from there before returning. A flight of Hurricanes for defence purposes was also stationed at Takoradi. Four more A.M.E.Ss. and two mobile pack sets opened up during 1942, while a site for an airfield in the Gold Coast for operational squadrons was chosen in March between Cape Coast and Elmina, about five miles inland and about fifty miles east of Takoradi. Part of the accommodation was provided by taking over a Roman Catholic school.

#### OPENING UP OF SOUTHERN REINFORCEMENT ROUTE

The need for a more southerly alternative air route, owing to possible enemy interference, was first considered in 1940, but no definite action was taken until the danger had been emphasised by an air raid on Fort-Lamy in January 1942, probably carried out by German aircraft refuelling at Zinder. A party consisting of a G.D. officer, a signals officer and a medical officer, surveyed the alternative route across Nigeria *via* Makurdi, Yola and Fort-Archambault in February, and in



March a second party, consisting of a G.D. officer and an equipment officer, made final arrangements for the siting and construction of the necessary accommodation (see Map 2, page 298).

A small aircraft assembly unit was started at Apapa early in 1942 to augment the production at Takoradi. A second airfield had been sited at Ikeja, as the runways at Apapa could not be extended and the airfield was becoming too congested; it was opened as a staging post in April 1942, after which all ferry aircraft from Takoradi landed there, unless forced by weather conditions to land at Apapa. Ikeja was situated about ten miles up the main road leading inland from Lagos; on three sides the surrounding country was firm, but on the fourth side the airfield was bounded by swamps, and on all sides there were numerous African villages. By the end of June, Takoradi alone had erected and despatched a total of 3,238 aircraft. As the Americans were also ferrying large numbers of aircraft by this time, the alternative route was now becoming necessary to relieve the congestion at the staging posts.

S.S. *Manela*, which had been used as a depot ship to relieve overcrowding in Freetown, departed on March 10, 1942. As this further increased accommodation difficulties, personnel of No. 95 Squadron were gradually moved in April from Foura Bay to R.A.F. Station, Jui, which was separated from Hastings by a tributary of the Bunce River and extensive mangrove swamps. The peninsula on which Jui was built was about two and a half miles long and varied in width from a hundred yards to half a mile. The slipway was completed in August 1941, but the buildings had not been started until December, so that the accommodation was far from complete when the squadron moved in. The station sick quarters was used as an officers' mess until August 1942 and many of the airmen lived in tents. The move of the squadron greatly relieved the overcrowding at Foura Bay (see Map 4) where attempts were then made to improve the living conditions and the kitchens but little progress was made owing to shortage of workmen, supervisors and materials.

#### R.A.F. TRANSIT CAMPS

The increase in strength of units was accompanied by a great increase in transit personnel and ferrying crews; as the accommodation on all stations was already overcrowded, their disposal became an acute problem. In Sierra Leone there was an Army transit camp at Wilberforce, but little room could be spared for R.A.F. personnel; accordingly the airfield at Waterloo was opened as a transit camp in May 1942. The camp was situated on the isthmus joining the Sierra Leone peninsula with the mainland (see Map 4). It was bounded on two sides by streams, on the third by mangrove swamps and on the fourth side by the railway.

The first runway had been started in August 1941, but its construction was so faulty that it had to be re-made. A subsidiary runway was completed by September 1942 when the airfield became officially serviceable, although before that it had been used as an emergency landing ground when Hastings was unserviceable. When the camp was opened for the reception of transit personnel, much of the accommodation was incomplete, cooking had to be done in a temporary shelter, and all water had to be carried from two tanks situated near the cookhouse. A medical officer had been stationed at the camp since January 1942 and he had already instituted a considerable amount of anti-malaria drainage.

All ferrying crews and most transit personnel at Takoradi were accommodated with the permanent staff, in spite of gross overcrowding. There was an Army transit camp near Sekondi, but as it consisted of unscreened buildings and was surrounded by native villages and swamps, use of the small amount of room available was avoided as much as possible. Eventually, in the middle of July 1942, it was necessary to erect tents on the No. 1 Camp football pitch in order to relieve congestion in the barrack rooms. In Nigeria, the accommodation at Apapa was insufficient even to take all the ferrying crews and until May 1942 all surplus R.A.F. personnel were billeted in various Lagos hotels. Arrangements were made in May for parts of the Army officers' transit camp at Ikoyi and the Army other ranks' transit camp at Yaba to be reserved for the R.A.F. These camps were of bush type construction and not mosquito-proofed, but were preferable to the hotels, moreover the standard of discipline was good. Even so, the hotels often had to be used, as the numbers frequently rose above the capacity of the camps.

The R.A.F. in the Gambia had been organised in February 1942 on a wing basis, No. 296 Wing Headquarters being at R.A.F. Marina. S.S. *Dumana* sailed from Bathurst in May 1942, when the airmen of No. 204 Squadron moved into quarters which had been erected at Clifton Road, Bathurst, and the officers and senior N.C.Os. moved into the Marina Camp. No. 375 A.M.E.S. arrived in August and was stationed at Latrisibge, but did not become operational and replace the two pack sets until October.

*Building Programme.* In June 1942 the Air Ministry Works Directorate representative visited the Gold Coast and Nigeria, where the building programme had fallen far behind requirements. He approved plans for further building at all the stations, asked Air Ministry for large numbers of Works Directorate personnel to be seconded to the Public Works Departments, and signalled for materials and mechanical equipment. Up to this time little planning had been exercised in the construction of stations, and buildings had been ordered strictly according to the

numbers to be accommodated at the time, so that the first increase gave rise to overcrowding. The growth of all stations had been so great that the kitchens and messes had become grossly inadequate and, although attempts had been made to meet the situation by piecemeal conversions and additions, the results were far from satisfactory. The Works Directorate representative introduced the new principle of planning the communal buildings for at least double the initial requirements and siting the rest of the buildings on a similar basis, but erecting only those barrack rooms that were immediately necessary. While he was touring Nigeria, information was received that No. 1432 Flight, an operational flight of Hurricanes for Army co-operation duties, was due to arrive at Lagos within a few weeks *en route* for Kaduna. No arrangements had been made at Kaduna for their reception, so a tented camp was erected on the polo ground and a permanent camp near the airfield was planned and approved. A visit to Fort-Lamy revealed that the few airmen stationed there were living in disgusting conditions in a leaky, condemned hut in the native area. The Americans had built first class accommodation and were at first willing for the R.A.F. airmen to share it, but before this could be arranged, their camp had become full through a sudden increase in American personnel. It was not until the end of 1942, when the Resident Minister expressed his horror at the conditions under which R.A.F. units were living, that alternative accommodation was provided. A further airfield was sited at Seccoom near Accra and a site for No. 5050 A.M.E.S. was chosen at McCarthy Hill nearby. The airfield was cancelled towards the end of 1942, before any major construction had been started, but an advance party moved into the A.M.E.S. in October, sharing living accommodation with Army units in Accra, as the domestic site had not been completed.

Progress in the building programme in the Gambia and Sierra Leone was still painfully slow throughout 1942, and, in spite of the arrival of extra European supervisors, there was little attention to detail in construction. The medical and dental officers at Hastings built and equipped the medical inspection room and dental theatre themselves, even to the plumbing!

*Projected Move of Air Headquarters.* With the assistance of Lord Swinton, the police college at Accra was requisitioned for conversion into a new Air Headquarters. It had been decided that with the Resident Minister and the Army General Headquarters at Accra, Air Headquarters would be better there than at Freetown. Work was started at once on the conversion of the building and construction of the extra accommodation required. The importance of the West African Reinforcement Route progressively increased as the North African campaign went forward, but it quickly diminished as soon as success had been achieved and alternative supply routes became

available. Emphasis was then placed more on ocean reconnaissance, for which close liaison with the Navy in Freetown and with the North-West African forces was essential. Accordingly, after several changes in policy, Air Headquarters decided at the end of 1942 to remain in Freetown. The police college buildings were, therefore, adapted for use as a R.A.F. controlled transit camp, which was opened early in 1943.

*'Marble' Scheme.* During 1942 a scheme was being considered by the Army for reinforcement of the Middle East by transporting 10,000 troops a month across Africa by air. The troops were to be brought by sea to Lagos, flown from Ikeja to Maiduguri and, after a night stop at Maiduguri, on to Khartoum, whence they would travel by rail to Cairo. The scheme, referred to as 'Marble', was finally dropped, but in the meantime the Army had built part of the transit camps at Maiduguri and Ikeja. When the Resident Minister visited Maiduguri at the end of 1942 he entirely agreed with the opinion expressed by the Principal Medical Officer early in the year, that the R.A.F. camp there was quite unsuitable, and, thanks to his intervention, the Army handed over to the R.A.F. the 'Marble' camp, which was situated adjacent to the airfield. The camp at Ikeja was taken over early in 1943 as a transit camp.

*R.A.F. Regiment.* Units of the R.A.F. Regiment arrived in West Africa in July 1942 to take over from the Army the ground defence of airfields. Many of the men were untrained and had had no special medical examination for fitness for the Regiment. Those who were sent to the staging posts had to be withdrawn to Takoradi in October 1942 for training, and many were re-mustered to A.C.H./G.D. on medical grounds. At the end of 1942 all members of the R.A.F. Regiment returned to the United Kingdom. (See Volume II, Chapter 12, for a full account of the formation, training and medical standards of the R.A.F. Regiment.)

*Further Developments.* A United States Army Air Corps unit arrived at Takoradi in August 1942 for the erection of Kittyhawk aircraft and was accommodated with the R.A.F. pending completion of their own buildings. Owing to the congestion at Takoradi they moved to Lagos in October and set up their assembly unit at Apapa airfield. No. 298 Wing (R.A.F.) was formed at Lagos on October 1, 1942 to administer all staging posts in Nigeria, thus relieving Takoradi of this responsibility. With the reorganisation of Nigeria, more senior officers were posted to command the staging posts, a wing commander being put in charge of Kano, where previously there had only been a flight lieutenant. The wing headquarters moved into a separate camp at Igbobi, near Yaba, half-way between Lagos and Ikeja, in November, the camp consisting of a converted African college, with additional huts built by the Public Works Department. The staging posts on the new route at Makurdi, Yola and Fort-Archambault had been gradually opened up

by advance parties from September 1942 onwards; the accommodation in most cases was good and well screened, but the route was only used by a small number of aircraft towards the end of 1942, and was closed early in 1943. In September 1942, No. 297 Wing was inaugurated at New England, Freetown, to control all R.A.F. stations in Sierra Leone. In October, Air Headquarters moved to their new camp at New England and No. 297 Wing replaced them at Foura Bay. The buildings at New England were far from complete, so that the overcrowding which had been experienced at Foura Bay continued at New England. In November 1942, the North-West African campaign commenced and it immediately became obvious that the whole future programme in West Africa would have to be revised.

From this time until the end of the Middle East campaign and the opening of the Italian campaign, the Command contributed to the war effort in these theatres by supplying substantial reinforcements in aircraft, largely assembled in West Africa, personnel and all possible forms of supplies, ranging from ammunition to food and essential medical requirements. It was to a large extent this uninterrupted supply of materials which provided the basis for these successful campaigns and, although to the personnel stationed in West Africa their work may have seemed unspectacular, its importance was well illustrated by the virtual annihilation of Axis forces in the Desert and the final successful onslaught in Italy.

#### MEDICAL NARRATIVE

##### SITING AND CONSTRUCTION OF R.A.F. STATIONS—

###### MEDICAL ASPECTS

The necessity for taking medical advice on the siting of stations in areas with a high incidence of endemic disease seems obvious, but there was little evidence of such advice having been sought in West Africa until the middle of 1941. The Medical Officers of Health were willing to advise Commanding Officers on matters of hygiene and sanitation but were seldom invited to do so. Even in 1942 medical advice was rarely sought and usually had to be thrust upon the authorities concerned, often repeatedly, before it was followed. This was partly the fault of the medical branch, as the inexperience of many of the medical officers sometimes led to incorrect advice being given or to its tactless presentation. There was usually little choice possible in the siting of airfields, as this was dictated by operational necessity, but the disposition of the buildings within the area chosen was of great importance, and the amount of health control possible depended greatly on whether a sufficient area had been requisitioned.

An interesting sidelight on the siting of R.A.F. establishments was the business acumen shown by certain natives. It was an important

anti-amaryl precaution to leave a 'building free' area ( $\frac{1}{4}$  mile radius) around R.A.F. stations and if native huts were built on such an area they had to be demolished, compensation being paid at the rate of £1 per hut. Some Africans soon learned to appreciate the significance of R.A.F. siting parties and speedily erected huts 'on spec.' in areas being surveyed—an 'investment' which rarely failed!

The works foremen engaged on R.A.F. constructional work were often ignorant of even elementary principles of hygiene and many failed to co-operate when the requirements were explained. Continual medical supervision was necessary to prevent the artificial formation of borrow pits and other mosquito breeding grounds and to ensure that essential details in hygiene construction were carried out correctly.

Until 1942 nearly all building was carried out under local arrangements and with local materials, little attempt being made to obtain help from the United Kingdom. As a result, the building programme fell far behind requirements, and much material, labour and money was wasted in erecting temporary makeshift accommodation, which had to be expanded later.

*Waterloo.* A R.A.F. medical officer was stationed at Waterloo from January 7, 1942 to offer medical advice on the buildings and to supervise the anti-malaria work; this was the first time in West Africa that a medical officer had been present from the beginning of the construction of an airfield site. He made his own plans of the area and completely eliminated a stream running across the middle of the airfield and others near the perimeter. Large settlements of native labourers and their families were allowed to spring up at the edge of the site in spite of the medical officer's protests, and these provided the source of malaria infection for many of the transit personnel during the middle of 1942. These settlements were demolished later, but considerable compensation had to be paid. The resident engineers and builders' foremen showed little co-operation and made many gross errors in sanitary construction in spite of correct advice from the medical officer. There was marked neglect in carrying out details shown on the building plans, resulting in many faults in the screening, and the special windows and doors were sent from the United Kingdom fitted with twelve mesh gauze, which was quite useless against mosquitoes. (*See Malaria—Screening.*)

*Takoradi.* The tendency throughout the Command not to submit plans of projected buildings to the medical branch for approval meant that many type plans were not shown to the P.M.O., and at Takoradi the S.M.O. usually first learnt of new buildings by seeing their foundations being laid. Direct orders from the commanding officer that all plans were to be submitted to the S.M.O. for approval were not obeyed. As a result of this many modifications had to be made during

the course of construction, which led to protests from the District Engineer. The Director of Public Works of the Gold Coast issued an order in June 1942 to all his District Engineers that no works were to be undertaken for the R.A.F. unless they had been approved by the S.M.O.

*The Gambia.* An Army malariologist accompanied the Air Ministry Works Directorate representative to the Gambia, and was consulted on the siting of the aerodromes at Brikama and Yundum, the first two aerodromes in West Africa for the siting of which any medical advice had been taken. It was agreed during this tour that all living accommodation and offices used at night in both should be screened.

*Hastings and Jui.* The malariologist also inspected the sites for the R.A.F. stations at Hastings and Jui and found malaria to be hyper-endemic in all the villages around. He recommended that the native houses in these areas should be removed and that the new quarters should not be occupied until mosquito-proofing had been completed. None of these recommendations was followed and, as already mentioned, when No. 128 Squadron moved into Hastings many of the airmen had to live in tents. After negotiations with the Air Ministry Works Directorate representative, the whole layout of the buildings at Jui was changed, Nissen huts being planned in groups connected by covered and screened ways to blocks containing latrines, ablution and drying rooms.

From 1943 onwards considerable progress was made in all R.A.F. building, for not only was more labour available, but much had been learned from the experience of the earlier years. Unfortunately, the original supplies of local mahogany were now exhausted but contractors were able to buy, from the R.A.F., packing cases in which crated aircraft arrived from United Kingdom; as the R.A.F. then paid for the work undertaken, this was an arrangement not without profit for the contractor concerned. In a few instances, however, the building programme lagged behind the increases in personnel and it was still necessary for personnel to be accommodated in tents. In an effort to provide at least some kind of permanent building many types of huts not normally acceptable to the medical authorities had to be accepted—for example, bush huts made of crintin, mud and interwoven thatch, or huts made of daub and bamboo wattling with conical thatched roofs; such buildings, though better than tents, had many disadvantages from the medical aspect, the greatest being the difficulty of rendering them mosquito-proof.

By 1944 a very much better standard had been reached and with few exceptions buildings were fully mosquito-proofed, the benefit of which was very fully demonstrated by the continually dropping figures for malaria and other diseases associated with poor accommodation.

## NATIVE LATRINES

Great difficulty was experienced in getting satisfactory native latrines. They were usually left out of the original camp design, and when added later were frequently placed next door to the kitchen, because the cooks wanted them to be conveniently near, and the medical officer had not been consulted. The principle of fly-proofing native latrines was received with astonishment by the Works Department, until its importance was explained. The few native latrines built on the camps at Takoradi were not fly-proofed, and in any case most Africans preferred promiscuous defaecation outside.

Attempts were made during 1942 to acquire an auger at Takoradi, in order to see whether borehole latrines would be a practical proposition, particularly for native use. On several occasions a suitable auger was promised by the Army, but it was never obtained, although in the Gambia one was used to bore holes for the disposal of sullage water. It is probable that it would not have been a success, as it was said that the laterite, prevalent all over Takoradi and throughout most of Nigeria, would probably have militated against its usefulness.

## FOOD SUPPLIES

## R.A.F. MESSING ARRANGEMENTS

For the first 18 months or so the R.A.F. provided their own rations in the Gold Coast and Nigeria using the Army Sierra Leone scale with some minor modifications. Rations in the Nigerian staging posts were generally better than those at, for example, Takoradi, as Nigeria is an agricultural country and local produce was easier to obtain—except at Maiduguri where the land was not fertile and importation of supplies, particularly perishable goods, was difficult owing to poor communications.

Rations in both Sierra Leone and the Gambia were provided through the R.A.S.C. and, although based on a similar scale, they were of a very much lower standard than those in the Gold Coast and Nigeria. This was due mainly to lack of local produce and the inability to supply substitutes when items were not available through shipping difficulties. In the Gambia the feeding was particularly bad, as very few ships called there and local supplies were practically non-existent. The water supply was in all cases from the main town supplies, but in the Gambia these were not safe and all water for drinking and cooking was chlorinated or boiled.

Where the local purchase of food was in force, especially in Nigeria and the Gold Coast, the feeding of all ranks was of a high standard. In the Gold Coast fresh vegetables were difficult to obtain from local sources, as civilian residents relied almost entirely on their own gardens, and African vegetables were considered tasteless or even unpleasant,



especially after their unimaginative European preparation by Service cooks. At many of the smaller stations the local Colonial Agricultural Officer gave great assistance in organising the production by neighbouring Africans of European vegetables and in arranging adequate supplies of milk and eggs. At Takoradi the medical officer recommended that the R.A.F. should start their own garden and the owner of one of the estates, some fifteen miles from Takoradi, very kindly offered to run a market garden if the R.A.F. would supply the seeds. This offer was accepted, Air Ministry sent out the necessary seeds and thenceforward very good supplies of vegetables were obtained. Potatoes, the one common exception, could not be grown, the local substitute being yam; on first acquaintance yam seemed reasonably palatable, but after a few weeks' constant association most people developed a lasting dislike of it. Potatoes were imported from time to time, but it was impossible to maintain a constant supply.

There was a very general distrust or distaste on the part of all R.A.F. ranks for indigenous foods. This probably was part of the inherent conservatism of the British character, but had intelligent catering officers been present from the start, by the cautious introduction of new foods a much more willing use might have been made of them. In the Gambia and Sierra Leone, where there were seasons during which fresh vegetables and fruit were practically unobtainable, ascorbic acid tablets were substituted. Marmite, which was issued with rations, was practically only used in cooking. The shortage of animal fats in tropical Africa was countered by the use of margarine, which was of a poor quality; bread also was at all times poor.

Commanding officers made arrangements for the transport by rail of fresh fruit and vegetables obtainable elsewhere during certain seasons. These practically ceased when the whole of the Royal Air Force in West Africa came on to R.A.S.C. rations some months after the formation of West Africa Command.

#### VISIT OF DIETETIC TEAM

A team of dietetic experts visited West Africa in November, 1942. In the Gambia they found the feeding to be very bad, and many personnel showed subnormal dark adaptation and corneal vascularisation detected by slit lamp examination. There were some cases of angular stomatitis and many had sore tongues with a clinically perceptible glossitis. Examination of a comparable group at Takoradi showed results well within normal limits, although the standard of feeding in the Gold Coast and Nigeria had not been as good since the Army took over the supply of rations in April 1942, as it had been when the R.A.F. catered for themselves. Representations were made to the Army and the matter was pursued by the Resident Minister. The Army

sent their medical consultant to report, and he did not concur with the R.A.F. findings; nevertheless as a result of his visit and the action taken the standard of rations was quickly improved. The dietetic team agreed that the equipment in the kitchens was very bad and the general standard of the kitchen buildings left much to be desired.

Investigation of complaints regarding the quantity and quality of R.A.S.C. rations often showed that adequate calorie value was being received, but the absence of bulk foods, such as porridge, did not create the feeling of fullness popularly associated with satisfaction. There were places, however, where definitely inadequate quantities of food were being issued. The R.A.S.C. at G.H.Q. were on all occasions most obliging, understanding and co-operative and it is probable that many of the deficiencies experienced were due to failures at the periphery. In some places it was said that the arrival of American personnel with their 'Local Hire Purchasing' capacity caused a diversion of supplies which were otherwise going to the British Services. During the early part of 1942 much of the general supplies of food originated in South Africa, but some came from Canada and the United Kingdom. Towards the end of 1942 the export of these products from South Africa was stopped, probably on account of South African commitments in the Middle East. Defects in food handling occurred on many stations in the transport of rations from the R.A.S.C. Depot to the station drawing them; the shortage of mechanical transport often led to the use of unsuitable and unclean lorries, which after collecting rations in the earlier part of the morning made a series of Service calls at other places before arriving at their unit several hours later.

It was felt that serious consideration should be given to the establishment of special vehicles for ration drawing which would contain adequate facilities for the transport of various types of food. Rations were sometimes seen arriving at a station in a truck which later in the day might be used for any other duty; the meat would be lying unprotected in an iron tub, the vegetables scattered about the floor, and canned foods and bread lying where they had fallen.

#### COOKING FACILITIES

Another cause of the feeding difficulties, until catering officers arrived, was the inability of cooks to make the best of the rations received. Kitchens in R.A.F. camps were almost universally bad. They had been constructed to deal with the original numbers expected and when the camps expanded, the kitchens soon became too small. A kitchen to which additions had been made was rarely satisfactory and further additions were usually already necessary by the time the first had been completed. The kitchen equipment was very inadequate and

much of it unsuitable. The standard ranges were of the small wood-burning type, which made the kitchens unbearably hot and quickly blackened everything with smoke.

The cleanliness and hygienic discipline of kitchens in many instances left much to be desired, but were extremely difficult to improve, due partly to an insufficient appreciation of the importance of hygiene on the part of the European Service cooks and partly to the inadequate number of cooks, the result of under-establishment and sickness. Native assistant cooks and other cookhouse employees were engaged in all areas, but these were for the most part unskilled, any good native cooks being retained by the civilians, who paid them better and assured them of a more certain future; in any case, even those who could cook well for private houses had little idea of how to cook for large numbers.

Examination of the stools of native cooks resulted in over 50 per cent. being rejected and there is little doubt that practically 100 per cent. would have qualified for rejection if repeated examinations had been made.

The arrival of catering officers towards the middle of 1942 resulted in a considerable easing of many of the above problems. They showed a great appreciation of difficulties and were tireless in their efforts to improve matters.

#### RECREATION, MORALE AND WELFARE

##### RECREATIONAL FACILITIES

During the period before the arrival of Headquarters, West Africa Command, recreational facilities on all stations throughout West Africa were very poor. Building had been so far behind requirements that no time could be spared to provide canteens, football pitches, and other similar facilities and at most coastal units bathing was for some time the only recreation available, although even then suitable bathing places were often several miles from the station. Most personnel in West Africa had had little Service experience and were wholly lacking in self reliance. The most difficult problem was to provide recreation for the evenings, particularly as the barrack rooms were overcrowded and there were no canteens. The N.A.A.F.I. at Takoradi had been completed towards the end of 1941, but as it had been planned for 600-700 and by that time the strength of the station had reached 1,500, it was still inadequate. This lack of evening occupation led to the airmen visiting local African townships, where they were exposed to malaria and other diseases.

Cinemas were gradually installed during 1942 at most stations, but two sizes of projector were sent out, so that the use of one size of film was limited to the stations with that type of projector, and the films were rarely of recent vintage. E.N.S.A. concert parties also began to

arrive in 1942, but there seemed to be a lack of appreciation by the E.N.S.A. authorities of the type of show the airmen wanted. The party which had the greatest success, judging from the applause and the size of the audiences, was one which consisted of semi-classical songs and piano solos and a comedian whose performance contained nothing that would not have been acceptable in a Victorian drawing-room.

Recreational facilities, and living conditions generally, materially improved from 1943 onwards; this was reflected in the steadily falling number of cases of malaria, dysentery and venereal disease.

#### MORALE

Morale in West Africa was good considering the disadvantage of having to work under trying conditions without the stimulus of active operations. Most personnel showed keen interest in their surroundings when they first arrived, but the depressing effect of the climate, and in some cases the effects of sickness, usually led to the development of considerable apathy in their attitude to life. This was particularly apparent in the interest taken in various forms of recreation. On the arrival of a new draft, great keenness would be shown for swimming, yacht building, and other spare time occupations, but after one or two months only a few enthusiasts remained. It is difficult to assess the relative importance of various factors in the production of this almost universal apathetic state. The climate was partly responsible, but it was not worse than that of many other R.A.F. stations in the Tropics. Lack of recreational amenities to provide occupation in the evenings and the almost complete absence of social life outside the Service certainly played a part. There was a feeling throughout the Command that West Africa was a backwater, rarely remembered by higher authority, and unknown to those not directly connected with it. The omission of West Africa from public speeches, in which all other fields of Service activity were mentioned, increased this sense of neglect. Probably the most important factor in the production of this state of apathy was debility following malaria. Although the apathy was not confined to those who had suffered from this disease, such an attitude can quickly spread under trying conditions, once it has been adopted by a few members of the community.

Many officers, both senior and junior, failed to show a sense of responsibility for the welfare of their men and seemed to be under the impression that their duties were over when their offices closed. This was most noticeable at Takoradi, where the station consisted of a large number of almost independent units, but there was no separation into units in the domestic accommodation. In these circumstances it was difficult for officers to make contact with their men after working

hours, and to foster a unit spirit. It is significant that, when members of the hospital staff moved into their own quarters, their general outlook underwent a remarkable change; great interest was shown in the fortunes of the unit football and cricket teams, all personnel developed a keen sense of pride in their unit, and this was reflected in a much higher standard of efficiency in the performance of their duties.

It was noticeable that whenever a large number of aircraft arrived for erection and the working hours had to be increased, the tone of the stations involved improved, and the sight of the convoys setting off in the mornings gave everyone a feeling of accomplishment and satisfaction.

It was impossible for the airmen not to feel some dissatisfaction when American units arriving in 1942 enjoyed a much higher standard of welfare than the R.A.F. The American quarters were all excellent, feeding was good, mail was regular and quick, and every unit had its cinema with films which had only just been released in America. Nevertheless, in spite of the many factors tending towards the production of dissatisfaction, the airmen retained their good humour; the general attitude was to ventilate their complaints by having a good grumble and then to make the best of things.

The morale of the Command received a considerable fillip in 1943 when ground crews saw that their efforts in assembling aircraft for the Desert battles were playing a decisive part in the achievements of the Eighth Army and Desert Air Force against Rommel, while the operational aircraft of Coastal Command were so harrying the U-boat packs in the Atlantic that it was rapidly becoming obvious that the contribution of these aircraft was materially swaying the balance of the war in the Atlantic in our favour.

At the conclusion of the North African campaign and after the fall of the Atlantic Vichy ports, both ground and air crews found that their direct share in the battle was largely over, and their rôle amounted to that of a peace-time force without the advantages of peace-time conditions; it is not surprising that in such circumstances the morale of all personnel fell noticeably, but such a reaction was a typical aftermath of war in every branch of the Fighting Services.

*Mail.* The most general complaint throughout the Command was the irregularity and delay in the arrival of mails, which undoubtedly adversely affected the morale of the force. The average time taken for a letter to travel from the United Kingdom to the coastal stations in the Gold Coast and Nigeria was six weeks to two months, and was even longer for the staging posts in Nigeria. During 1941 mails from Sierra Leone and the Gambia were taken to the United Kingdom in Sunderlands returning for major overhauls, and mail for West Africa was brought back on their return journey. This practice was stopped in

1942 owing to lack of space in the Sunderlands. Air mail letter cards were available in 1942 at the rate of two per month, but the benefit of these was greatly reduced by uncertainty as to the time they would take in transit. No air mail service was available from the United Kingdom to West Africa until 1943, although promises had been made that one would be started ever since 1941. The annoyance at the lack of air mail service from the United Kingdom was aggravated by the fact that letters were accepted by post offices at home and paid for at air mail rates, but were sent by sea. The dissatisfaction with the mail service was increased by the fact that adjoining American units received letters from the United States within a few days of their being despatched.\*

*Length of Tour.* There had been doubt for some time about the official length of tour in West Africa and the policy, so far as was known, was that after eighteen months in West Africa, those who were still fit would be posted for a further tour to the Middle East. In October 1941 information was received that the first West African draft was to be transferred to the Middle East. So many were found to be suffering from malaria, or from post-malaria debility, that strong recommendations were made to Air Ministry that all personnel in West Africa should be posted back to the United Kingdom at the end of eighteen months. This was finally agreed to and in January 1942 the length of tour in West Africa was fixed at a minimum of one year and a maximum of eighteen months, a decision which did much to encourage personnel to keep themselves fit during their tour.

The official definition of the length of tour was warmly welcomed, but the delay in the policy being put into effect caused considerable irritation, as many airmen, particularly those in Nigeria, had completed twenty-four months before they were detailed for posting back to the United Kingdom.

Recommendations were frequently made that periods of duty at the staging posts should be limited to a maximum of nine months. Although there was general agreement on this subject, little action was taken, and the medical branch had to effect the posting of several airmen by marking them unfit to return to their staging post after discharge from hospital.

*Working Hours.* Working conditions in most places were indifferent, as there were few hangars and most work on aircraft had to be carried out in the open, where frequently the parts of the aircraft were too hot to touch. Even at Takoradi, where there were good workshops and hangars, the number of aircraft became so great that most of the erection had to be done outside.

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\* See also Chapter 10, page 457.

A production drive to increase the output of aircraft was started in March 1941 and the working hours for ground personnel, on aircraft erection duties, were increased from 49 to 66 hours a week. The attendance at the sick parade and the number excused duty showed a steep rise during April and May, and the S.M.O. made strong representations to have the working hours reduced, pointing out that a reduction in hours would probably increase output (*see* Fig. 2 opposite). He met with some opposition, but in June the working hours were reduced to 54 hours a week. The total man-hours lost through all sickness immediately fell sharply, in spite of a continued rise in the malaria rate due to the onset of the malaria season. At the same time the output of aircraft actually increased. If the reduction in working hours had been delayed any longer, the loss in production would probably have been serious, as the increased general sickness would have coincided with the peak in the malaria incidence.

#### MEDICAL FACILITIES

##### PRIOR TO OCTOBER 1941

*Takoradi.* A medical officer who had been some ten years in the Nigerian Medical Service, but had had little experience in the R.A.F., was selected to accompany the first party to Takoradi. He was followed a month later by another medical officer, who had been in practice in Hong Kong before the war.

A wing commander S.M.O. and three other medical officers, including one Polish officer, arrived in Takoradi at the end of 1940. The S.M.O. was away in South Africa for six weeks soon after his arrival and in May 1941 was posted to Egypt, the original medical officer resuming the duties of S.M.O. Takoradi.

During June and July 1941 two more medical officers were posted to Takoradi and in August a pathologist, a surgeon and a medical specialist arrived. As one of the medical officers already there was a fully qualified surgeon, the newly arrived surgeon was reposted to Egypt a month later. At the same time the establishment for nursing orderlies was raised by 25 per cent.

A medical inspection and dental centre at No. 1 Camp was completed in March 1941 and provided very good accommodation consisting of a room for the medical officer, a separate room for the Polish medical officer, a treatment room, an office and duty orderlies' room, a dispensary, a crash room, a waiting room, a dental officer's room and a dental laboratory. One microscope was available and some stains had been acquired from the Medical Research Institute in Lagos, where specimens requiring bacteriological or serological examination were normally sent. An African was trained to stain films for malaria parasites, and an average of nearly 50 a day were examined. A small

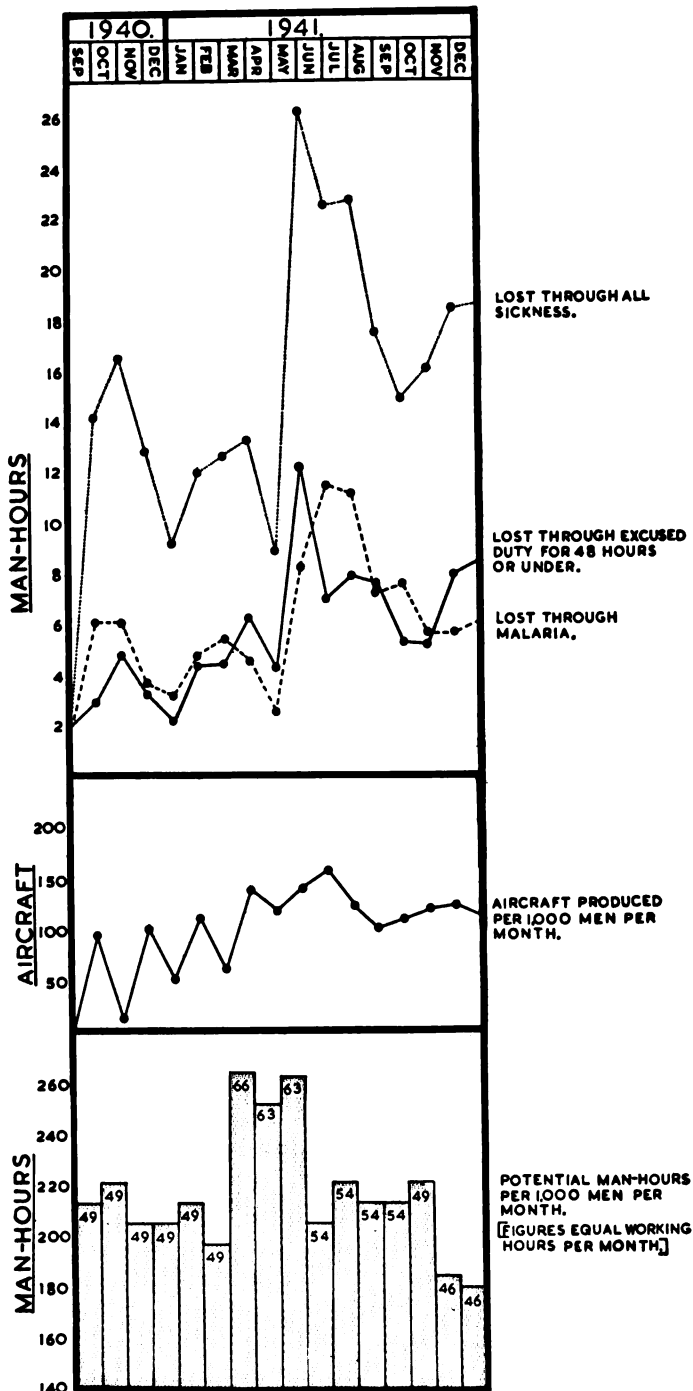


FIG. 2. Graph showing medical conditions in relation to work. R.A.F. Takoradi.



medical inspection room was set up on the airfield by taking over one of the offices, but this was used only as a first-aid and treatment centre for those working on the airfield. Two marquees were erected in the grounds of the civilian hospital and equipped with 28 beds and emergency rations. These were for first-aid use in case of a surprise attack.

The only hospital facilities at Takoradi were those afforded by a Government European hospital, which could in emergency accommodate 24 patients. The contractors who built the harbour, several years before, had erected this hospital for the treatment of their employees. The R.A.F. medical officer made arrangements for holding the daily sick parades at this hospital and for the admission of any cases requiring hospital treatment.

The admissions to hospital in Takoradi during September and October 1940 were 131, of which 74 were for malaria. In order to augment the beds available in the Colonial hospital, a four-roomed bungalow in the European residential area was taken over in November and was equipped for twelve patients. In December 1940 the Director-General of Medical Services made urgent requests to the Directorate-General of Equipment for the bivouac mosquito nets, which had been supplied to Takoradi, to be replaced by the rectangular type. It had been found that when bivouac type nets were used with ordinary beds with mattresses, insufficient room was left for the occupant to lie down without touching the net. In the morning, nets had been blood-stained by mosquitoes biting through them. The more effective rectangular nets were received early in 1941.

The sharp rise in the malaria rate in May 1941 caused a crisis in the problem of hospital accommodation. A barrack block on No. 1 Camp was taken over as an emergency sick quarters capable of taking 20 patients, and the Officer Commanding 52 British General Hospital was asked to give assistance. This hospital, half-way between Takoradi and Sekondi, was intended solely for African troops and being unscreened and situated in a highly malarious area, was quite unsuitable for Europeans. However, the Officer Commanding very kindly set aside one ward for R.A.F. patients up to 40 of whom were accommodated there until the R.A.F. General Hospital opened in January 1942. The R.A.F. General Hospital, which was built at Takoradi, is described fully at the end of this section. (*See plan, Fig. 3, page 334.*)

*Nigerian Staging Posts.* When the Nigerian staging posts were opened, arrangements were made with the Director of Medical Services, Nigeria, for Colonial Service medical officers to provide medical attention, as no R.A.F. medical officer was available. The medical problems in Nigeria were much the same as those at Takoradi. The incidence of malaria was similar in the coastal regions, but at the more

northerly stations it was more seasonal, as practically no mosquito breeding occurred in the dry season. At Kano and Maiduguri, which were outside the tsetse area, cattle, horses, camels and donkeys were plentiful, and as a result flies were much more numerous and bowel infections became almost as common as malaria, if adequate precautions were not taken. The hospital at Lagos was well run and an ambulance was supplied whenever required.

A sick quarters at Maiduguri and an annexe to the civilian hospital at Kano were designed and approved during the latter half of 1940. The provision of water and electricity was difficult at Maiduguri, but as the sick quarters was near the Pan American Airways camp, arrangements were made that it should be jointly run, the R.A.F. to provide the building and the Americans the water and electricity.

Air Ministry sanctioned the establishment of a R.A.F. ambulance at Lagos, Kano and Maiduguri in December 1940, but it was not until the middle of 1942 that these vehicles were received. In the meantime ambulances were borrowed from the Army and Colonial Medical Service.

There were European hospitals at all the places where R.A.F. personnel were stationed, except at Maiduguri where a bungalow in the medical officer's compound was taken over as a small sick quarters. At first it only had room for two beds, but it was later extended to take eight.

Although the arrangements made were the best possible in the circumstances they were far from satisfactory.

*Sierra Leone and the Gambia.* Medical care of the few R.A.F. personnel in Sierra Leone and the Gambia before March 1941 was carried out by the Army. A R.A.F. medical officer arrived in Freetown in March with No. 95 Squadron. A small medical inspection room was set up in the Foura Bay College and hospital cases were admitted to 34 and 51 British General Hospitals, both of which were unscreened and relied on a bucket system for conservancy. It was found on the troopship in which they travelled that many of the squadron personnel had not been inoculated with T.A.B. or vaccinated, although all had had their yellow fever inoculation. The dental state was very poor, a finding which was universal throughout West Africa in drafts arriving from the United Kingdom.

A medical officer accompanied No. 200 Squadron to the Gambia in May 1941, another arrived in August with No. 204 Squadron and a third arrived the following month to take over medical administration of R.A.F. Station, Marina.

Medical accommodation in S.S. *Dumana* consisted of a medical officer's room, a medical inspection room, a small operating theatre, and four cabins with two bunks each. S.S. *Dumana* was moored

sufficiently far from the shore to be fairly free from mosquitoes and, although many of the men found living on board irksome, owing to the difficulties of getting ashore, the sick rate of No. 204 Squadron was less than a third of that of the personnel at Jeswang. At Marina three rooms were available for the medical officer, one being used as an office, one as an inspection and treatment room, and the third as a medical and sanitary store. Medical accommodation at Jeswang was provided by three tents, one being the medical officer's consulting room and office, the second a medical treatment room, and the third a store.

Hospital cases in the Gambia were at first sent to the civilian hospital in Bathurst, but after August the Army were able to provide accommodation at 55 British General Hospital at Cape St. Mary, about eight miles from Bathurst, and in the hospital ship *Newfoundland*. 55 British General Hospital had no waterborne sewage, was not screened, and was sited in one of the most malarious districts, where anophelines were still abundant at seasons when other parts of the Colony were relatively free. The hospital ship was satisfactory from a medical point of view, but was difficult of access in emergency.

#### WEST AFRICA COMMAND

*Air Headquarters.* A Wing Commander Principal Medical Officer arrived with the staff of Air Headquarters West Africa. He was at first accommodated on board S.S. *Manela* but this was found to be very inconvenient, so he borrowed a hospital tent from the Army and erected it at Foura Bay as the P.M.O.'s office. In February he managed to acquire two rooms in a 'Lagos' hut. This was the only accommodation available for the medical staff at Air Headquarters until the move to New England in October 1942.

The P.M.O. was the first medical officer with experience in Service administration to be posted to West Africa, although a few senior medical officers had paid short visits of inspection. He found the medical statistics and stores accounting to be very confused and in some cases non-existent. Investigation of complaints of lack of facilities and equipment showed, in many instances, that the deficient items had not been demanded or the demands had been submitted incorrectly. It was impossible to rectify matters retrospectively owing to the absence of records. Lack of forms and experienced staff made re-organisation very difficult. It was said that all the stationery for Air Headquarters West Africa had gone to Malta, with instructions to forward it to West Africa. Needless to say all forms had to be re-demanded from the United Kingdom. The only medical officer on the Air Headquarters staff, apart from the P.M.O., was the malariologist, who had had no experience in Service administration. The P.M.O. and

the malariologist had to carry out the duties of the S.M.O. Sierra Leone, Freetown embarkation officer, president of medical boards, and medical officer of Air Headquarters unit, as well as their normal Command staff duties.

The P.M.O. composed and issued a complete set of medical administrative orders as soon as possible, basing these on normal peace-time procedure. He reorganised the medical administration of the Gambia by appointing the medical officer at R.A.F. Marina to be S.M.O. of R.A.F. Bathurst, in which were included all units in the Gambia. Another medical officer was posted to take over R.A.F. Marina in December.

*Takoradi.* When the P.M.O. paid his first visit to Takoradi he made arrangements for some rooms on the airfield to be converted into two dental officers' rooms, a dental mechanic's laboratory, a crash room, a medical officer's consulting room, and a treatment room. The main sick parade was then held on the airfield instead of on the camp, thereby saving a considerable amount of the airmen's time. The medical inspection room on the camp was converted into a special treatment centre, two rooms being left for medical inspection and treatment of personnel working on the camps. A bungalow, which had been taken over in May 1941, was retained and converted into a special treatment ward by the addition of waterborne latrines and a pantry.

*Nigerian Staging Posts.* The greatly increased strengths of the staging posts made it imperative at the end of 1941 that a R.A.F. medical officer should be permanently stationed in Nigeria. A medical officer was accordingly attached to Apapa from Takoradi in December 1941 to act as station medical officer and, as representative of the S.M.O. Takoradi, to supervise the medical administration of the other staging posts. Another medical officer was sent to Apapa in February 1942 to replace the first one, who had been posted to the United Kingdom. When the new medical officer arrived he found that practically no medical records had been kept, and no stores accounting had been carried out. When the P.M.O. toured Nigeria soon afterwards, he arranged that the medical officer at Apapa should control all medical administration in Nigeria and should communicate direct with Air Headquarters on all routine matters such as medical returns. The S.M.O. Takoradi still remained S.M.O. Nigeria, but only 'retained a watching brief'. The arrangement was an attempt to relieve the S.M.O. Takoradi of some of his duties, which were too many for him to discharge efficiently; it was not a success, as he was still responsible for Nigeria, but was now deprived of the necessary information.

The sick quarters at Apapa was completed in March 1942 and officially contained six beds. The War Office had informed Air Ministry, early in 1941, that two Army hospitals were being established at Lagos,

and that the Army would then be able to provide hospital accommodation for the R.A.F. In fact no Army hospital was opened in Lagos until early in 1943, when the hospital provided for the 'Marble' Scheme was opened on a reduced scale. Previous to that the nearest Army European hospital was at Ibadan, about 100 miles away. R.A.F. venereal cases were sent to Ibadan, as the civilian hospital could not take them, but all others were sent to the European civilian hospital or treated at the Apapa sick quarters. The civilian hospital had only about twenty beds available for all three Fighting Services, so that during the malaria season the disposal of hospital cases became an acute problem. By making use of the verandahs six more beds were added to the Apapa sick quarters, and later in the year 18 Service patients at a time could be accommodated.

An annexe to the European hospital at Kano was completed at about the same time, but on being inspected by the P.M.O. it was found to be quite unsuitable for occupation. It had been sited over a main drain, with a large open drain running down one side, it was not screened, and the construction was extremely crude. It was decided that its conversion into a satisfactory ward would be more expensive than re-building, so it was never occupied by the R.A.F. and in the middle of 1942 was taken over by the Army. The American Army posted a medical officer to Kano early in 1942 and arrangements were made whereby he also looked after R.A.F. personnel there. This was not very satisfactory, as the medical officer concerned was unable to give sufficient supervision to the officers' mess and transit camp which were some miles from the airfield. The R.A.F. medical officer at Apapa found on a visit to Kano that patients with malaria were not being sent to hospital or even kept in bed in their quarters, most of them spending their time sitting about in the mess drinking whisky and swallowing an occasional tablet of quinine at irregular intervals. However, the American medical officer had instituted a drainage scheme round the airfield which proved to be a major factor in limiting the malaria rate. In July a R.A.F. medical officer was attached to Kano and conditions generally became very much more satisfactory.

The progress in the building of the sick quarters at Maiduguri was painfully slow and the Americans became so exasperated at the delays that they erected their own sick quarters on their camp. A second medical officer was detached from Takoradi to Nigeria in May and was stationed at Maiduguri. The new sick quarters was ready for occupation at the end of July, but no electricity had been laid on, as the Pan American Airways had not considered themselves still bound by their agreement (*see* Medical Facilities—Prior to October 1941), in view of the repeated failures of the R.A.F. to fulfil their promises of early completion of the building. A further difficulty lay in the fact that the

American supply was of a different voltage (110 volts) from the R.A.F. electrical equipment available. The sick quarters had, therefore, to be opened using Hurricane lamps for lighting and oil stoves for heating.

In September 1942 three more medical officers were posted to Nigeria so that when No. 298 Wing was formed on October 1, there were medical officers at nearly all staging posts, and the medical and sanitary arrangements were much improved. In the middle of 1942, sergeant sanitary assistants arrived for nearly all stations in West Africa and, as a result of the Resident Minister's anti-malaria drive, adequate numbers of aircrafthands (general duties) were posted for anti-malaria, anti-amaryl, and sanitary duties. The sergeant sanitary assistants proved to be invaluable and all showed a very high standard of knowledge and interest in the work.

The railway rest camp, adjacent to the officers' mess and transit camp at Kano, was taken over and converted into an admirable station sick quarters in September.

*Layout of Sick Quarters.* Standard plans for sick quarters were worked out in the middle of 1942. Five type blocks were designed: a medical inspection room, an administrative block, a ward, an operating theatre block, and a kitchen block. All were designed so that they could be made of 'Lagos' huts or in 'sandcrete'. The individual blocks were connected by screened covered ways, and any sick quarters could be enlarged by adding further blocks. The principle started at Takoradi of having the medical inspection room on the technical site and the sick quarters on the domestic site was followed in all future planning. Standard sick quarters of this type were ordered at all stations in the Gambia and on the Southern Reinforcement Route.

*Strength of Medical Branch.* The establishment of the medical branch in West Africa had greatly improved during 1942. The reinforcements asked for earlier arrived after the North African campaign had started, when many of the units for which they were intended had been cancelled. This enabled the strength of the medical branch to be brought up to its full establishment, which included a group captain P.M.O. and five wing commanders. Previously, since the formation of the Command, there had only been a group captain P.M.O. and two wing commanders, one the malariologist and the other the S.M.O. Takoradi.

*Inter-Service Medical Arrangements.* Difficulties arose through dependence on the services of doctors and hospitals outside the R.A.F. Ideas on diagnosis and treatment were, on occasions, a little unorthodox and it was difficult to justify, for example, a diagnosis based on a therapeutic test which consisted of giving anti-malarial drugs, M. and B. 693, emetine and N.A.B. consecutively to all pyrexial cases! As

those concerned in such eccentricities were outside R.A.F. control it was not easy to persuade them to adopt methods which had been broadly taught and advocated in the Services.

Difficulties were also encountered in the treatment of R.A.F. personnel in Army hospitals. Not unnaturally Army medical officers often failed to realise the need for special disposal of R.A.F. key personnel.\* Few of the hospitals which the Army was compelled to use for Europeans were screened, most depended on bucket latrine conservancy and their standard of catering was lower than that normally found in Army hospitals. Many patients contracted malaria while in hospital but this is as likely to have been the fault of the patient as of the hospital. It was naturally difficult to criticise if treatment by either civilian or Army doctors seemed unsatisfactory. It should, however, be recorded that in the vast majority of cases both the civilian and Army medical officers were most co-operative, and afforded all the help possible with their limited facilities.

#### MEDICAL SUPPLIES

The R.A.F. were dependent on the Army Base Medical Stores for all 'B' and 'C' class stores† except at Takoradi, where all medical stores were supplied by Air Ministry. This was unsatisfactory, as many items were not available from Army sources, although no difficulty was experienced in obtaining them at Takoradi through Air Ministry. This applied also to non-medical stores, many of which were supposed to be obtained from Army sources, but were rarely available and had eventually to be demanded through Air Ministry after much initial delay.

With the expansion of the Command in 1943 it was possible for more medical stores to be allotted to West Africa although delivery was still subject to the availability of transport; as this improved, the supply position became easier until in the final years of the war most stores items were available through R.A.F. sources and dependence on Army supply greatly diminished.

#### R.A.F. HOSPITAL TAKORADI

It was obvious from the first that the hospital facilities already described at the beginning of this section would be inadequate for R.A.F. requirements and that further in-patient accommodation would have to be provided. Three alternative courses were possible: extension of the existing civilian hospital; construction of a hospital designed solely for the R.A.F. and relatively valueless on evacuation; or construction of a building which would be suitable for either the R.A.F. or the Colonial Government and which could be taken over by the latter

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\* See Chapter 3—M.R.Ss. Western Desert and Chapter 10—Medical Policy relating to Patients in M.F.Hs., pages 105, 479.

† Broadly, all stores other than instruments.

after the war. The first plan was found to be impracticable from an engineering point of view, and the third alternative was adopted, as the Colonial Government had already intended to rebuild their hospital, but had abandoned the project when war broke out. Air Ministry gave approval for the construction of an 84-bed hospital at Takoradi in October 1940.

The civilian hospital was excellently situated on fairly high ground overlooking the sea; it was also well away from any likely malarious area and for this reason especially it was decided to build the R.A.F. hospital in the vicinity. Fig. 3 overleaf shows the layout of the hospital, which was well built of good quality local concrete blocks; the timber used was excellent, for most of it was mahogany, a natural product of the Gold Coast.

There were many delays in the building of the hospital and it was not until January 1, 1942 that the first patients were admitted. As at that time only one wing was complete, some R.A.F. patients were still being admitted to the civilian hospital and the undertaking to provide hospital accommodation for all Naval and Army European personnel in the Takoradi area could not be implemented until the rest of the hospital was opened in March. Even then the 84 established beds were soon filled and extra beds had to be provided by putting them along the ward verandahs, which were fortunately spacious.

It had been realised earlier that the hospital accommodation would be inadequate and that an extension must be added; this was started on the completion of the main building and proved to be very necessary, as the strength of the station at Takoradi had been steadily increasing, and during June and July there was a sharp rise in the incidence of malaria. On July 28 the record figure of 336 patients were in hospital at one time, 270 of them in the main building, making use of all available space, including the verandahs, and the rest in the convalescent bungalow and in two barrack bungalows which had been taken over.

By the end of October 1942 the extension was ready for occupation, giving a total equipped bedstate of 196 beds, not including verandah space which could be used as required during the malaria season. These large 12-foot verandahs were built on to both floors, and constituted a special feature of the new hospital; they were carefully and permanently mosquito-proofed so that patients were able to sleep without mosquito nets—a great advantage in a hot climate. These generous verandahs and the large airy wards facilitated medical attention besides increasing the number of patients who could be accommodated in an emergency.

The hospital had a well-equipped operating theatre, X-ray department, laboratory, dispensary and medical store, while a massage room, mental ward and recreation room were built in the extension, which



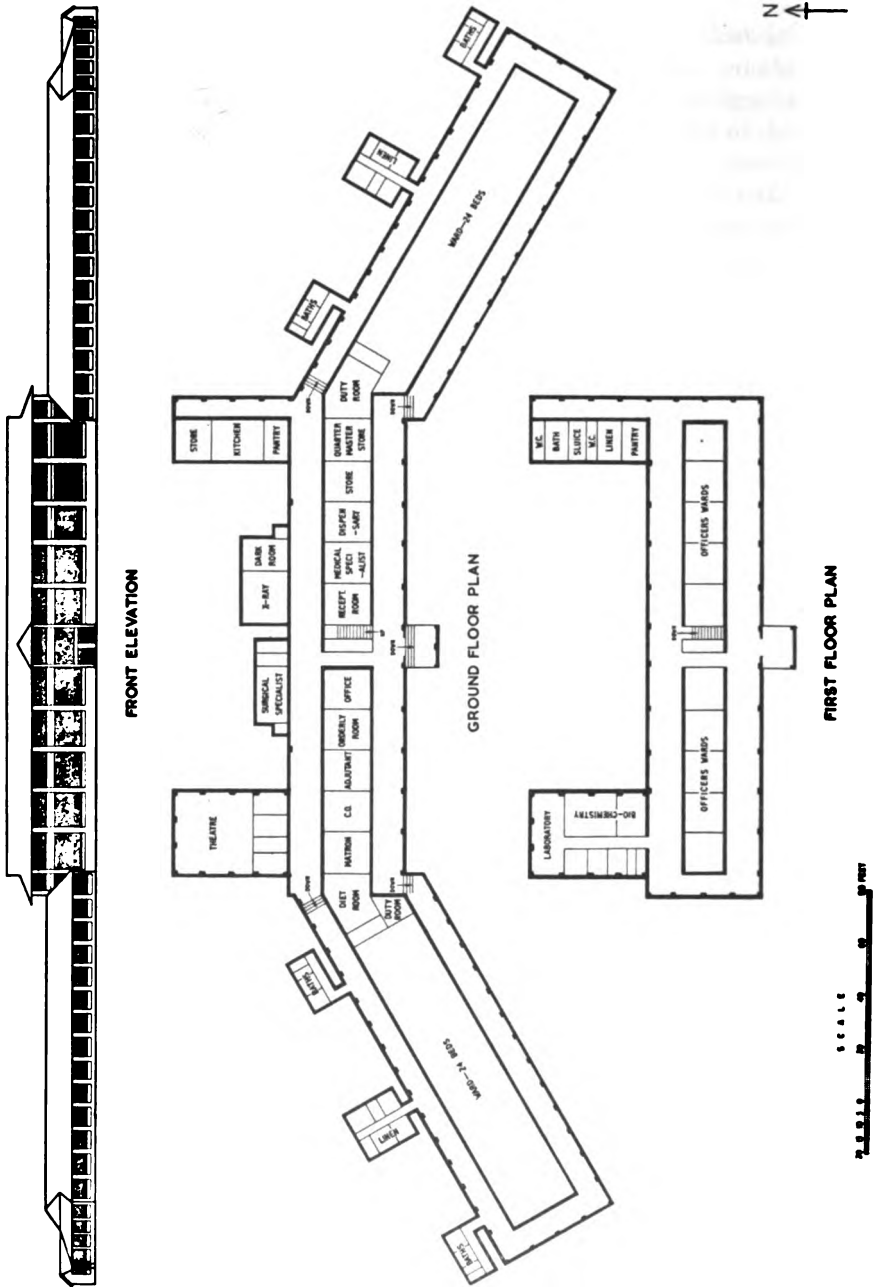


Fig. 3. Plan of R.A.F. Hospital, Takoradi.

was connected to the main building by a small corridor. The laboratory in particular, although it was too small at first and had to be moved, was excellent when finally completed; this was a most important department, for the majority of patients in the hospital were cases of malaria and the volume of laboratory work was therefore greater than in most hospitals. During 1942, a total of 32,985 investigations were carried out, 21,442 of these being for malaria.

On the opening of the hospital most of the necessary equipment had been received and any deficiencies were made good in a very short time; materials were provided through Air Ministry medical supply channels and in all instances were of a high quality. This satisfactory position contrasts markedly with that obtaining in the early days of the R.A.F. in Takoradi when the R.A.F. medical officer was without a microscope and obtained one only after an appeal had been made through the *British Medical Journal*. Because of this lack of an instrument essential in the diagnosis of malaria, the figures for 'Lost through all sickness' in the graph in Fig. 2 in all probability include a large number of cases of undiagnosed malaria (but *see also* Malaria—Clinical Aspects).

Domestic arrangements for the hospital require little mention. It was possible to have a plentiful piped safe water supply from the station and full waterborne conservancy; food supplies were plentiful and of a high quality and fruit in particular was abundant. These last two factors were considered to be of great importance, as the majority of patients had suffered from malaria and needed a full diet to help shorten convalescence and thus ensure a rapid return to duty. The ample supply of vegetables was largely the result of the scheme mentioned earlier whereby the Air Ministry provided seed to local firms and guaranteed buying the produce.

When the size of the hospital was increased, the main kitchen became too small and another was built in the extension; each of these kitchens had two Aga stoves and cooking was done by native cooks and kitchen boys under the supervision of a R.A.F. N.C.O.

Microscopes were naturally in great demand during the war. As the supply from Germany was cut off the shortage was acute and medical officers going overseas were invited to take their own instruments with them on a guarantee of safe transport only!

Blackout of the hospital caused much trouble in the early half of 1942; blacking out the wards was insufficient as half the patients were on the verandahs. Furthermore, some form of protection from rain was required on the verandahs during the tornado season. The final scheme agreed to by the Air Ministry Works Directorate representative in July was the provision of double-louvred shutters which were very satisfactory, but were not completed until the end of 1942.

Staffing of the hospital was little different from that of any R.A.F. station hospital. Most departmental facilities\* were available, although as medical conditions, in particular malaria, predominated, medical officers were selected with this fact in mind. In the early days some difficulty was encountered over the inexperience of medical officers, new to the Service, in handling patients from out-stations and appreciating the peculiar problems created by the conditions under which such personnel were living; this was remedied when the P.M.O. of the Command insisted on all medical officers completing six months on a station prior to attachment to the hospital. Nursing was undertaken by members of the P.M.R.A.F.N.S. and R.A.F. and African nursing orderlies; ward cleaning and domestic duties were also carried out by local native labour, which proved most satisfactory; one African who was trained in laboratory work became an excellent and valued technician (*see* Medical Facilities—Prior to October 1941). Medical officers and nursing sisters were accommodated in nearby messes while other ranks were housed in blocks in the hospital grounds. The first bungalows of the hospital staff were occupied in September, and all medical personnel were accommodated in the hospital camp by November. These quarters were well screened and each pair of bungalows was connected to an ablution and latrine block.

R.A.F. Hospital Takoradi served a very large area and received patients not only from the Gold Coast but from the other three British West African Colonies. This was made possible by the Command's air routes which allowed sick personnel to be conveyed long distances in the minimum of time; the staging posts were also valuable in this connexion, for they were all provided with sick quarters rather larger than normal and it was therefore possible to care for patients satisfactorily if an overnight stop was necessary. It is noteworthy that in spite of their long journeys few patients arrived much the worse.

Approval for the building of R.A.F. Hospital Takoradi had been given on the understanding that it should cater not only for R.A.F. personnel but for members of the sister Services as necessary. The hospital therefore accepted cases from outside the Takoradi area and was always prepared to admit patients of any rank who required special facilities and for whom a high standard of nursing care was desirable; these patients were, with rare exceptions, flown in by R.A.F. transport or inter-communications aircraft.

A further extension was added to the west wing giving an extra 120 beds; this was begun early in 1943, thus greatly increasing the facilities of the hospital.

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\* The staff consisted of a physician, surgeon, pathologist and junior houseman, the latter being selected from medical officers on out-stations.



PLATE XXXII : Initial clearance of mangrove swamp (genus *Rhizophora*)



PLATE XXXIII : Swamp after preliminary clearance. Staves topped with coconut shells mark future drainage channels



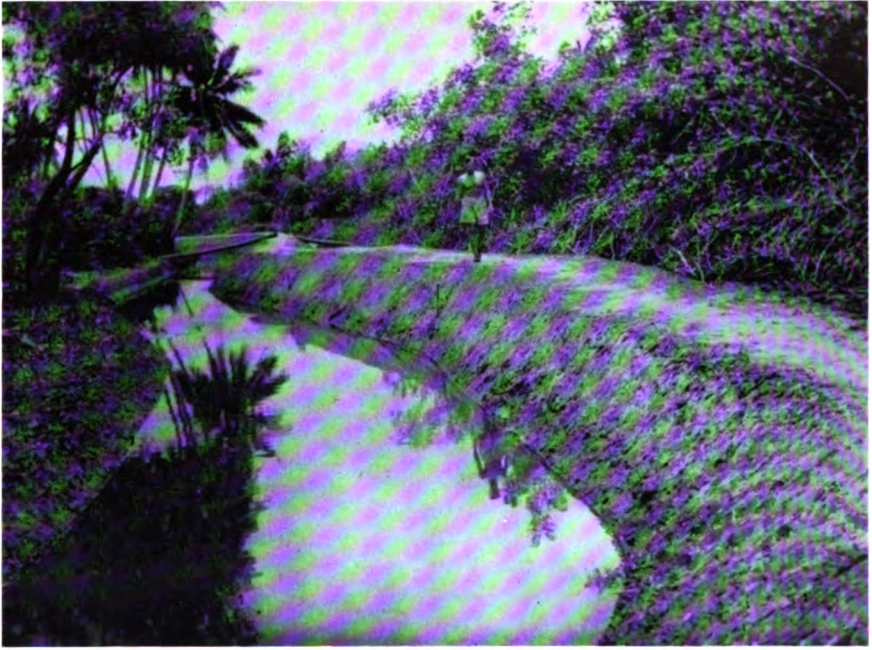


PLATE XXXIV: Anti-malaria measures. Bund protecting reclaimed land from tidal waters



PLATE XXXV: Anti-malaria measures. Tidal gate in bund controlling the system



PLATE XXXVI: Anti-malaria measures. The formidable task of clearing the Orugu River





PLATE XXXVII: Anti-malaria measures. Army malarialogist searching for larvae in Orugu River

*Convalescence.* As in most overseas hospitals a problem was created by those patients who, although sufficiently recovered to leave hospital, were not fit enough to return at once to their units. The provision of convalescent facilities depended on *ad hoc* arrangements and local goodwill, and in the early days of Takoradi a bungalow in the town was made available by the civilian authorities for this purpose. Attempts were made in July 1942 to acquire a block of flats to relieve the congestion at the hospital and to provide a semi-convalescent home. Agreement was reached in August that the R.A.F. would take over these flats, but it was not until the following month that all the formalities were concluded and the necessary conversions could be started. On September 9, 1942, when the conversions were at last nearly complete, the Resident Minister returned the flats to the civilian authorities for the use of harbour pilots, which left the hospital situation worse than before, as the convalescent bungalow had already been returned to the civilian authorities to placate them for the loss of the flats.

Practical assistance was received from local residents, particularly planters, who made accommodation available on their estates for R.A.F. convalescents, a most helpful and greatly appreciated gesture.

## Health of the R.A.F. in West Africa

### MALARIA

The importance of malaria in the health of the Command was such that it is no exaggeration to state that the success or failure of the Reinforcement Route lay in the intelligent use of what anti-malaria equipment existed in West Africa. Hence a very complete survey of malaria and the measures taken to combat it by the R.A.F. is necessarily recorded.

### PAST HISTORY IN WEST AFRICA

Until the beginning of the twentieth century the European members of many expeditions to the West Coast of Africa had been decimated and even completely wiped out by disease, chiefly malaria. The introduction of quinine and its regular use for the suppression of malaria greatly increased the survival rate, but the morbidity from long residence in West Africa still remained high. The gradual improvement in the general health and the expectation of life of European residents during the first quarter of the twentieth century was due not so much to direct anti-malaria work as to a general improvement in the living conditions.



## POSITION IN 1940

When the R.A.F. arrived in West Africa in 1940 malignant tertian malaria was still hyperendemic throughout British West Africa. Quartan malaria was present in isolated pockets, the native children in some villages showing a quartan parasite index up to 50 per cent. Quartan parasites could rarely be found in the blood of adult natives, and only occasional cases of quartan malaria occurred in Europeans. A few cases of benign tertian malaria had been reported in West Africa in patients who had never visited any other malarious country, but many authorities believed them to have been misdiagnosed cases of ovale tertian malaria, which had been proved to be endemic, though rare. The malaria problem in West Africa, therefore, resolved itself into control of the malignant tertian type. The splenic index in Takoradi school children had been reported in 1938 and 1939 as 29 per cent. and 28 per cent., but examinations by Army and R.A.F. medical officers during 1942 showed figures varying in different villages from 40 per cent. to 90 per cent. Nearly all native children were pot-bellied and many had large umbilical herniae, but these former were probably due mainly to intestinal worms, malnutrition, and the bulky farinaceous diet, rather than to splenic enlargement. It was difficult to assess the extent to which the indolence of the natives was due to malaria, as there were so many other possible contributory factors. The large number of adult patients to be found in any native hospital suffering from acute attacks of malaria demonstrated that either the immunity of the adult was only short-lived and partial, or that there were a great many immunologically distinct strains of the parasite, the latter view being held by most malariologists.

## MALARIA VECTORS

*Anopheles gambiae* was the main vector of malaria throughout British West Africa and selected open shallow collections of water for breeding. *A. funestus*, the next most important vector, preferred overgrown shady pools or slow-moving streams. *A. gambiae* var. *melas* was of great importance in some coastal areas, particularly in Freetown, and probably in Takoradi, as it was specially adapted to breeding in salt water. An Army entomologist in Freetown studied the breeding habits of *A. gambiae* var. *melas* during 1942 and showed that great care had to be taken in dealing with lagoons near the sea, or control of breeding of *A. gambiae* might merely lead to an increase in that of *A. gambiae* var. *melas*. Similar care had to be taken in planning any scheme to control the breeding of *A. gambiae* or *A. funestus* in other parts, as clearing of bush or mangroves was liable to eliminate *A. funestus*, but encourage *A. gambiae* and *vice versa*. There were many other anopheline mosquitoes, but probably none of them was of much importance as a malaria vector, except perhaps in limited areas.

## SEASONAL INCIDENCE

There was a close correlation between the rainfall and the seasonal incidence of malaria, but the temperature and humidity also had a marked influence on the breeding of mosquitoes (*see* Fig. 4). During the wet season in the Gambia, larvae of *A. gambiae* could be found in every puddle, but during the dry season when the humidity was low, few larvae could be found even in suitable pools. Similarly in Northern Nigeria little breeding could be found in the dry season when the humidity was very low. Breeding in the coastal areas occurred throughout the year, although it was very much less during the dry season, in spite of the presence of ample suitable water.

## CIVILIAN ANTI-MALARIA MEASURES

The European population universally used regular suppressive quinine to avoid overt attacks of malaria. They slept under mosquito nets which at the same time provided protection against other unpleasant inhabitants of the Tropics, but no other methods of personal protection were in general use. Those who retained sufficiently good health to remain on the West Coast after their first few tours developed a partial immunity, and were usually able to overcome attacks of malaria by treating themselves with daily doses of 20 grains of quinine for 48 hours.

Few attempts had been made to attack the malaria problem by more radical means, and many of the civilians were indifferent to anti-malaria measures. Some civilian medical officers argued that if anti-malaria measures were introduced on a large scale, the Africans living in the controlled areas would lose their immunity, and widespread epidemics with a high mortality would result. That this argument was unsound was proved by the fact that susceptible European populations could live in West Africa without a high mortality, in spite of the inadequacy of the anti-malaria measures.

The principle of establishing separate European reservations had been partially followed in the main towns, but in many cases the reservations had been badly sited and the policy of the Governments to remove racial distinctions had led to relaxation of the regulations and consequent encroachment by the natives. Very few civilian houses in West Africa had ever been mosquito-proofed, and even the hospitals had only small sections screened for treatment of yellow fever cases, in order to conform with the anti-amaryl regulations. It was claimed that screening had been found to be of no use, and this was probably true of such screening as had been tried, since its design in buildings which had been screened, such as anti-amaryl quarters on aerodromes, contained so many mistakes. There had been little attempt at control of mosquito breeding by oiling or drainage. Although the artificial

formation of mosquito breeding grounds was controlled by standing regulations of the Public Works Departments, many had been produced

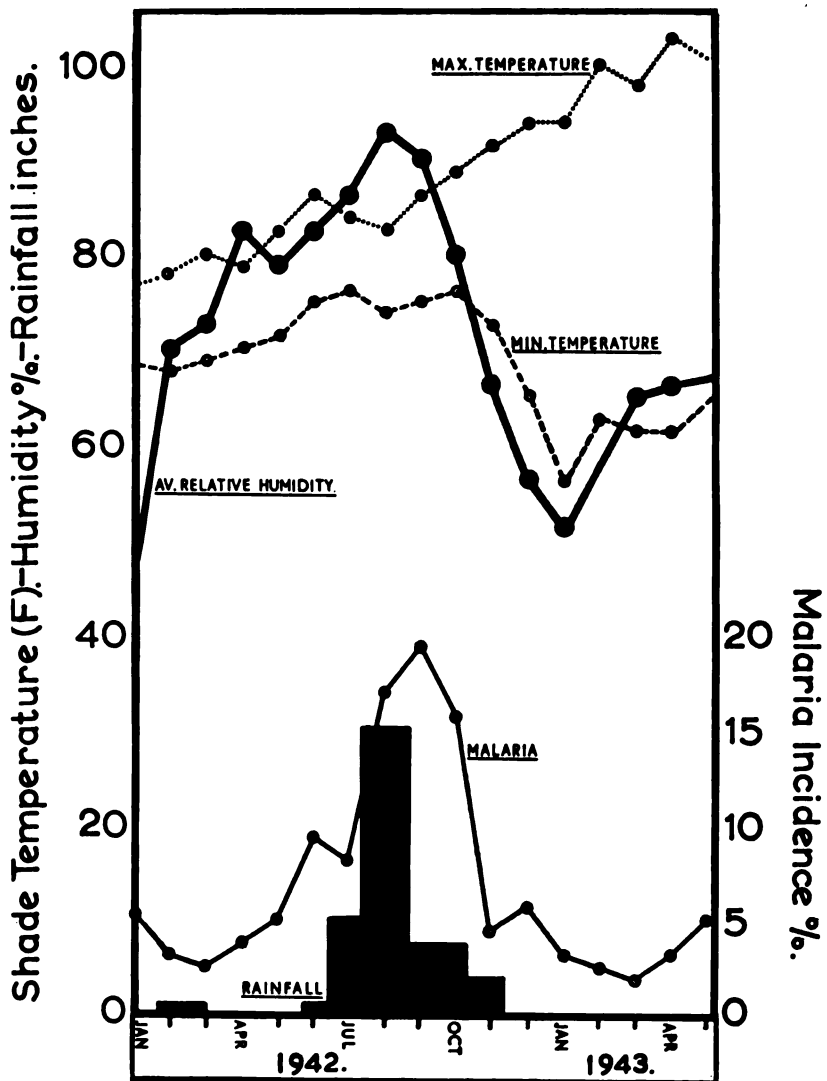


FIG. 4. Graph showing the effect of climatic conditions on malaria incidence. R.A.F. Bathurst.

by the formation of undrained borrow pits, the discharge of road drains into low-lying areas at the side, and interference with natural drainage by railway and road embankments.

## INCIDENCE IN R.A.F.

During the ten months in 1941 during which No. 95 Squadron was at Foura Bay, the malaria rate was 1,250 per thousand. It was impossible to be sure how many recurrences were due to relapse and how many to re-infection. It was generally accepted that malignant tertian malaria did not have a great tendency to relapse, and some confirmation of this view was obtained by an analysis of the 1941 malaria rates of No. 95 Squadron. Of this squadron, 207 personnel remained at Foura Bay from March 1941 until the end of December 1941. A record was kept showing how many times each airman suffered from malaria. A statistical analysis, made with the assumption that a man admitted in one month was not again an admission risk as a primary case until the next month, showed that the number of re-admissions was compatible with the hypothesis that they were mainly due to re-infection, but with the data available, there could be no proof that this was in fact the case.

The two A.M.E.Ss. at Kissi East and Wilberforce formed an interesting comparison. Kissi East was situated in a hyperendemic area and the malaria rate for the last six months of 1941 was 2,000 per thousand per annum. Wilberforce was sited in the European residential area on a hill, and the rate for the same period was only about 200 per thousand per annum. The rate at Kissi East showed a marked drop in November 1941, corresponding with the completion of screening of the quarters, and there were no cases in December. It might be argued that this drop was not due to the screening, but to the normal seasonal variation, but against this was the fact that the incidence at Hastings nearby rose in December 1941.

The Maiduguri airfield was adjacent to an area which became flooded during the rains, and Army defence posts and labour camps were sited within the building free zone. Malaria was practically non-existent during the dry season, but the extensive flooding during the wet season gave rise to a sharp explosive outbreak.

The malaria rate for 1941 at R.A.F. Station, Takoradi, the only station at which there had been R.A.F. personnel throughout the year, was 1,100 per thousand per annum. Similar rates occurred in 1941 at other stations for the periods during which they were occupied. The rate at Takoradi in 1942 was 830 per thousand per annum. Examination of the graph in Fig. 5 shows a close correlation between rainfall and the malaria rate, except towards the end of 1942, when the malaria rate continued to fall in spite of heavy rains. The rainfall at Takoradi in 1941 was fairly steady from March to November, resulting in persistent pools of water; the graph of the malaria incidence shows a correspondingly wide plateau. Heavy rainfall early in the wet season of 1942 was followed by a dry spell in August and September, sufficient to dry up the pools; the graph of the malaria incidence shows a similar

higher peak with a narrow base. The lower incidence in 1942 compared with 1941 cannot be entirely attributed to the success of anti-malaria measures, since the difference in rainfall probably accounted for some of the improvement, and stricter criteria of diagnosis, referred to in the section dealing with the clinical aspects of malaria, were also contributory.

Comparison of R.A.F. and Army rates in Takoradi for the periods April to December, 1941 and 1942 (no figures were available for the Army prior to April 1941) shows that the Army rate was always higher than that of the R.A.F., except in April, 1941 (*see* Fig. 6). Differences in

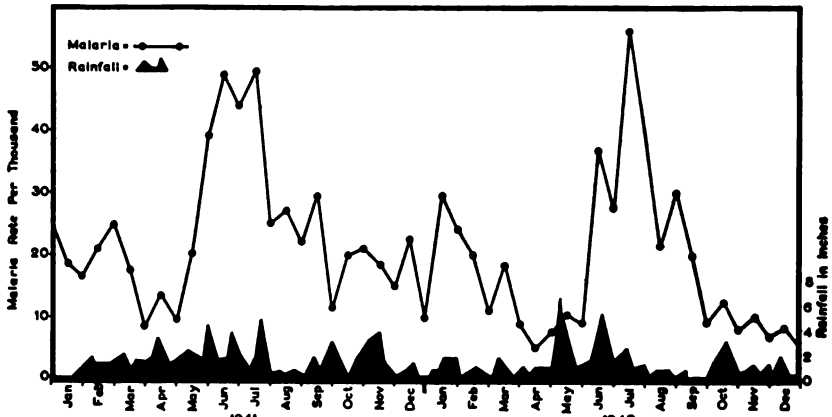


FIG. 5. Graph showing relation between rainfall and malaria at Takoradi.

predisposing factors between the two Services which operated throughout 1941 and 1942 appeared to be due to the better living conditions of the R.A.F.\* The Army figures for April to December 1942 were 200 per thousand per annum lower than those for the corresponding period of 1941, compared with a fall of 300 per thousand in R.A.F. figures for the same periods. This 50 per cent. greater fall in the R.A.F. figures cannot be attributed to the climate and it was estimated that at the maximum only 5 per cent. could be due to the stricter criteria of diagnosis. Screening of buildings was the only anti-malaria measure exclusively adopted by the R.A.F. in 1942. It is, therefore, reasonable to assume that screening was mainly responsible for a 45 per cent. greater reduction in the R.A.F. malaria rate in Takoradi in 1942 than in the Army figures over the same period.

The continual fall in the R.A.F. malaria rate at Takoradi at the end of 1942 was probably due to the large scale drainage work beginning to show an appreciable effect.

\* It should be remembered that there were many more Army than R.A.F. personnel and that the former, by the very nature of their work, were often forced to live in very highly malarious areas.

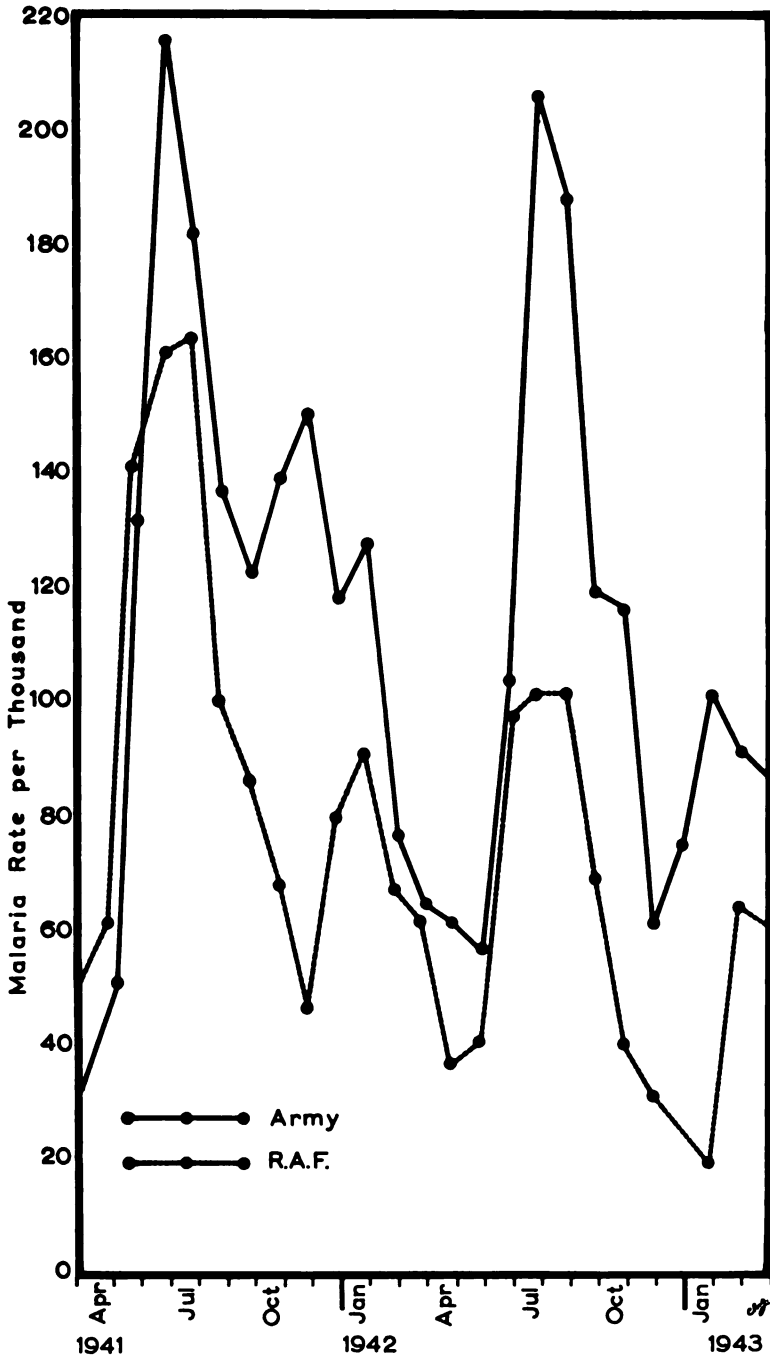


FIG. 6. Graph showing malaria rates of the Army and R.A.F. at Takoradi.

## CLINICAL ASPECTS

Medical officers of the Colonial Medical Service claimed that the clinical manifestations of malaria and the response to treatment varied greatly from place to place in West Africa, and those R.A.F. medical officers who had experience at more than one station confirmed this view. Even between the malaria at Takoradi and Accra, only 170 miles apart, there was said to be a considerable difference in the response to treatment.

The acute manifestations of the disease were in general reasonably mild, almost certainly due to the use of suppressive therapy. Very few pernicious cases were encountered and most of those which did occur were in patients who were known to have avoided their suppressive quinine. This was confirmed by experience at R.A.F. Hospital, Takoradi, where a large number of Naval personnel were treated. Most of the Naval personnel failed to take their suppressive quinine regularly, and their attacks of malaria were very much more severe than those usually found in other patients; so much so that an acute attack with a high sustained temperature which took more than 48 hours to control with quinine became known as 'Naval malaria'.

During 1941 and the first half of 1942, lack of microscopes\* at out-stations made it necessary to rely on clinical signs for the diagnosis of malaria. As this was by far the commonest disease, any pyrexial patient with no definite signs of any other disease was usually treated as a case of malaria, although not necessarily recorded as such. Even the advent of microscopes did not entirely settle the matter, since many cases of undoubted malaria showed no parasites in their blood owing to the use of suppressive quinine. One R.A.F. medical specialist was of the opinion that nearly all cases of diarrhoea, in which no causative organism could be found, were due to malaria and treated them as such. After the middle of 1942 a more critical approach was made at Takoradi to the diagnosis of patients with diarrhoea having blood smears negative for malaria parasites. All such patients were taken off anti-malarial drugs on admission to hospital, and were treated with salts or sulphaguanidine, repeated blood examinations being made for malaria parasites. This investigation showed that only 10 per cent. of cases of diarrhoea eventually showed malaria parasites in the blood, and the rest responded to non-specific treatment as quickly as had the cases previously treated with quinine. The 10 per cent. of cases with diarrhoea showing malaria parasites was no more than might have been expected as a concurrent infection, and did not indicate that the diarrhoea was in any way due to malaria. This change in the standard of diagnosis, coupled with the

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\* See Medical Facilities—R.A.F. Hospital, Takoradi.

introduction of sulphaguanidine, resulted in a great saving of manpower, since the cases of simple diarrhoea were only off duty for three or four days, instead of for a fortnight to three weeks. At the end of 1942 a similar investigation was being made of other cases of obscure pyrexia.

The treatment of malaria in the R.A.F. in West Africa during 1941 was not standardised. Most R.A.F. medical officers adopted a course consisting of quinine bihydrochloride 30 gr. for seven days, followed by 20 gr. for seven days; but the course of treatment in the civilian hospitals varied greatly and usually consisted of short quinine courses with a lower daily dosage, often 20 gr. for five or seven days. The relapse rate of malignant tertian malaria was considered by those with long experience to be low. Most authorities disliked the use of pamaquin, except for the treatment of gametocyte carriers, as it was not thought to reduce the number of relapses in malignant tertian malaria. It was generally agreed that any effect it might have on the relapse rate was certainly insufficient to justify its routine use, which would materially increase the average time in hospital, and the period of convalescence.\*

The incidence of gametocytes in Service personnel had been thought to be low, until the R.A.M.C. malariologists in 1942 found a 30 per cent. incidence of gametocytes in malarial patients examined between the 10th and 14th days after the onset of the disease. This led to the adoption of a routine examination of all malaria patients between the 12th and 14th days and although the incidence of gametocytes in R.A.F. personnel was not found to reach 30 per cent. it was found to be much higher than had previously been thought.

The limitation of supplies of quinine† led to greater use of mepacrine in 1942. Previous findings on the slower action of mepacrine in controlling the acute symptoms were confirmed, and a standard course was devised in which quinine bihydrochloride 30 gr. was given for the first three days to control the pyrexia, and mepacrine 0.1 g. t.d.s. was started on the second day in order to give time for the full action of mepacrine to be established by the time the quinine was stopped. The mepacrine was then continued for a further five days. Mepacrine alone was tried in a few cases at Takoradi, but was soon abandoned as control of the fever and disappearance of parasites from the blood was greatly delayed, and in some cases the fever continued to rise after 24 hours'

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\* Editorial Note: In India and Ceylon during the years 1931-35 and subsequently, extensive trials of treatment with quinine combined with pamaquin were carried out. It was found that in dosages varying from quinine 15 to 20 gr. and pamaquin .02 to .04 gramme daily for periods of seven to fourteen days supervised by various authorities, this combination was most successful in controlling gametocyte infections and also in greatly reducing the relapse rate in benign tertian malaria.

† Due to Japanese occupation of the principal quinine producing areas in the Far East.



treatment, occasioning fear as to the onset of pernicious symptoms. The use of a large initial dose of mepacrine to overcome the delayed action was not tried until 1943, a daily dosage of 0.3 g. never being exceeded owing to the fear of toxic reactions.\*

Certain Army units used a course consisting of 0.3 g. mepacrine and 30 gr. quinine bihydrochloride daily for a week, but there seemed to be no evidence that these heroic measures were any more successful than the use of either drug alone.

#### PREVENTION

Few of the R.A.F. medical officers posted to West Africa had a very extensive Service background and still fewer had had previous experience in the Tropics.† The remoteness, to begin with, of the Middle East and Coastal Commands made it difficult for them to obtain advice, and that offered by the civilian medical officers was often tinged with a defeatist attitude. Medical advice to the Executive on the steps necessary to combat the very real dangers of malaria was essential, for in spite of the high malaria rates during 1941, few executive officers appreciated the importance of hygiene measures and their own responsibility for carrying out the recommendations of medical officers. The general tendency was for them to regard the endemic diseases as inevitable 'Acts of God' and preventive measures as ideas of the medical profession intended only to annoy. Senior officers, with previous experience overseas, considered that they knew more about malaria than their medical officers, and regarded the malaria problem in West Africa in the light of their experiences in Iraq or India, while the junior officers were led astray by the example of their seniors and the civilian population. The future of the R.A.F. in West Africa had not been defined, so that all measures were planned on a temporary basis, each expansion of the programme coming as a surprise. As a result of this it was assumed that radical long-term preventive measures would not be approved. Lack of equipment and the initial absence of any establishment for sanitary squads increased the difficulties with which the medical officers had to contend.

The A.M.E.Ss. were exceptions with regard to interest taken in preventive measures. All the officers commanding A.M.E.Ss. were most co-operative and actually approached the medical branch asking for advice. The sick rates for their stations reflected this greater interest, as in 1942 they had a lower incidence of malaria than other stations in

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\* Mepacrine was, however, used more extensively in later years when experience of the drug had fully established both its efficacy and its lack of toxicity even in large doses, except in a small percentage of cases.

† The standard of knowledge of Tropical Medicine demanded for the normal qualifying examinations was, when applied to actual conditions, found to be woefully inadequate.

the Command, although many of them were situated in hyperendemic areas.

Methods of personal protection against malaria were made the subject of station standing orders from the beginning and included the use of mosquito nets, the taking of 5 gr. of quinine bihydrochloride daily by all personnel, and the wearing of trousers, mosquito boots and long-sleeved shirts in the evening. Unfortunately, strict observance of these orders was not enforced. The use of anti-mosquito cream was at first encouraged, but it was soon found that it was much more unpleasant to the user than to the mosquitoes who seemed to regard it with indifference or even approbation. A routine check of all pilots and aircrews on ferrying duties was instituted. Their morning and evening temperatures were taken the day before departure and their blood was examined for malaria parasites. A final check on the temperature was made half an hour before departure. Any showing parasites in their blood or having a temperature above 99.0° F. were automatically detained. The disposal of cases with lower temperatures was subject to the medical officer's discretion in each individual case.

Reliance was placed almost entirely on such methods of personal protection and on the oiling of potential breeding grounds for the control of malaria in the R.A.F. in West Africa until 1942. More radical methods had not been attempted as the future had not been foreseen and all matters of policy had been decided on the assumption that the R.A.F. would be required in West Africa only for a short time. Even in 1942, when the very high incidence of malaria the previous year had shown the necessity for further measures to be taken, and it was evident that the R.A.F. would have considerable commitments in West Africa at least until the end of the war, the Air Headquarters at first opposed the Resident Minister's scheme for extensive malaria control of aerodromes discussed later in this chapter, still considering that anti-malaria measures should be limited to methods of personal protection and oiling. It is certainly possible that methods of personal protection, including screening of all buildings, might have considerably reduced the incidence of malaria if they had been efficiently carried out, but it had been amply proved by 1942 that unless much stricter discipline and better co-operation could be obtained from the executive authorities, such methods were ineffective.

In July 1941 the squadron leader medical officer posted to Freetown to be in charge of anti-malaria work for the R.A.F. inspected Takoradi on his way from the Middle East. He found that although trousers were being worn at night, long-sleeved shirts were not in general use, as airmen were only issued with two shirts each, whose sleeves they had usually had cut down for day-time use. Mosquito boots were universally worn by airmen, but not by all the officers. He suggested that

anti-mosquito cream should be used, but later in his tour agreed that it was ineffective. Airmen's huts were being sprayed with insecticide each evening, but no spraying of the officers' messes was being carried out. He suggested that the spraying of African houses in Takoradi township might materially reduce the R.A.F. malaria incidence. In May, Headquarters Middle East had suggested to Air Ministry the use of aerial dusting of Paris green. The anti-malaria medical officer carried out some simple tests which led him to believe that Paris green would be effective for the control of breeding in the swamps at Takoradi. Arrangements were made by Air Ministry for the conversion of two Tiger Moth aircraft which eventually arrived at Takoradi, the first trial flights being made in January 1942.

Even if radical methods of control had been decided on earlier, the R.A.F. possessed no trained entomologist or personnel with experience in anti-malaria drainage, and ill-directed efforts at control by these methods might easily have made matters worse.

The use of the Army malariologists to operate the scheme devised by the Resident Minister was only successful owing to the pleasant personalities of the malariologists concerned, since they were placed in the awkward position of being responsible to their own commanding officers, and at the same time to the Army Area D.M.S., the Colonial Government D.M.S. as chairman of the Area Board, the Commanding Officer of the R.A.F. station concerned, and the Resident Minister.

Further points of interest on preventive measures will be considered in the following paragraphs under separate headings for each method of control.

#### SUPPRESSIVE CHEMOTHERAPY

All R.A.F. personnel were required to take 5 gr. of quinine bihydrochloride or 4 gr. of quinine hydrochloride daily throughout 1940, 1941 and 1942, except in the Gambia and at R.A.F. Station, Hastings, where mepacrine was introduced in the latter half of 1942. In the Coastal Command stations tablets of quinine were not available at first, which meant that many shirked taking their suppressive quinine owing to its bitter taste in liquid form. Less than one in ten airmen and N.C.Os. were taking the drug, but this was rectified by better supervision and the addition of chloroform water to the liquid quinine.

When the malaria rate became alarmingly high during 1941, the daily dose was raised from 5 gr. to 10 gr. and this was maintained until the end of the year. The increased dosage was stopped owing to lack of evidence that it caused any fall in the malaria rate, and to the considerably increased debility among those taking it. In relation to the evidence of the efficacy of the increased dose, it must be admitted

that many airmen, probably about 50 per cent., continued to take only 5 gr. but the majority of those who did take the larger dose suffered from toxic symptoms such as tinnitus, continuous headache, and 'muzziness', and many developed an unhealthy earthy complexion. Experience in 1941 led to the conclusion that the increased debility from a dosage of quinine bihydrochloride greater than 5 gr. daily more than outweighed any increased protection against malaria. Many personnel failed to take their suppressive quinine during 1941, but in 1942 the supervision was greatly improved. Several cases of urticaria due apparently to sensitivity to quinine were met, but mainly in patients being treated for clinical attacks.

There seems little doubt that the use of suppressive quinine increased the number of cases of chronic malaria and malaria debility by masking the acute attack and thereby preventing treatment being sought before the chronic infection was established. A routine examination of airmen at Takoradi towards the end of 1942 revealed that about 5 per cent. of airmen, who had not been aware of ever having had an attack of malaria, had enlarged spleens. Parasites were present in the blood of about 1 per cent. of aircrew personnel on routine examination prior to proceeding up the route. The use of suppressive therapy was nevertheless amply justified by its prevention of pernicious attacks, as was demonstrated by the very much more severe attacks in Naval personnel already referred to, and the fact that the only death from cerebral malaria at Takoradi was that of a flight sergeant who had refused to take suppressive quinine.

The Army changed early in 1942 from quinine suppression to the use of mepacrine in a dosage of 0.2 g. twice weekly. When the first units changed over, personnel stopped taking quinine before starting the mepacrine, and owing to the delayed action of the latter, a minor epidemic of malaria resulted about a fortnight after the mepacrine had been started. After this, an overlap of ten days was instituted whenever anyone changed from quinine to mepacrine, but the R.A.F. failed to benefit from the experience of the Army when a change to mepacrine for ground personnel took place in the Gambia in August. Owing to the shortage of quinine its issue was stopped at Jeswang as soon as the mepacrine was available, and there was a sudden outbreak of malaria due to the delayed action of the mepacrine, 25 per cent. of the ground staff going sick in three weeks. A similar, though less drastic, result was observed during the change over period at Hastings in October. The mepacrine was found to be quite as effective as the quinine, and there were very few cases of toxic reaction. It was, however, impossible for all R.A.F. units to adopt mepacrine suppression until early in 1943, owing to shortage of the drug. The Army increased the dose of mepacrine to 0.1 g. six days a week at the end of 1942.

From 1943 onwards the use of mepacrine was universal for all forces\* in West Africa and its efficacy is well shown by the continued drop in malaria incidence that was observed in 1944 and 1945. Though mepacrine was an important factor in the reduction of malaria it was at first looked on by many as a poor substitute for quinine and was thought by the men to have unpleasant side effects, such as sterility. In a relatively short time, however, these unfortunate rumours were dispelled and all personnel became 'mepacrine conscious', a very necessary attitude if the drug was to serve its purpose.

A few cases of sensitivity to mepacrine were recorded but these were of interest to the medical authorities mainly because of the rarity of the condition. By 1945 the whole Command was malaria conscious and this factor alone was largely responsible for the excellent health record.

The Command malariologist recommended in December 1941 that all personnel returning to the United Kingdom should be given a 'blanket' course of anti-malaria treatment during the voyage home, instead of the previous practice of instructing them to continue their suppressive quinine for six weeks. On this suggestion being approved by Air Ministry, a Command medical administrative instruction was issued, but it is doubtful whether this order was ever followed, as there were several difficulties in its application, as well as medical objections. Anyone receiving a full course of anti-malaria treatment should be confined to bed; this would be impracticable with a large draft on a troopship. It was generally accepted that no amount of treatment with quinine during the latent stage of malaria would reduce relapses, whereas the cancellation of the six weeks' continuation of suppressive quinine might allow the development of pernicious attacks of malaria on reaching a cold climate. The instruction ordering 'blanket' courses was cancelled towards the end of 1942.

#### MOSQUITO NETS

The nets originally supplied to the R.A.F. in West Africa were of the bivouac type, and were found to be very unsatisfactory when used with ordinary beds. They were designed for use with camp beds, and were too low when a mattress was included, as it was then impossible to sleep under them without some part of the body being in contact with the net. Rectangular nets were demanded and some were received, but many bivouac nets were still being used in the Gambia in the middle of 1942. A large number of bell type nets were in use, and were

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\* As far as the R.A.F. was concerned, mepacrine was at first issued only to ground personnel, aircrew continuing to take quinine as a protection against malaria. This was because mepacrine was considered to predispose to anoxia, this view being based on the results of a limited animal experiment which were soon proved to be fallacious.

fairly satisfactory, but not as good as the rectangular ones, as they were rather high and tended to hang in folds, and this made it more difficult to examine them for the presence of lurking mosquitoes.

Considerable difficulty was experienced in maintaining sufficient stocks of mosquito nets, as large drafts frequently arrived with little previous warning.\* It was suggested by many medical officers that nets should be made a personal issue in the United Kingdom to all personnel going overseas and that each man be made responsible for the upkeep of his net, but no effective action resulted. Frequent inspections were necessary to ensure that nets were in good repair, and defective nets were liable to be issued to new drafts or transit personnel unless the medical officer personally supervised their issue.

All nets had to be adjusted for the night by 1800 hours, but the object of this was rather defeated because overcrowding of accommodation made it impossible to provide tables and chairs in the barrack rooms, so that airmen were faced with the choice of not using their barrack rooms until it was time to go to bed, or raising the nets and sitting on their beds; in view of the general lack of occupation for the evenings it is not surprising that the second alternative was that most frequently adopted.

#### SCREENING

The high malaria rate during 1940, in spite of most personnel having arrived after the peak of the malaria season, showed the necessity for further anti-malaria measures. The S.M.O. stated in a report to the D.G.M.S. at the end of 1940, that some control of the mosquito breeding had been obtained by excavating the sand bar across the Whin River lagoon and thus increasing the salinity of the water, but that the swamps, which were the main breeding grounds, were so extensive that 'it would be uneconomical, even if possible, to deal with them and they must be regarded as a permanent liability'. Whether increasing the salinity of the water did in fact reduce anopheline breeding is open to some doubt, as it may merely have replaced *A. gambiae* with *A. gambiae* var. *melas*, which were found in considerable numbers in 1942.

It was therefore recommended in January 1941 that all living accommodation should be permanently mosquito proofed, as the quickest and cheapest method of control. A demand was submitted to Air Ministry for the necessary metal gauze, but difficulty was experienced in getting it from England or South Africa, so it was finally ordered from America and was delivered at Takoradi at the end of June 1941, too late to screen the camps before the 1941 malaria season. The

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\* A similar state of affairs was frequently encountered in the Far East.

buildings erected before the middle of 1941 had not been planned for eventual screening. The civilians had used this method of prevention so little that no one had much practical experience in its detailed design. Lack of spring hinges or other satisfactory devices for making the doors self-closing, and the many mistakes in the design, rendered the screening practically valueless when it was said to be finished at the end of 1941. Some of the gauze was sent to Nigeria where orders were given for all living accommodation to be screened. Many mistakes were made in the design, but on the whole the standard of work was better than at Takoradi. Progress was slow and the original buildings were not completely screened until early in 1942. Screening was difficult at Maiduguri owing to the rough type of building and it was quite impossible to fly-proof the kitchens.

The screening of the camps at Takoradi was reported to be complete at the end of 1941. All nets were withdrawn from personnel in screened quarters and were returned to Freetown in spite of Command routine orders that mosquito nets were still to be used in screened buildings. Inspection of the camp early in 1942 revealed the fact that the design and the detailed finish of the screening of all buildings was so bad that none could be deemed properly protected. An urgent demand was made for sufficient mosquito nets to replace those returned to Freetown, but they were not received until August. The Public Works Department at this time refused to undertake the screening of buildings already constructed or the modification of those already screened, claiming that this work should be done by the Air Ministry Works Directorate Clerk of Works, who was responsible for all maintenance. The Clerk of Works was given detailed plans of the necessary modifications by the S.M.O., but he failed to follow them and the quality of his work was so bad that the modified buildings were worse than before. Fortunately, he worked so slowly that he had not done a great deal of damage when the Air Ministry Works Directorate representative visited Takoradi in June and put a new Clerk of Works in charge. Even where the screening was otherwise effective, lack of spring hinges for the doors made it impossible to complete the work satisfactorily. Various devices, such as weights and pulleys, were tried as substitutes, but they were not successful as they only lasted a few days. The new Clerk of Works showed much more initiative than his predecessor and was extremely co-operative. He managed to acquire a sufficient number of good spring hinges and quickly re-built new mosquito-traps on the entrances to all buildings. So much time had been wasted that it was quite impossible to complete the work before the 1942 malaria season, so that during the peak of the season in July many airmen had no nets and were sleeping in inadequately screened quarters. By the end of 1942 all barrack rooms were efficiently screened. The success of similar

measures at Hastings is clearly shown in the graph (Fig. 7), where the anopheline index dropped in 1942 to almost negligible proportions.

Medical and technical building manuals have for many years carried detailed information on the construction of buildings suitable for tropical inhabitation and their fly-proofing. All this information had to be re-learned in West Africa largely by methods of trial and error, by both works and medical branches, for incorrect design of screening and poor workmanship resulted in much waste of anti-mosquito gauze

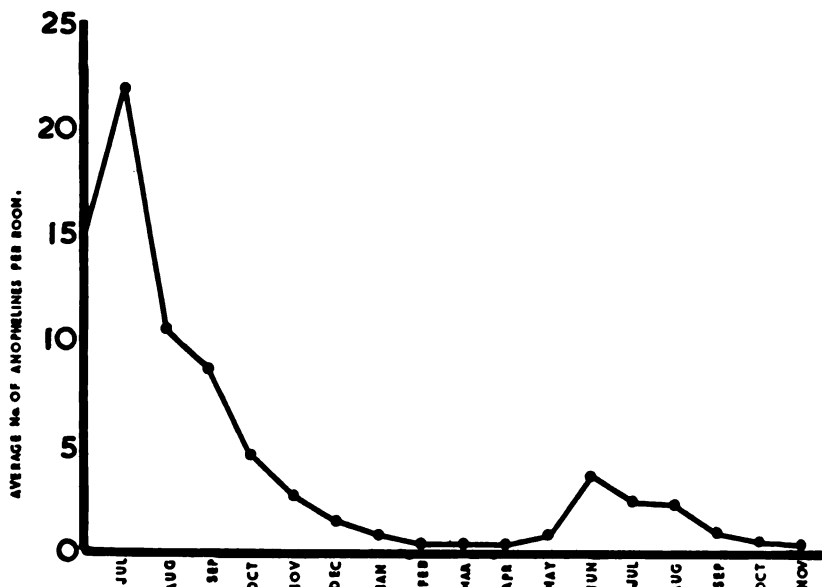


FIG. 7. Graph showing Anopheline index for a house at R.A.F. Station, Hastings 1941-2.

and as a result of experience certain rules were formulated for the correct design of screened buildings. Three-foot dwarf walls were insisted upon round all verandahs, as this saved the gauze most liable to damage from being kicked and did not affect ventilation. Where there was no verandah, each window was screened with a single complete fixed gauze frame, no removable flaps being allowed, and the window was hung to open inwards. Where a window was already hung to open outwards, and could not be changed, flaps through which to operate the window were still not allowed, and opening and closing of the window had to be done from the outside. Experience had proved that removable parts were always abused and very soon the hinges or other fastenings became unserviceable. Entrances to screened buildings had to be reduced to a minimum and each one was 'trapped'. Traps made by incorporating parts of the verandahs were not allowed, as this obstructed the passage and reduced ventilation. All traps were therefore



made as porches external to the verandahs, and were at least eight feet long to ensure that the first door closed before the second was opened. Traps were made as narrow as conveniently possible, so that they should not be used as store rooms, providing hiding places for mosquitoes, and their doors had to be single, opening outwards, and hinged on opposite jambs. Wherever new buildings were being constructed after the beginning of 1942, an ablution block was placed between every two barrack rooms, and connected to them by screened covered ways. Routine inspection of screening to detect any damage was essential, for when damaged the whole became a mosquito trap of some efficiency. (See Figs. 8 and 9.)

The anti-mosquito gauze was useless if the mesh was greater than 16 holes to the inch and even then the holes were too large if the wire of which it was made was very thin. The importance of specifying the gauge of the wire as well as the mesh did not seem to be sufficiently understood by those responsible for ordering it, so that some of the 16 inch mesh gauze had holes much too big. In the coastal areas, monel metal gauze was the only type which withstood corrosion well, and that made of galvanised iron was hardly worth using as its life was so short. The S.M.O. took control of the issue of all anti-mosquito gauze in the Gold Coast in July 1942. By this means he was able to ensure that plans of all screening were shown to him, and much waste of gauze was avoided.

In the middle of 1942 all the screening available in Nigeria had been sent to the staging posts on the new southern route, as these places were expected to be even more malarious than those on the northern route. The new buildings on the northern route and at Lagos could not therefore be screened in the latter half of 1942, but they were designed ready for screening, so that no time would be lost as soon as the material was available. Supplies of screening improved throughout the years and by 1944 were adequate.

The initial shortage of screening material was no doubt responsible for many cases of malaria but later the personnel themselves were partly to blame when they contracted the disease, for lack of care in handling doors and windows that had been proofed, and failure to report damage to proofing so that replacements could be fitted, soon rendered the most efficient screening ineffective. It was noticeable in this connexion that well-planned lectures on the subject of malaria and its prevention did much to bring home the value of screening and made the men more conscious of its relation to their own health.

#### DRESS DISCIPLINE

It was a Command order that all personnel must wear long-sleeved shirts, buttoned at the neck, long trousers, and mosquito boots from

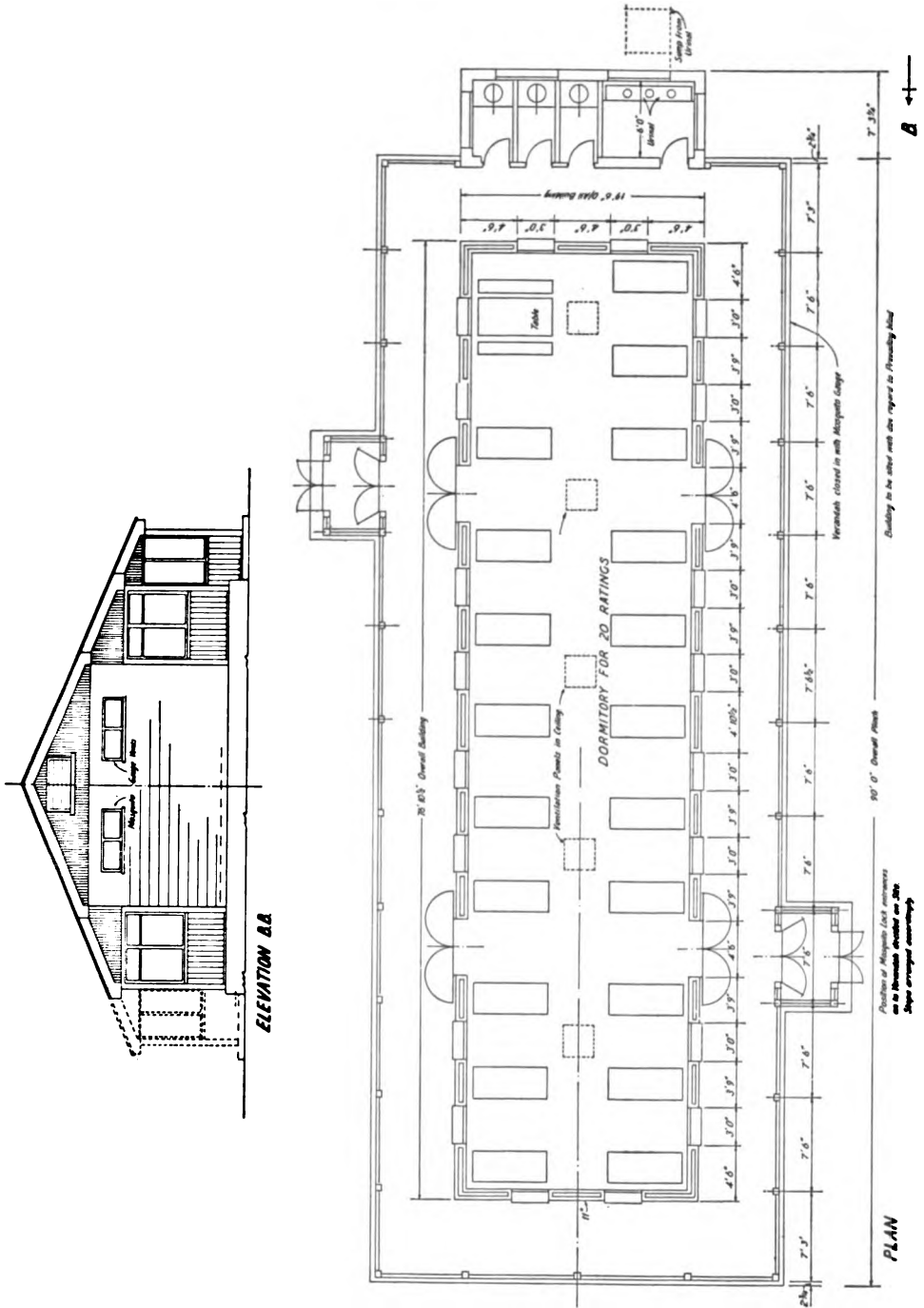


FIG. 8. Plan of dormitory showing mosquito proofing.

dusk until dawn. In spite of repeated inspections by medical officers and resulting orders in Station Daily Routine Orders, dress discipline was inclined to be extremely slack. This was mainly due to the bad example set by many senior officers, and in some cases even by senior

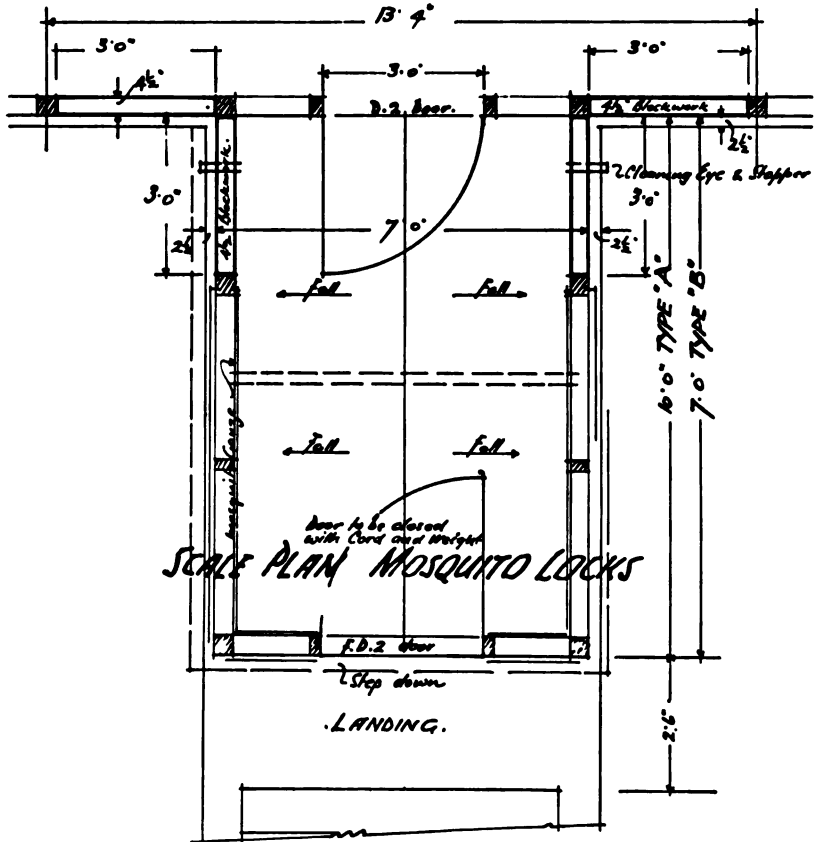


FIG. 9. Plan of a Mosquito Lock.

medical officers, and in the reluctance shown by administrative officers to take any effective action in the case of offenders.

During his tour of the Command early in 1942, the P.M.O. found that anti-malaria discipline was very slack, and many of the medical and dental officers were not setting a good example. No further difficulty was experienced with the medical and dental officers, but the executive officers failed to appreciate the importance of the regulations. Acting on the advice of the P.M.O., the A.O.C. issued a letter to all commanding officers stressing the importance of anti-malaria measures and stating that he would hold them personally responsible if the malaria incidence in 1942 was not materially lower than it had been in

1941. As a result of this, further orders were issued but little attempt was made to assist the medical officers in seeing that they were carried out.

Towards the end of 1942 discipline among permanent members of the Command was greatly improved, but aircrew and transit personnel were still common offenders.

The Americans wore long trousers and long-sleeved shirts during the daytime as well as at night, which obviated the necessity for their personnel to change.

Mosquito boots were issued on arrival in West Africa. This was most unsatisfactory as the supplies of certain sizes frequently ran out when large drafts arrived, and transit personnel were a continual drain on stocks, so that many officers and airmen were without them. Frequent requests were made that mosquito boots should be issued in the United Kingdom, but no satisfactory answer was received.

Many complaints were made by Air Ministry and Middle East Command that there was an unnecessarily high rate of malaria in personnel in transit through West Africa, and that many were not provided with the necessary protective clothing. It was true that many transit personnel could not be provided with protective clothing because supplies were inadequate, and personnel were sent by air from Middle East with only a pair of shorts and a short-sleeved shirt, the rest of their kit having been withdrawn before embarkation. Few had had any instructions on anti-malaria precautions, and none were provided with quinine before leaving Middle East.

From 1943 onwards propaganda on the subject of malaria was having its effect, as also was the increasing vigilance of the executive. The latter, although perhaps slow to grasp its importance, gradually tightened dress discipline until in 1945 infringements of the regulations were rare, although it is only fair to state that the increased availability of protective clothing was partly responsible for this improvement, for regulations concerning dress could now be enforced in a way that was not possible in the earlier years when everything was so scarce. Particularly good work was done in the transit camps where a continual watch was necessary on those who were, understandably, less aware of the dangers than permanent personnel. The fall in the malaria rate over the years removed any doubts which may have existed concerning the necessity for and the efficacy of the preventive measures adopted.

#### ADULT MOSQUITO DESTRUCTION

Early in 1942 attempts were made at several stations to implement the anti-malaria measures by spraying with insecticide native quarters in the immediate vicinity of R.A.F. stations. The practice became universal throughout the Command after the visit of the Aerodrome

Inspection Officer in June 1942. All native houses within a mile of the perimeter of R.A.F. camps were sprayed at least once a week, but the effectiveness of this measure was considerably impaired by the lack of supplies of satisfactory insecticides, and the poor quality of spraying apparatus.

All R.A.F. living quarters were supposed to be sprayed with insecticide every evening, the N.C.O. in charge being made responsible for each barrack room, and the sanitary squad for the communal rooms. This measure was not very successful, as executive officers gave little help in its enforcement. Spraying of all quarters by natives in the early morning, before personnel left the mosquito nets, was instituted at No. 298 Wing Headquarters at Igbobi in February 1943, and this resulted in considerable reduction of the mosquito population.

Up to 1943 spraying had been done with whichever insecticide was available; pyrethrum was considered to be the most effective but it was very scarce, as most of the areas in which it was grown were under Axis domination and the main Kenya crop available to the Allies failed in 1942. A major advance was made late in 1943 when D.D.T. became available, at first in small quantities but later in adequate amounts. The usual method was to spray a 2 per cent. mixture of insecticide in kerosene; this was reported to be most effective and to keep its lethal qualities for a considerable time when applied to inside walls of living accommodation. Personnel were quick to appreciate the efficacy of this method and hence all spraying was conscientiously carried out.

#### PARIS GREEN

Attempts to control mosquito breeding by spraying Paris green from Tiger Moth aircraft were made at Takoradi during the first six months of 1942. Various modifications to the hoppers in the aircraft had to be made before satisfactory distribution of the Paris green was obtained, but it was still very difficult to direct the Paris green on to a narrow area, such as the edge of a swamp, particularly as the wind was rarely less than 5 m.p.h. and the aircraft were not allowed to fly below 100 feet, owing to the atmospheric conditions and nearby hills. Furthermore, the Paris green did not reach the larvae unless they were quite unprotected by vegetation, and it was decided at the end of August 1942 that there was little evidence that the aerial Paris green had controlled the breeding to any useful extent, and that the results did not justify the expense. The use of aerial Paris green was therefore reserved for the treatment of flooded areas after heavy rains, when it was probably of value.

Paris green dusting with hand-blowers was fairly satisfactory where a good diluent dust was available, but great difficulty was experienced

in persuading the natives to use it owing to their fear of poisonous effects. Paris green was completely superseded when supplies of the much more effective D.D.T. powder became available.

#### REMOVAL OF NATIVE HOUSES

When the principle was instituted of declaring airfield areas to be under the health control of the R.A.F., native villages within the declared areas were removed whenever possible. It was found that if the villages were of mud construction, the cost of removal was less than that of regular spraying. It was most important that a sufficient area should be requisitioned when an airfield was first sited, as the natives very soon learnt that if they hastily constructed a village just outside the perimeter, they would eventually get well paid in compensation for its removal. (*See Living Conditions: Siting and Construction of R.A.F. Stations—Medical Aspects.*)

#### LARVICIDAL FISH

Ponds with clean shallow edges were satisfactorily controlled by the introduction of small minnow-like fish (*Gambusia*), of which an abundant supply could usually be obtained from a search of likely ponds and streams. The young fish lived in the shallows in order to avoid their cannibal elders, and could be found even in footmark puddles at the edge of the ponds.

#### OILING AND DRAINAGE

Neither of these two measures could give satisfactory results without the other. Before extensive drainage was undertaken, new potential breeding places were continually appearing as seepages in quite unexpected places, so that it was impossible to ensure that all water was regularly oiled. Removal of all water could not be attempted in the coastal areas owing to the extremely small fall available. The principle adopted was, therefore, to run wide deep open drains down the valleys, with subsidiary contour drains feeding them from the hillsides and preventing hillside seepages. By this means the subsoil water level was lowered, and although all water was not removed, it was collected into drains where it could easily be oiled. Tracks were made along the banks of the drains, so that inspection could be carried out on a bicycle. The whole area drained was divided into sections, and each man on spraying duties was given a definite part of the system to spray, for each day of the week.

Control by oiling was made more difficult during 1940 and 1941 by lack of European staff, sprayers, and satisfactory larvicidal oils. The Shell Company was unable to supply malarial regularly and old engine

oil\* with 5 per cent. petrol was found to be ineffective. Four Oaks and Mysto sprayers were both supplied, but the latter became unserviceable after about a fortnight, as the rubber parts perished.

Tests were carried out at Takoradi on the 'malarial' supplied by the Shell Company. It was found that it had no standard composition, its constituents being largely dependent on the oils available. Several samples tested did not fulfil the requisite standards of toxicity, spreading power, or permanency. The Shell Company were very ready to co-operate and arrangements were made whereby samples of each new blend were tested at the R.A.F. hospital laboratory, as far as facilities permitted, before being issued.

A squadron leader medical officer, posted to Freetown to be in charge of anti-malaria work for the R.A.F., inspected Takoradi on his way from the Middle East in July, and among other suggestions he recommended a scheme for ponding swamps along the north-east border of the airfield. He considered any large draining scheme to be out of the question owing to the expense and the time required for its completion.

Approval was given in August 1942 for the expenditure of £5,000 on the scheme to canalise and pool the swamps along the north-east border of the airfield at Takoradi. Patchwork repairs on the surface of the runways had been continuous since 1940 when two aircraft had fallen through the main runway. A more radical scheme of subsoil drainage of the runways had been started in 1941, and the S.M.O. pointed out that his swamp drainage would considerably assist in the general drainage of the airfield. He was thereby able to obtain the labour he required at the expense of the airfield maintenance account, the £5,000 remaining intact. The existence of this £5,000 stimulated Government interest in the malaria problem, with the result that an Inter-Service Committee was formed, under the chairmanship of the Provincial Commissioner, to co-ordinate all anti-malaria work in the area. The Committee was not a success although it was a step in the right direction. It met once in 1941 and once again in 1942, out of which a tentative scheme for the spraying of houses in the African township was evolved.

The Army, early in 1942, started a drainage scheme whose out-flow would have to use the already partly completed drains on the north-east boundary of the airfield. Arrangements were, therefore, made to combine the work of the R.A.F. and the Army, but co-operation proved difficult and the arrangements did not materialise. In May a malariologist of the 7 Mobile Malaria Field Laboratory took charge of the

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\* Considerable confusion arose from the term 'waste oil'. This did not, as most medical officers thought, refer to used engine oil, but was a technical term used in the refining industry for a special type of oil with larvicidal properties.

Army anti-malaria work and from then onwards close liaison was maintained between the S.M.O., R.A.F. and the Army. The Army malariologist had a Royal Engineers lieutenant attached to him to give advice on engineering matters and to organise the labour concerned in the anti-malaria drainage. An arrangement was made by which the Army units paid for all labour concerned with drainage near their camps, and labour employed on drainage round the airfield or the R.A.F. camps was paid out of the R.A.F. airfield maintenance account. When the Aerodrome Inspection Officer appointed by the Colonial Office finished his tour of airfields in West Africa, he reported that there was 'an almost complete absence of precautionary measures on and around aerodromes in the Command'. In replying to these reports the A.O.C. pointed out the many measures which had been taken by the R.A.F., but showed that the policy had been primarily short-termed and against any extensive drainage scheme.

Two medical conferences were held in Lagos in July 1942. At the second conference recommendations were considered for the co-ordination of anti-malaria work by all Services, and the resultant recommendations of the conference were submitted to the Resident Minister. The latter would not agree to any scheme embracing anti-malaria control throughout the Colonies as he considered the protection of airfields on the reinforcement route and of the R.A.F. personnel operating them to be his primary duty, and until that had been accomplished, he would not allow attention to be diverted to any other consideration. A final scheme was approved by the West Africa War Council, under the chairmanship of the Resident Minister, at the end of August 1942. Under this scheme an Area Board was appointed for each Colony, consisting of the civil D.M.S., and medical representatives of the three Services, with an Army malariologist as expert adviser.

The Area Malaria Boards were exclusively devoted to anti-malaria work affecting airfields and R.A.F. camps. Airfield areas, in which the commanding officer of the R.A.F. station would be the health authority through his S.M.O., were to be defined by the Area Malaria Boards for each airfield, and would normally include up to a mile outside the perimeter of the airfield and the R.A.F. living accommodation. It was the duty of the area malariologist to submit a comprehensive anti-malaria scheme to the Area Malaria Board for each airfield area in his Colony, working in close co-operation with the S.M.O. of the station. The Area Board would then consider the scheme, and if it met with their approval they would recommend what share of the expenses should be paid by the three Services and by the Colonial Government. It had been the wish of the Resident Minister that the area malariologists should be R.A.F. officers or independent civilian experts, but as the Army possessed the only trained malariologists



available, he reluctantly agreed to their appointment. The reluctance was due not to any personal disapproval or feeling against the Army, but to the fear that as the R.A.F. was in executive control, the administration of the scheme would be complicated by having the malariologists belonging to a different Service and therefore responsible to more than one master.

After delays due to correspondence with headquarters on the financial arrangements to be made, it was finally agreed that once the Area Malaria Board had approved a scheme, work could be put in hand immediately by the Public Works Departments in the Gold Coast and Nigeria, and by the Air Ministry Works Directorate in the other two Colonies, pending final approval from Air Headquarters. The works would be charged against the Air Force account, adjustments between the Services being made later.

The anti-malaria drainage scheme at Takoradi was already far advanced when this new organisation was set up and, while waiting for the financial arrangements to be settled, difficulties were encountered in getting approval for payment of some of the labour involved. The £5,000 provided for drainage schemes in 1941 was finally used to settle the accounts and proved invaluable, as it enabled labour to be retained during the change over period, thus preventing the complete stoppage of work and loss of trained labour which would otherwise have occurred.

Under the new arrangement the malariologist and his engineer continued to direct the scheme at Takoradi, but all payment of labour and the supply of equipment were undertaken by the Public Works Department, which also helped in the provision of European supervision. The airfield area was defined to include the Whin River and Butua River watersheds, but the Asamang swamp watershed remained the exclusive province of the Army. The work on the nine square miles included in the airfield area had been almost completed by the end of 1942, but by the end of R.A.F. occupation the area covered was about 30 square miles. Drainage schemes on a smaller scale were carried out under similar arrangements in the other two Colonies. The usual methods of clearance and drainage are described more fully in the following paragraphs.

#### METHODS OF CLEARANCE AND DRAINAGE

The actual work of clearance was not as straightforward as might be imagined, for the luxuriant tropical growth effectively concealed the nature of the land beneath, and what appeared from a distance to be firm ground, often proved on closer inspection to be an area of marshland.

The first step was the production of plans by the surveyors and engineers suggesting the best methods of draining and of constructing

bunds, tidal gates and other works with a view to speed and ease of construction and maintenance. After a careful study of relevant maps and aerial photographs, a tentative scheme was drawn up which, it was realised, would in all probability need revising later when the area could be more closely inspected from the ground after the initial clearance. These plans were then discussed by the interested bodies, so that any alterations required could be made; this called for close liaison between all the authorities concerned, for it was essential that such vital points as prevailing wind, proposed increases in accommodation or future extensions to airfields should be taken into account if an efficient plan was to be drawn up. The medical responsibility in such a project is obvious, and medical officers often had to make decisions which involved very considerable contracts. It reflects great credit on the medical officers concerned (usually the Army malariologists working for the R.A.F.) that in few instances did their advice prove wrong or unsuitable, for the problems encountered were often quite outside the scope of normal medical training.

Preliminary clearance of the main areas could now begin. This was usually the heaviest part of the work as mangroves, coarse tropical grass and boulders in the beds of streams had to be removed before it was possible to site the main canals and runnels. Mangroves provided a particularly difficult problem as their eradication demanded much hard manual labour by gangs often working up to the waist in mud. There was a high percentage of sickness among labourers, arising from minor accidents and the singularly unpleasant conditions in which the task was carried out.

With the main areas cleared it was possible to see whether the proposed sitings for canals and ditches were suitable; if so, these were marked out and their construction could now begin. It also had to be decided at this stage whether large and costly artifices such as bunds and sluice and lock gates would be needed. These were essential in many places where the swamps were tidal.

The final step was to link the rest of the area to the main waterways. This drainage of the entire area into one system might require elaborate contour or herring bone drains which would have to be dug and canalised into small permanent drains leading into the main system.

Once the scheme was completed it was imperative to ensure that its maintenance was entrusted to personnel who were conversant with the management of the system. Sluice gates would need frequent operation in the rainy season or during high tides, while in dry periods they would require to be left open, otherwise the normally flowing waterways might produce sluggishly moving water or even stagnant pools, both of which would favour the breeding of mosquitoes. As shown in Plates XXXII-XXXV, the systems were comprehensive and

if properly maintained rendered formerly notorious areas relatively safe.

Certain difficulties were encountered in various localities, but only one will be mentioned here, as it was both unexpected and difficult to combat. This was the damage caused to the earth sides of canals and drains by land crabs. Deterioration from this cause was so great that continual repairs had to be carried out to prevent collapse and such measures as the incorporation of bamboo mattresses in the walls to give additional strength were adopted, but no really effective solution was found. In flat areas the land crabs created a further problem in that their holes, which were quite deep, often filled with water and provided excellent breeding places for the mosquitoes. The only effective method of dealing with this was to fill the holes and to attempt to reduce the crab population by trapping.

The provision of labour was often a problem. It was necessary to employ large gangs of natives, particularly in the initial stages where swamps and mangroves had to be cleared, and it sometimes proved difficult to obtain sufficient men; even if native labour was abundant it was seldom possible to ensure adequate European supervision—which was essential if a reasonable day's work was to be done by the gangs. Materials and tools needed for the work were often in short supply, particularly wood, and the ingenuity of the engineer in charge was often taxed to provide essential needs. At this stage in the war only actual war material received any worthwhile priority and anti-malaria supplies were rarely classified as such. In many instances Army, R.A.F. and Civil authorities pooled both material and man-power in schemes which were common to all. 5 and 6 Army Mobile Malaria Field Laboratories, at Freetown and Lagos respectively, assisted greatly in the overall planning. (*See Plate XXXVII.*)

In certain areas it was found impossible to carry out the extensive clearance and drainage required with the limited funds and labour available, and in such instances, aerial spraying was the only method of control which could be used, although its effectiveness was limited by the thickness of the vegetation which formed an 'umbrella' over many of the breeding grounds.

Wherever mechanical drainage was carried out on the lines described here, this method of anti-malaria control proved extremely effective and was responsible, together with improved methods of personal protection, for a steady decline in the number of cases of malaria among R.A.F. personnel.

The following list of the main clearance schemes completed or projected up to the end of 1943 gives some idea of the amount of work undertaken and of the extent of the planning and organisation involved. That the labour and expense were more than justified is seen from a

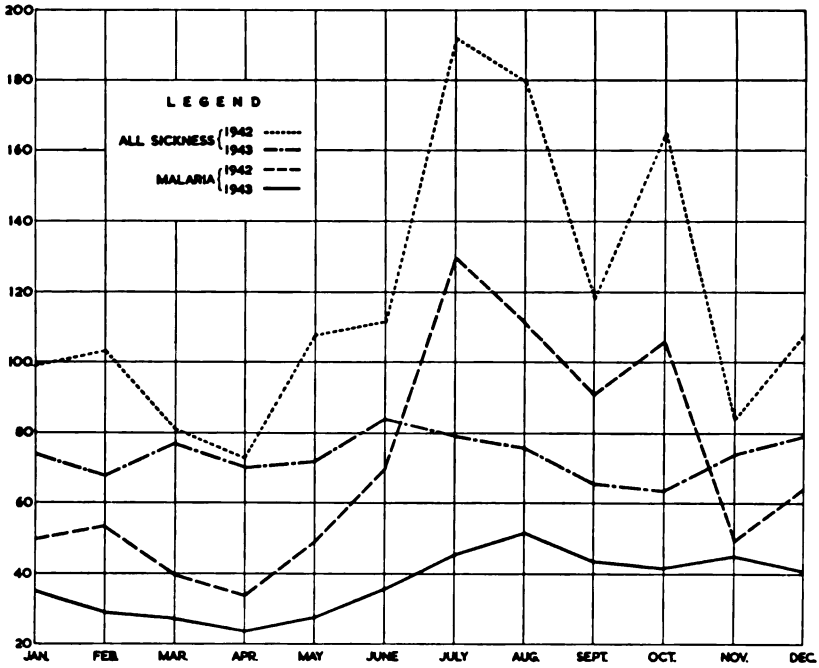


FIG. 10. Malaria and All Sickness rates per 1,000 per month 1942-3.

comparison of the malaria rates for 1942 and 1943 in Fig. 10. The greatly reduced incidence for 1943 is largely due to the drainage schemes undertaken during that year, viz.:

- Yundum . . . Bush clearance, surface levelling and vertical drains. One native village removed completely from the camp area.
- Jui . . . Contour draining of the Orugu swamp completed. Two native villages completely removed and the third about to be removed.
- Fisherman's Lake Bush clearance and draining completed by Pan American Airways.
- Lungi . . . Partial removal of village.
- Waterloo . . . Three of the four creeks drained.
- Harperfield . . . Bush clearance, surface drainage and commencement of draining a swamp into a lagoon by the U.S.A.A.C.
- Lakka } . . . Swamp and surface drainage completed.
- Tumbu }
- Aberdeen }
- Wellington }
- Takoradi . . . The very extensive anti-malaria drainage scheme completed.
- Accra . . . Bush clearance, surface levelling and drainage and swamp drainage into the sea commenced.

- Maiduguri . . Drainage of north swamp completed. One village completely removed.
- Kano . . . Village removal completed. Jakara river bed widened for  $1\frac{1}{2}$  miles. Borrow pits on station filled in or drained into the Jakara.
- H.Q. No. 298 Wing (Igbobi) . . Bush and surface drainage completed.
- Lagos } . . Sea wall completed for 2 miles against tidal flooding and two tidal gates built. (See Plates Apapa } XXXIV and XXXV.)
- Libreville . . Bush and surface clearance commenced.

#### MALARIOLOGISTS

The position with regard to malariologists was most unsatisfactory. Medical officers with the necessary qualifications were only to be found in Army formations and, though they gave whatever aid they could, it was not always possible for them to spare time from their own duties. It was only in the middle of 1942 after direct representation from the Resident Minister that R.A.M.C. malariologists were attached to the R.A.F. for whole-time duties and it was largely due to their efforts that the large scale malaria clearance schemes were later carried out with such successful results. (See section on Oiling and Drainage.)

The squadron leader medical officer, posted for anti-malaria duties, arrived in Freetown in July, at about the same time as No. 128 Squadron. It was found necessary to send the No. 95 Squadron medical officer to look after the personnel of No. 128 Squadron at Bo, so the malariologist had to perform the duties of squadron medical officer to No. 95 Squadron as well as his other duties.

#### COMPARISON BETWEEN R.A.F. AND AMERICAN ANTI-MALARIA MEASURES

When the Pan American Airways occupied the camp at Accra their malaria incidence during the first six months was extremely high. A comparatively young, but well-known American malariologist was sent as S.M.O. He immediately issued orders for personal protection similar to those adopted by the R.A.F., had all accommodation efficiently screened, and instituted a drainage scheme for a mile round the camp. The discipline was good, as offenders were sent back to America and thereby forfeited their very well paid jobs.

The screening was designed so that barrack rooms, ablutions, and messes, were all connected within the same screening, and the fittings, such as spring hinges for mosquito trap doors, were of excellent quality. The initial drainage was carried out in three days by using a deep cutting tractor-drawn plough, after which spade work was only required for finishing. Adequate European staff was made available and

unlimited native labour could be engaged. The result was that in 1942 the Pan American Airways' malaria rate in Accra was less than 0.5 per cent. per month. It is significant, however, that the site for the American camp at Accra was ideal for anti-malaria control, as outlets for drainage were readily available owing to the sloping character of the surrounding country. Further extensive clearance was, however, found to be necessary and it was carried out by the same malariologist.

## OTHER DISEASES

## BOWEL DISEASES

The incidence of bowel diseases was high at Maiduguri, where the dysenteries were nearly as common as malaria. Flies were abundant and it was not possible to screen the buildings owing to their rough construction.

The rates per thousand per year at Takoradi for 1942 were:

Amoebic dysentery . . . . .	15.3
Bacillary dysentery (proven bacteriologically) . . . . .	22.8
Bacillary dysentery (clinical) . . . . .	18.0
Enteritis . . . . .	98.0
Food poisoning (August 1942 outbreak) . . . . .	59.2
Total . . . . .	213.3
Total, less food poisoning outbreak . . . . .	154.1

Probably a high percentage of cases was due to infection carried directly to food by native food-handlers. The native population showed a very high rate of bowel infection and 50 per cent. of applicants for jobs connected with food-handling had to be refused on medical grounds. Probably most of the successful candidates would also have been found to be infected if repeated bacteriological examinations had been made. African cooks showed complete disregard for normal ideas of cleanliness in the handling of food, and lack of European cooks made supervision inadequate. The continual presence of building labourers on all camps made control of promiscuous defaecation difficult and this, combined with the primitive construction of kitchens, gave flies a maximum opportunity to infect food.

No cases of Shiga dysentery were encountered at the R.A.F. Hospital, Takoradi, but some cases of Sonne and Flexner dysentery were treated with sulphaguanidine with satisfactory results.

The number of cases of dysentery decreased after 1942, and the figure for 1944 was only three-quarters that for 1943 whereas strengths were increased by 25 per cent.

Cases	1943	1944
Total cases . . . . .	383	293
Amoebic . . . . .	35	11

Though generally the cases were scattered throughout the Command, two small outbreaks of interest occurred in 1944. The first was at Takoradi in February when 35 men were infected through inadequate chlorination of drinking water and the second at Jui in October when 63 personnel were affected, the outbreak being traced to 4 chronic cases among Europeans employed in the cookhouse. These outbreaks are mentioned as they were both due to factors which could have been controlled by routine measures.

In 1945 another small outbreak of bacillary dysentery occurred among airmen at Takoradi when 40 were affected; exhaustive efforts failed to identify the source of infection.

#### FOOD POISONING

Just as the peak of the 1942 malaria season had passed, a severe outbreak of food poisoning occurred in No. 2 Camp at Takoradi and 112 patients were admitted to hospital within 48 hours with enteritis. No definite conclusion could be reached as to the source of the epidemic though the investigators laid the blame on some native honey used in making a trifle.

#### CEREBRO-SPINAL MENINGITIS

The occurrence of a case of cerebro-spinal meningitis in an airman at Takoradi in July 1942 caused considerable concern, as at that time the camp was very overcrowded and the malaria rate was rising alarmingly. The danger of an epidemic of cerebro-spinal meningitis during the malaria season was considered to be so great that tents were erected on the football pitch, in order to relieve the congestion in the barrack rooms. Fortunately no further cases occurred.

#### SMALLPOX

In view of the seriousness of this disease and the fact that small outbreaks had been recorded for many years in West Africa, especially in Nigeria, particular care was taken to ensure that new arrivals in the Command were correctly vaccinated and also that these vaccinations were kept up to date during their stay.

The only R.A.F. case recorded occurred in 1943 in an airman stationed at Kaduna in Nigeria. On investigation it was found that he had last been vaccinated three years previously—a period that was at that time accepted as just within the protection limits. The case was of particular interest in that it was confluent and that the patient recovered—a rare event in this normally fatal variety of smallpox. Fortunately this was an isolated case and did not lead to an outbreak.

In March 1944 a small outbreak of smallpox occurred in native villages in the Gambia and as a precautionary measure all personnel in

Bathurst were re-vaccinated and in particular all native employees. No cases were recorded among Servicemen or European civilians. Later in the year a larger and more serious outbreak occurred in Sierra Leone, the disease rapidly spreading over the borders of Liberia into the Southern Provinces of the Protectorate, moving down the villages on the railway line from Daru towards Freetown. This created a serious threat in view of the size of the Service population in the Freetown area and it was necessary to place a cordon across the Freetown Isthmus to prevent natives from entering the Colony. That this action was justified was shown by the complete freedom of Service personnel and European civilians from the disease. Conservative estimates gave the number of cases arising from this outbreak as 389, with 86 deaths, though it was realised that the actual figures were probably considerably higher in view of the uncertain methods of notification in native villages. Sporadic cases occurred in the area until late in September, three cases among natives near Hastings being the last notified.

#### PLAGUE

In 1944 there was a serious outbreak of plague in Dakar, Senegal. Although no cases occurred in the R.A.F., the epidemic is mentioned here in view of the preventive measures which were taken by the R.A.F. health authorities and also because plague is a disease rarely encountered by R.A.F. medical officers.

The first cases were diagnosed in April and, at first, were few in number but in view of the seriousness of the disease and the disastrous consequences which could follow an outbreak in the Services, all medical authorities viewed the situation with great concern.

The health conditions and measures taken by the civil authorities in Dakar were found to be far from satisfactory and did not conform with Articles 27 to 29 of the International Sanitary Convention for Aerial Navigation as laid down in 1933. The Service authorities therefore had no alternative but to consider Dakar an infected port under the terms of the Convention and to take all possible precautions to safeguard Service personnel. From June, when the outbreak assumed larger proportions, Service men were forbidden to enter the port, except on essential duty, when production of a valid certificate of plague inoculation was required and mosquito boots, dusted with D.D.T. powder, had to be worn day and night while within the banned area.

The figures overleaf, obtained from civilian medical sources and representing the known cases between April and November 1944, give some indication of the extent of the outbreak; there were undoubtedly a number of other cases which were not notified.



*Total Cases*

European 4 (3 deaths)  
 African 560 (505 deaths) (Mortality rate approx. 90 per cent.).

*Treated in Hospital*

Bubonic Plague	. 101	} = 97 deaths, 47 recoveries.
Septicaemic Plague	. 28	
Pneumonic Plague	. 15	

**BLACKWATER FEVER**

The necessity for absolute rest right from the start in cases of blackwater fever was soon confirmed by Army experience, and Army mobile blackwater fever teams were organised. Whenever a case of blackwater fever outside a hospital was reported, the nearest Army team, complete with equipment, was taken to it by air. This organisation resulted in a very considerable reduction in the mortality.

At R.A.F. Hospital Takoradi, the mortality at the end of 1942 was two deaths in eight cases, which compared favourably with other Services. The main lines of treatment adopted were complete rest with blood transfusion, if the haemoglobin fell below 60 per cent. and haemolysis was still occurring. All those concerned with these cases were convinced that complete rest, mental as well as physical, was far more important than any active therapeutic measure so far devised.

**RABIES**

A cat belonging to one of the officers at Takoradi developed rabies and died. Sections of the cat's brain were positive. The officer, who had been scratched by the cat while it was ill, was given a full course of anti-rabic treatment and suffered no ill effects. There was already a station standing order forbidding any pets to be kept and this afforded a useful opportunity to have the order properly enforced.

**PULMONARY TUBERCULOSIS**

At no time during the war did this disease create a numerical problem for the Command. The low incidence was probably partly due to the fact that from 1942 onwards the R.A.F. policy of examining aircrew candidates by mass X-ray before acceptance was extended to all new entrants into the R.A.F.\*

The importance of the disease lay in the fact that personnel contracting pulmonary tuberculosis in West Africa deteriorated rapidly. They were consequently given a very high priority for invaliding to the United Kingdom. The largest numbers recorded were in 1943 and 1944 when 9 and 17 cases respectively were invalided.

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\* See R.A.F. Volume I, Chapter 6: Special Services—Mass Miniature Radiography, page 288.

VENEREAL DISEASE

Official concern was expressed in 1942 at the high incidence of venereal disease at Takoradi, and its apparent increase since 1941. As a matter of fact, the figures quoted for 1941 were almost certainly lower than the actual incidence, as perusal of the records early in 1942 showed that a number of cases had never appeared in the official returns. In any event, even comparing the rates at their face value, the incidence of gonorrhoea had actually *decreased* in 1942, as the following figures show:

		<i>Rates per 1,000 per annum</i>		
		1941	1942	
Syphilis—primary	} . . . . .	5.5	6.7	} 9.8
„ secondary			2.6	
„ tertiary			0.5	
Gonorrhoea—acute	} . . . . .	54.2	26.0	} 30.7
„ relapse			4.7	
Chancroid	. . . . .	12.2	27.5	
Lymphogranuloma Inguinale	. . . . .	No record	9.4	
Balanitis	. . . . .	No record	10.0	
Urethritis 'V'	. . . . .	No record	12.5	

In consolidated returns for venereal disease rates, all the above types were included at Takoradi, whereas many other units only showed cases of syphilis and gonorrhoea. Furthermore, there was a special treatment centre attached to the hospital at Takoradi and this probably led to fewer airmen attempting to get treatment outside. All these factors combined to make the incidence appear higher at Takoradi than elsewhere.

Free issue of condoms at the beginning of May 1942 was followed by a marked drop in the V.D. rate. Any attempt at reducing venereal disease by placing known brothels out of bounds was useless. The airmen obtained their contacts either at local dance clubs or through Africans working in the camps, who could always produce a 'sister' willing to co-operate.

The years 1943 and 1944 showed a steady improvement in the figures for venereal disease. The main danger areas still remained in the Gold Coast and Nigeria. The steps taken to increase recreational facilities undoubtedly contributed to this lowering of the V.D. rate, and intensified propaganda by executive and medical authorities had its effect.

In 1944 the first two cases of sulpha-resistant neisserian infection were recorded. These were no doubt due to misuse of the sulpha drugs, which were at this time one of the most profitable commodities to sell on the black market, leading to under-dosing by unqualified persons and the production of sulpha-resistant neisserian strains; this state of

affairs was not limited to West Africa but was seen in Italy and in India, Malaya and other parts of the Far East.

#### DISEASES OF THE SKIN

Malaria and dysentery were the two serious diseases responsible for most of the non-effectiveness in West Africa but among the minor illnesses skin infections accounted for the majority of attendances at sick parades.

The commoner skin conditions could be divided roughly into two main types—those caused by primary infective agents and those which had originated in minor abrasions. In the first group, the dermataphytoses were predominant, usually affecting the feet or the auditory canal. The predisposing conditions were those normally associated with skin diseases exacerbated by the hot, humid climate. Although not inherently serious diseases, such infections gave much cause for concern, both in view of the numbers involved and because of the ineffectiveness of efforts at control.

Two skin diseases of some interest in the primary infective group were those caused by the Tumbu fly (*Muscoides*) and the Chigger (*Tunga penetrans*). In the former, larvae attached themselves to clothing lying on the ground (the African's normal method of drying clothes), later burrowing into the back of the wearer and causing crops of painful suppurating boils; fortunately, the insect was local in distribution and it was therefore possible to apply protective measures with some degree of success. The Chigger, on the other hand, was widely distributed; this insect attacked mainly the feet, which were particularly vulnerable when sandals were worn rather than boots. Neither of these infections became a serious menace but they were responsible for a steady flow of non-effectiveness in certain areas; both caused considerable discomfort to those affected, although the latter had chiefly themselves to blame through disregarding elementary medical instructions.

Skin infections of the second type were of interest, for they arose out of small abrasions which in the United Kingdom would have healed by first intention but which in the West African climate provided the nidus for skin infections of a chronic and resistant nature. Many such abrasions were caused in the early days of the Command, when large numbers of personnel were engaged in manual labour of one sort or another—in the erection of buildings, in the construction of the necessary field cooking and sanitary apparatus, and assisting in airfield construction or the hundred and one small manual duties associated with new stations or temporary camps abroad. Organised games were another source of minor injury and there were in addition those who were obviously susceptible to skin infections—men having

seborrhoeic diathesis, those with previous histories of skin complaints and rufous personnel who with few exceptions fared badly in hot damp climates. An elementary preventive measure would have been the exclusion of such men from service in West Africa.

All possible control was exercised by the medical branch, with what support the executive could offer. Preventive measures adopted included the following:

#### *General*

1. Daily scrubbing and airing in the sun of duckboards from wash-houses;
2. Use of permanganate as a disinfectant in bath houses and showers;
3. Careful inspection at frequent intervals of natives who worked in Service laundries.\* One difficulty encountered was the habit of the African native of drying clothes on the ground, where they were easily accessible to the 'Tumbu' fly, and careful supervision was necessary to ensure that clothing was suspended clear of the ground to dry.

#### *Personal*

Every opportunity was taken by medical officers to acquaint personnel with the dangers of acquiring skin diseases and they were encouraged to take the following simple precautions to minimise the risk:

1. Working without a shirt whenever possible as a healthy sun tan was found to be an excellent preventive to skin infections;
2. Changing socks as often as possible and seeing that they were properly washed. This was often impossible because of the airmen's very limited wardrobe and laundering difficulties;
3. Use of foot powders of the talcum variety.

In addition, personnel were advised to dry the auditory canal very carefully and gently after bathing or swimming.

It is interesting to note that in 1945 skin diseases were the most common reason for personnel being invalided home. Although this is an indirect tribute to the effectiveness of malaria and dysentery control it also emphasises the difficulties of preventing skin diseases in large groups of Servicemen. Also of interest was the fact that the P.M.O's. report of that year noted that no skin specialist was available in West Africa from among the three Services.

#### YELLOW FEVER

No cases of yellow fever occurred in the R.A.F. but anti-amaryl precautions were particularly necessary in view of the considerable

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\* Laundries were only provided at a few stations, washing at the others being done by personal boys in any basin or under any tap available. Even where they did exist, the laundries were inadequate and no proper drying rooms were provided.

risk of carrying infection to areas where the disease was non-endemic. These precautions are described below.

#### ANTI-AMARYL PRECAUTIONS

The object of anti-amaryl precautions was two-fold: to prevent contraction of the disease in areas where yellow fever was endemic, and to prevent the yellow fever vector, *Aedes aegypti*, or persons incubating the disease from being carried in aircraft to non-endemic areas. (See Map 5.)

Prior to July 1940 co-ordination of yellow fever control in West Africa had been vested in the *Office International d'Hygiène Publique* in Paris, which ceased to function on the fall of France. The need for



MAP 5. Yellow Fever area in Africa.

some official body to co-ordinate anti-amaryl measures during war-time was met in October 1941 by the formation of a British Inter-departmental Committee on Yellow Fever Control, with the Medical Adviser to the Secretary of State for the Colonies as chairman. In the meantime the original 1926 Regulations as laid down in the International Sanitary Convention for Aerial Navigation had to be carried out as far as local conditions would allow.

All R.A.F. personnel had received protective inoculations against yellow fever before leaving the United Kingdom. The Takoradi airfield had been declared anti-amaryl in March 1940, but although technically conforming with the articles of the International Convention, it was surrounded by swamps, there were numerous crab holes in the land round the swamps, and parts of the native township were close to the perimeter of the airfield. The crab holes had been shown to be favourite breeding places of *Aedes irritans*, and larvae of *A. gambiae* and *C. thalassius* had been found after heavy rains. The International Convention had laid down that an anti-amaryl aerodrome must be 'situated at an adequate distance from the nearest inhabited centre'. What constituted an adequate distance had never been defined, but the generally accepted interpretation was that there should be a building-free zone 440 yards wide round the perimeter of the airfield, and this was confirmed by the Third Interim Report of the Inter-departmental Committee, issued in September 1942.

The Colonial Government, as signatory to the International Convention, was responsible for the application of the anti-amaryl regulations through their Airport Health Authority, who, at Takoradi, was the Medical Officer of Health.

In the absence of R.A.F. medical officers, anti-amaryl control remained in the hands of the Nigerian Colonial Medical Service, who were, not surprisingly, unable to give sufficient supervision to ensure adequate disinsectisation of aircraft or proper control of passengers. Undrained borrow pits were made by the Public Works Department all round the airfields at Kano and Maiduguri, in spite of standing regulations controlling their formation, and general camp sanitation was badly neglected. The airfields were already in existence when the R.A.F. arrived, so that their siting had to be accepted, although it was not ideal from a hygiene point of view. It was considered that it would be more satisfactory for the R.A.F. to take the responsibility in respect of R.A.F. aircraft. The matter was discussed with the D.M.S. of the Gold Coast and as a result, the S.M.O. Takoradi, or a medical officer of the R.A.F. Medical Service authorised by him, was appointed, on September 16, 1940, as a recognised 'Health Authority' with the corresponding statutory powers under the Quarantine (Aerial Navigation) Regulations, 1937, of the Gold Coast.

Anti-amaryl regulations were carried out as far as possible by spraying all aircraft on arrival and departure. This was done by nursing orderlies under the supervision of the engineer officer, who was in the best position to know the expected times of arrival and departure, but it was not satisfactory owing to the lack of accurate information, and checking of passengers was very difficult to organise. In consultation with the D.M.S. Gold Coast, two anti-amaryl forms, one for the aircraft and one for its occupants, were devised and printed locally. The forms certified that the necessary precautions had been taken, and were carried by the captain of the aircraft. They had to be signed by him and by the health authority at each stopping place. The ferry pilots were lectured on the rationale of this and all but a few co-operated willingly. There was an epidemic of yellow fever in the Kordofan area of the Anglo-Egyptian Sudan in 1940. The outbreak started in a remote part of the Nuba Mountains and spread rapidly, in spite of the inaccessibility of the original focus. Clinical yellow fever had never been previously reported in the Sudan, although positive mouse protection tests had been obtained from many places in the south-west of the country. The disease could not have been introduced by air transport as the district was remote from air routes, but the rapidity of the spread and the high mortality served to demonstrate to non-medical people the very real danger of epidemics in previously non-endemic areas.

Early in 1942 three Army European personnel died from yellow fever in Freetown. An investigation showed that many who had been inoculated against yellow fever had a negative mouse protection test. All personnel were, therefore, re-inoculated using Rockefeller vaccine. The Inter-departmental Committee on Yellow Fever Control had issued its Interim Report in December 1941, and this stimulated greater interest in anti-amaryl control and provided a more substantial backing to the demands of the medical profession in all Services. An Aerodrome Inspection Officer, appointed by the Colonial Office, commenced a tour of all airfields in West Africa in February 1942. He was followed soon after by an entomologist, who arrived in Freetown to carry out research into the production of a satisfactory ointment or other form of mosquito repellent. R.A.F. personnel volunteered as 'guinea pigs', but towards the end of 1942 the entomologist moved to Lagos to continue his researches, which had so far produced no satisfactory results.

Tests of the phantomyst\* sprayers issued for the disinsectisation of aircraft had shown them to be unsatisfactory owing to insufficient diffusion of the insecticide. Special heads were made in the workshops at Takoradi for attachment to the phantomyst pressure pump units,

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\* R.A.F. Volume I, Plate XLVI.

and these produced a fairly satisfactory power spray. The heads were designed on the same principle as a hand spray gun, but were made of stouter material and had a large splayed nozzle. Tests with pistol grip paint sprayers showed these to be excellent, and twenty were demanded from the equipment branch, but when they were eventually supplied at the end of 1942, they were mislaid before they reached the medical authorities.

At the first of two medical conferences at Lagos in July 1942 the First Interim Report of the Inter-departmental Committee on Yellow Fever Control, published in December 1941, was considered in detail and various recommendations were made to extend the health control around the airfields, and to tighten up the regulations controlling passengers travelling by air. It was decided that aircraft need only be sprayed with insecticide when leaving the endemic area, and that this need only be done at the last port of call in the endemic area, as supplies of efficient insecticide and power sprayers were very limited. The Aerodrome Inspection Officer recommended that pyrethrum extracts should be used as insecticides, and that pyrethrum powder should be used in camp buildings and native houses to give a more lasting reduction in the domestic mosquito population. Large amounts of pyrethrum powder were ordered from Kenya, but when it eventually arrived, it was in the form of unpowdered flowers and much had been damaged by water. It was recommended that no one should be allowed to travel by air unless in possession of a valid certificate of yellow fever inoculation or holding a special dispensation signed by one of the Colonial Governors (*see* also Volume II, Chapter 3, Gibraltar—Yellow Fever Control and Chapter 4, Transport Command—Immunisation, Vaccination and Health Regulations, pages 308, 403).

The recommendations were submitted to the Inter-departmental Committee on Yellow Fever Control for consideration at their next meeting, but were put into immediate operation.

The anti-amaryl control of aerodromes was a major problem and although the control of mosquito breeding was covered by anti-malaria control, the enforcement of regulations relating to air passengers and disinfestation of aircraft presented additional problems. The decision at the Lagos Conference in 1942 to make inoculation against yellow fever compulsory for air passengers, unless exempted by a Colonial Governor, and to limit disinsectisation of aircraft to ports of departure from the endemic area, greatly eased the position. The arrival of airmen detailed specifically for anti-amaryl work in the middle of 1942 made strict control a practicable proposition. It was found essential to have at least two men on duty throughout flying hours on airfields where disinsectisation had to be carried out, as great annoyance was caused if there was any delay in dealing with the passengers or the aircraft.



During 1943, by which time the regulations of the Convention relating to anti-amaryl precautions were considered to be working as efficiently as possible in war-time, experiments on the effectiveness of aircraft spraying methods were carried out. At Natal in Brazil a count was made of the number of live arthropods arriving in aircraft which had left West Africa (including both Service and civilian aircraft of all nationalities—all being similarly bound by the Convention), and the formidable figure of 15,000 was recorded. The majority of these proved to be harmless, but over 300 insects capable of transmitting malaria were found—282 *A. gambiae*, 32 *A. pharaensis* and 24 *A. funestus*.

It was obvious that the fault must lie in the spraying of the aircraft prior to departure from West Africa and experiments were therefore conducted to discover the actual lethal effect of the spraying methods. At R.A.F. Station Jui, eleven mosquitoes were caged in different parts of a Sunderland aircraft, of which the interior was then sprayed with 16 'sparklets'; after 2 hours five of the caged mosquitoes were still alive, but after 12 hours all had succumbed. The sparklets, although recognised to be one of the less efficient methods of spraying, were much used, as other supplies were not always available; they lasted for approximately 5–8 seconds and delivered a very fine but intermittent mist. Further experiments were carried out using the Westinghouse aerosol (high pressure) bomb and the phantomyst sprayer; both of these proved to be effective if intelligently used, but they could easily be mishandled and become inefficient.

The following conclusions were reached from these experiments and relevant investigations:

- (a) Spraying of aircraft was effective if carried out conscientiously and with fully serviceable equipment;
- (b) Error was liable to occur mainly from the human element;
- (c) Flying-boats were more difficult to spray than land aircraft. This was due partly to their size and partly to the difficulty of reaching them at their moorings and the obvious limitation of the size of apparatus which could be used;
- (d) Empty aircraft were more effectively sprayed than those which were loaded; particularly difficult were freight aircraft, where items of cargo often formed 'pockets' where the chemical mist could not penetrate;
- (e) Many of the spraying plants were not working to maximum efficiency and when breakdowns occurred less effective methods had to be used;
- (f) Antagonism was encountered in certain aircrews who were reluctant to suffer the slight delay involved in having their aircraft properly sprayed;

- (g) Certain countries did not take the wording of the Convention sufficiently seriously;
- (h) Executive difficulties. These were most important and were behind a number of the reasons for aircraft leaving without being sprayed. For example, the duty sprayer might be informed that an aircraft was going to take off at a certain time and on arrival find it had already departed, or a sprayed aircraft might become unserviceable and the replacement not wait for the sprayer's attention;
- (i) Finally, it was proved that the mosquito was fortunately more susceptible to the chemical employed than most of the other arthropods and that the concentration which would not kill a fly was lethal to the mosquito.

Subsequently during the war no cases of yellow fever were recorded but continual vigilance was necessary to ensure that the regulations as laid down by the Aerial Sanitary Convention were carried out. Although from 1943 onwards it was possible to allot greater numbers of personnel for the spraying of aircraft there were always occasions when the regulations were not complied with, and the medical authorities were never able to feel that a completely satisfactory system had been evolved.

#### THE WEST AFRICAN AIR CORPS

The West African Air Corps, a labour force of Africans employed mainly on constructional work for the R.A.F., has received little mention in the foregoing narrative and a detailed description of the Corps is not relevant to this History; nevertheless, as all medical arrangements for this force—other than the provision of hospital accommodation, which was an Army responsibility—were undertaken by the R.A.F., it is appropriate to include here brief reference to the main problems which arose in the employment of a body of Africans in close proximity to European forces.

Plans for the enlistment of Africans were finally completed in 1943 but enrolment did not begin until February 1944. From the initial 6,280 recruits examined it was found necessary to reject 1,193, or approximately 15 per cent.; this may appear to be an unduly large proportion of rejections, but as the examinations were carried out at several centres in completely different areas and the individual percentages all averaged around 15 per cent. it was considered that the examinations were both fair and consistent. The following conditions, listed in order of frequency, were discovered at these examinations: yaws, ophthalmic diseases, herniae, diseases of the genitals, circulatory diseases and venereal diseases.

The most interesting medical consideration was that up to this time it had always been the policy to prevent Africans from living within

the bounds of permanent European habitation, and it will be remembered that to achieve this the wholesale removal of native villages from the immediate vicinity of R.A.F. camps had been carried out. The agreement that medical care should be provided by the R.A.F. was complicated by the very definite insistence that no Africans were to be accommodated within 440 yards of European quarters and that at certain airports where this was not possible they were to be housed within the anti-amaryl belt.

#### ACCOMMODATION

Apart from this requirement of segregation, accommodation problems were basically the same as those involved in housing R.A.F. personnel and there was at first the usual overcrowding. However, the position was easier in that at this stage of the war certain existing accommodation was becoming vacant and could be taken over for the use of the West African Air Corps. The chief stations at which personnel of the Corps were located were as follows:

Gambia	.	.	Denton Bridge near Bathurst.
			Lamin near Yundum.
Sierra Leone	.	.	An old camp near Jui.
Gold Coast	.	.	Takoradi and Accra.
Southern Nigeria	.	.	Lagos, Ikeja and Oshodi.

In the Gambia, circular mud-walled *giddahs* with thatched roofs, designed to accommodate eight persons, were built and it is interesting to note that at Lamin, before the recruits would live in the camp the services of a witch doctor had to be employed to exorcise a spirit they believed to inhabit a grove of trees in the area. At Takoradi, Accra, Lagos and Ikeja accommodation was in 'Lagos' huts. The general standard of accommodation was good and far higher than that to which most of the recruits were accustomed.

#### SANITATION AND HYGIENE

The medical authorities gave particular attention to the question of sanitation as it was realised that a large proportion of the recruits would be carriers of diseases which, if hygiene measures were neglected, might easily be transmitted to Europeans.

*Water.* In all stations where Africans were employed a piped safe water supply was available for both cooking and washing purposes. It was, however, almost impossible to prevent them from drinking from unauthorised and usually unhygienic sources and it was fortunate that most of the recruits were relatively immune to waterborne diseases, so that the dangers were not as great as might have been expected.

*Latrines.* In most camps latrines were of the bucket type and although difficulties were encountered in the management of these, strict

supervision guaranteed at least a minimum of safety. At Yundum specially designed latrines with septic tanks were successfully employed in place of the usual Otway pits.

*Food.* As the recruits were not accustomed to European rations, it was necessary to provide special food for them and the scales laid down for the West African Frontier Force were successfully adopted. These consisted mainly of koos (a native millet), rice, bush cow, dried fish, yams, bananas and palm oil. An interesting problem arose over the cooking of these rations in that although Africans were willing to undertake cooking for Europeans, recruits were not prepared to cook for themselves, as this was considered a menial task; it was therefore necessary to employ native women as cooks.

*Disease.* As was to be expected, there was a high incidence of disease among the Africans. From the numbers appearing on sick parades the main disease appeared to be malaria, albeit a mild, twenty-four hour type, but when 'Free from Infection' inspections were carried out a very large number were found to be suffering from skin diseases, for which an African did not usually report sick. The venereal disease rate was high—154·2 per thousand—and it was practically inevitable that all recruits would contract gonorrhoea. Treatment was always by injection or emulsions of drugs, this being necessary to prevent tablets being secreted and sold on the black market, where they commanded a very high price. Efforts were made to try and combat venereal disease by propaganda and advice, but although prophylactics were available and E.T. rooms established, few made use of the protection thus offered.

#### GENERAL MEDICAL OUTLOOK

The Africans, although stoical when occasion demanded, were quick to grasp the advantages of 'going sick', were adept at making the most of trivial diseases and were always willing to try their hand at malingering. This caused considerable difficulty to medical officers who were inexperienced in handling natives and probably contributed to the relatively high minor sickness rate recorded for the Corps.

#### CONCLUSION

The R.A.F. commitments in West Africa grew from a small experiment to an unforeseen size. Many gloomy prophets foretold that sickness and bad flying conditions would render the operation of the West African Reinforcement Route impossible, but although they were shown to be wrong when the experiment proved successful and the great importance of the route as a supply-line to the East became apparent, no provision was made for future expansion in the formulation of policy. The Command, therefore, grew by the tardy piece-meal

fulfilment of immediate requirements. This lack of foresight affected the activities of the Command in all its branches, and was the main cause of the difficulties which arose.

Realisation of the future size of the Command might have led to the earlier adoption of large-scale medical preventive measures, such as anti-malaria drainage schemes, whose expense could only be justified by the size and importance of the stations involved.

Demands for equipment were usually based on present requirements owing to the absence of any information about future expansions; supplies were, therefore, nearly always insufficient for immediate needs, as there was a delay of about six months between demand and supply.

The lag in the building programme and the resultant overcrowding were again mainly due to the failure to plan on a sufficiently large scale; buildings had continually to be enlarged and extra staff, mechanical appliances, and adequate supplies, were not applied for until the end of 1941 when the programme was already far behind schedule and the Command was rapidly expanding.

The medical branch was handicapped from the start by not having a medical officer with experience both in the Service and in tropical hygiene. Preventive measures were instituted gradually, so that many bad habits had developed before orders for their prevention were issued. This resulted in much greater opposition to the orders than might otherwise have been experienced. Some of the medical officers who first went to West Africa gave incorrect advice through lack of experience, and set a bad example in personal hygiene. This tended to undermine the confidence of members of the executive branches, many of whom needed little to make them antagonistic to hygienic measures.

The attitude of most executive officers, particularly in the early days, to medical preventive measures was, with few exceptions, one of grudging acquiescence after much argument, rather than willing co-operation. The practical result of this was that suitable orders were promulgated on paper at the request of the medical officers, but no attempts were made to see that they were carried out. Not only did this obstruct the application of hygiene measures, but it also undermined the standard of general discipline. Notable exceptions were the commanding officers of the A.M.E.Ss. who, without exception, gave wholehearted co-operation.

Nevertheless, in spite of all these difficulties, and many others which have been discussed in the narrative, the R.A.F. in West Africa was able to make a significant contribution to final victory, while from the medical aspect many valuable lessons were learned and advances made, as was shown by the contrast between the sick incidence at the beginning of the period and that at the end.

For the first years the sickness rates were such that at times the output of aircraft was dangerously threatened by non-effectiveness, in spite of every effort of the medical authorities, who at this period were only receiving, at the best, half-hearted support in health projects. However, a marked change of attitude was apparent after the arrival of Lord Swinton in 1942. Co-operation between all branches of the three Services and the civilian authorities became closer and more harmonious and the need to improve living conditions was steadily driven home at all levels. This had the vital effect of increasing the flow of aircraft over the whole reinforcement route.

The early, but unpopular, insistence of the medical authorities on the importance of stamping out malaria was vindicated by the fact that the yearly incidence of malaria fell continually during the Command's existence.

## CHAPTER 8

# ITALY AND THE BALKANS

### November 1942–May 1945

#### INTRODUCTION

**T**HE LATE SPRING OF 1943 saw the elimination of the enemy from North Africa and while this process was being effected plans were prepared for the invasion of Southern Europe.

The Royal Air Force Medical Services in the Western Desert had grown up from small beginnings, as had the Desert Air Force itself, from its early days in Egypt; it had now in fact become a highly organised mobile medical service with its mobile field hospitals and could ensure that there was always at least one reception hospital available in the vicinity of the foremost air striking force.

The Desert Air Force, which was in fact the old Western Desert Air Force, had always been the spearhead of the R.A.F. attack in the Desert. It was equipped with fighter aircraft and medium bombers and had borne the brunt of all the fighting since hostilities began in that area. From a position of inferiority, it had gradually built up its air power to be able to assert complete superiority over the enemy. From being numerically overwhelmed in the Desert it had asserted itself so effectively that in numerical superiority the scales were weighed down in its favour at the end of the campaign. It had always had moral superiority over the enemy whether Italian or German and its deeds against great odds, coupled with its close association with the fortunes and vicissitudes of the Eighth Army, knitted the personnel of the two Services into one striking force, working in the closest co-operation; both had been allowed to develop an egocentric personality which certainly gave a fillip to morale, and in the case of the Desert Air Force gave a sense of superiority which, although sometimes considered as an assumed self-aggrandisement, nevertheless imparted that little something that made all the difference.

Supporting this invading force were other groups of a semi-static nature, such as Nos. 205, 216 and 242 Groups, which provided medium and heavy bomber support and transport. The main reinforcing group for supplies, equipment, the provision of bombs and in particular the servicing and repair of aircraft, was No. 214 Group, a very large technical supply equipment organisation which directly affected the serviceability of aircraft operating in the front lines.

The Desert Air Force was a large independent Force with its medical services organised for self-administration; it also undertook hospitalisation of all its own personnel except for certain cases which required

a standard of surgery or medicine which could not be provided within its own resources. During the Italian campaign the Desert Air Force controlled four mobile field hospitals\* for the major portion of the time and in the invasion of Italy Nos. 21, 22, 24, 25 and 30 M.F.Hs. came under its direct control; all these hospitals except No. 24 (which was left behind in Tripoli for the reception of casualties from the Sicilian invasion) were transferred to Italy under the direct control of the Principal Medical Officer, Desert Air Force; the latter also controlled four anti-malaria control units. No. 31 M.F.H. had been located in the Tunis area and was transferred to Italy to the administrative control of No. 214 Group early in 1944 and was located at Bari. This hospital, however, was soon transferred to the newly-formed Balkan Air Force after a suggestion that it might be disbanded. The remaining units, not incorporated in the Desert Air Force, were served by their own sick quarters and transferred cases, where necessary, to Army medical units or to R.A.F. mobile field hospitals or general hospitals.

The Desert Air Force, which at one time during the Italian campaign consisted of twelve operational wings, usually had squadrons operating under one wing headquarters at one and the same airfield—or possibly two or three flying strips in the same area—and in consequence squadron sick quarters had been consolidated into a wing central sick quarters; this meant that the medical officers of the squadrons used their unit sick quarters as medical inspection rooms and devoted most of their time to the supervision of flying personnel and routine hygienic administration. Such a scheme had worked very well in the Desert and it was most successful in Italy. Detailed comments on the organisation of these R.A.F. hospitals, mobile field hospitals and sick quarters will be made later.

The Desert Air Force, although normally under Middle East control, had had a Principal Medical Officer and staff; the latter, from an operational point of view, had been allowed almost a free hand in its own plans and the operational disposal of its field hospitals and medical personnel; much of the medical planning for the invasion of Sicily was designed and implemented by the Principal Medical Officer. In June 1943, almost the whole of this Force which had come through the Desert was still administered by the long arm of Headquarters, Middle East, Cairo. The British North African Air Force had meanwhile moved in with the American Striking Force to the Algiers–Tunis area and it was therefore inevitable that the forces operating in Italy should come under North African control and that eventually the British North African Air Force Command should be absorbed with the United States

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\* Formerly Medical Receiving Stations. See R.A.F. Volume I, Chapter 5, page 265 and Chapter 3 of this volume, page 105.



Army Air Force into a Mediterranean Allied Air Force Command which transferred its Headquarters to Caserta in the winter of 1943. The American influence in this Command was such that a United States Army Air Force General was appointed Supreme Air Commander in 1944, and the majority of the casualties which occurred with the Eighth Army in Italy were evacuated with the co-operation of American transport aircraft, without whose generous aid, air evacuation would have been impossible.

Following the invasion, units began to stream into Sicily and Italy as soon as accommodation could be made available for them; No. 114 Maintenance Unit, a large equipment supply depot, occupied the Alfa-Romeo underground factory in Naples and No. 113 Maintenance Unit a large industrial area at Capodichino, Naples. Most of the transfer had taken place by the late spring of 1944.

Medical control over all these air force units was vested in the Principal Medical Officer, R.A.F. Headquarters, M.A.A.F., who became responsible for the whole medical policy and organisation of R.A.F. medical services in the Italian theatre.

Following the appointment of the Principal Medical Officer, M.A.A.F., control over the Desert Air Force medical units became tighter; but the P.M.O., Desert Air Force retained a considerable latitude in the operational disposal of the medical forces allocated to him although he lost control over matters of higher medical policy.

After preliminary softening up by the long range machines of the American and British formations on the North African coast and in Malta, within bombing range of Southern Italy, the first air force which actually went into Sicily was that known as the Desert Air Force. Malta, now almost freed of the threat of invasion, began to recover and to re-equip its airfields as a base for short range air attack upon Southern Italy. All the military hospitals in Malta were emptied to the base hospitals on the North African coast and the Delta area of Egypt in order to be available for the reception of casualties from the Sicilian invasion.

#### CLIMATE AND TOPOGRAPHY

Inasmuch as the area covered in the Mediterranean campaign involved a large portion of the Mediterranean littoral, it will be appreciated that the climate varied in all its extremes. In North Africa the usual desert conditions prevailed and in consequence there was the variable desert climate—hot, torrid summer heat and a cold, and often, near the mountains, a wet winter. Sicily has an extremely torrid summer and in winter the climate is mild. The greatest variations in the climate obtained on the sides of Mount Etna which is snow-capped for the greater part of the year.

Stretching along both sides of the Apennine backbone of Italy are coastal belts which rapidly ascend into the mountains in the form of valleys and it is in these valleys and on the contiguous farming land that most of the malaria occurs. In Southern Italy spring starts relatively early but even in springtime it can be bitterly cold with the north-easterly Balkan winds. Snow occurs on the south-east coast of Italy as late as May and after this period there are five months of hot and fairly dry weather necessitating tropical dress; yet conditions are extremely variable, depending upon the height of the Apennines. Even in the south of Italy it is bitterly cold during the winter. The farther north one goes the colder the winter becomes, until, in the Florence-Forli area, conditions are Alpine.

Northern Italy's climate is also one of extremes, aggravated by the broad expanse of the Po Valley plain which is bitterly cold in winter and extremely hot in summer. Northern Italy contains a very large area of the Alps and this has a profound effect upon the climate both in the Po Valley and in the Gulf of Genoa. Frequent thunder-storms of marked intensity occur during the summer especially in the Genoa-Leghorn area and are accompanied by violent wind storms; this is occasioned by the melting of the snows in summer with consequent violent changes of atmospheric pressures.

In the Po Valley, both in spring and autumn, flooding is liable to occur owing to the sudden melting of the snows and the extremely heavy autumnal rains. Such rain belts extend downwards on the Adriatic as far as the Vasto-Foggia area. Violent local Alpine thunder-storms also occur at all times from the end of June to October. Until the advent of the Fascist régime, considerable areas of Northern Italy were marsh land. Advantage was taken of the nature of the land by the Germans to make the tactical move of destroying the existing pumping arrangements and reflooding the land.

Sardinia is either flat or raised upland and yet the wildest mountain scenery was encountered in nearby Corsica which has a small coastal belt particularly on the west, which is very marshy and highly malarious.

On the east side of the Adriatic lie the Balkan countries, a mountainous wild countryside enjoying the fringes of a continental climate, i.e. intensely hot and arid in the interior in the summer and cold in the winter. Snow occurs throughout the Balkan Peninsula in winter, being particularly pronounced in the northern parts of Yugoslavia, where the traditional wind-blown snow-storms persist for days at a time.

Our ground and air forces were thus operating in temperatures up to 110° F. in the North African desert area and in Alpine conditions in the mountains of Italy, where considerable numbers of our air force were engaged on ground and radar maintenance duties. The torrential autumn rains extending throughout North Italy in October

and November produced a chaos of mud and flooding in which mechanical transport broke down and yoked oxen were used for routine camp duties. Italy can be as damp, cold and miserable as England in winter. The short spring is bright with fruit blossoms and wild flowers but within a month all these have vanished and grass and crops turn brown; the crops are gathered by June and only fruits are left to ripen in the autumn.

The Foggia plain in spring appears undulating with the wind-waved crops which are quickly harvested; the land then dries up into a sun-baked prairie where dust and heat are intolerably wearying; the autumn rains rapidly produce a potential quagmire, and, until the spring, conditions are miserable in the extreme. (Plates XXXVIII and XXXIX illustrate winter and autumn conditions in North Italy.)

#### LAMPEDUSA

Before the invasion of Sicily it was necessary to occupy the islands of Pantellaria and Lampedusa. Of these, the Royal Air Force Medical Branch was only engaged at Lampedusa and the account reveals the difficulties which constantly recurred in similar form in most of the Italian occupied villages and towns.

Lampedusa surrendered to the Allies in June 1943 after concentrated air bombing, and was occupied by a small detachment of Coldstream Guards. On June 17, after four days of preparation, two flights of No. 2864 R.A.F. Regiment Squadron were despatched by sea, accompanied by a flight lieutenant medical officer, carrying drugs and equipment. Plans had been made to send a R.A.F. surgeon with an operating room attendant and nursing orderly a few days later and to provide an air ambulance for air evacuation.

The R.A.F. party arrived on June 18, to find not a single building in the town intact, and 60 per cent. of the local population, which numbered about 4,000 in all, living in caves in very insanitary and overcrowded conditions. The comparatively undamaged hospital contained 77 patients, with a staff of 8 medical officers and 65 medical orderlies. It consisted of one brick ward of 30 beds and an operating theatre in use as a food store; also a number of large wooden huts. Close to the hospital 1,200 Italian soldiers were encamped; everywhere was chaos and disorder, urine and faeces being voided indiscriminately all over the island, the fly population was high and the hospital buildings amazingly dirty. No sewage system existed; the artesian water supply was good but it was thought safer to chlorinate the water. Local enquiries showed that malaria was not endemic but there was much scabies. The goats were said to be infected with *Brucella melitensis* to which, however, the local people were largely immune.

The main task was to clear up the disorder, the first step in this

direction being to get rid of the surplus military population. Accordingly, 50 walking cases with two Italian medical officers and 150 prisoners-of-war were despatched to the mainland by the returning landing craft which had brought the R.A.F. party. The remainder of the prisoners (other than medical staff) were transported three days later. The brick building was cleaned, fumigated and opened as a ward, and the operating theatre cleared out and re-opened. General tidying up of the ground began.

On the third day the surgeon and his team arrived on attachment from No. 31 M.F.H. and the first sick parade was held; gastro-enteritis afflicted most of the British personnel for a few days and in consequence war was waged on the hordes of flies and the main ward was fly-proofed with cotton gauze on a wooden framework. Slit trench latrines were dug and all patients' faeces disposed of by burning with petrol and burial. On the morning of the fourth day all Italian medical personnel were paraded and lectured in French (interpreted by the senior Italian medical officer) on discipline, cleanliness, and the future programme. Later events proved them to work loyally and well; it was thought that this good result was achieved by explaining to them beforehand why certain things had to be done, and by the friendly feeling engendered by the decision at the end of June to give Italian orderlies full British rations.

Six days from the start an appendicectomy had been carried out, a pathological laboratory was doing Kahn tests, urethral smears and similar laboratory work, while a considerable number of cave-dwellers had been inoculated with T.A.B. vaccine. An incinerator was built, the cookhouse given cement pointing, electric light and telephones installed and mosquito nets provided for all patients' beds. When aircraft were based on the island's airfields, three crash beds were opened; after a Boston aircraft had crash-landed, a Hurricane was sent to the mainland for plasma and returned within six hours—but unfortunately too late; the patient's death, however, was not due to lack of plasma, as it had meanwhile been possible to start local blood transfusion. It proved difficult to summon an air ambulance from the mainland but a D.C.3 did come on one occasion to remove eight patients to base hospital.

There was a number of civilian accidents, caused by unexploded grenades, and in spite of emergency surgery several deaths resulted. The whole medical service, civil and military, was controlled by the S.M.O., the hospital being open to all. The town out-patients' clinic was conducted by an Italian medical officer, the local civilian practitioner having proved incompetent and untrustworthy.

Some 500 out-patients were seen per week (mostly conjunctivitis, boils and abrasions) and a small fee was charged for consultation, the money being put into a fund for the relief of the needy. This and many

other public health events were explained in an article written by the S.M.O. and published in the local Italian press. Vitamin C tablets, lemon juice, and Farine diastase were distributed free, while children were convict-cropped and forced to sea bathe to eliminate lice.

By the end of June initial reconstruction of the island's civil life was largely completed, Sicily had been invaded and Mussolini had fallen. All R.A.F. medical staff were therefore withdrawn to Tunis.

#### A SHORT DESCRIPTION OF THE CAMPAIGN

Sicily was invaded by the Allies on July 9-10, 1943, and captured after five weeks' heavy fighting. After this invasion, in which surprisingly little resistance was met, especially from the Luftwaffe, the original plan had been to occupy the Italian mainland across the Straits of Reggio, sweep into Calabria and occupy Brindisi. This scheme was carried out but was somewhat complicated in its course by the demand of Italy for an armistice following the capitulation of Sicily. It was hoped that, after the armistice, the Italian Forces would themselves actively resist the German invaders but events did not follow the expected course. There was no great wish on the part of the Italians to fight the Germans and it was not until the North of Italy was reached by the Allies and the course of the war had been indicated by the invasion of France that the Partisan Force in Northern Italy really took an active hostile part against the Germans who were then occupying that part of the country.\* The attitude of the Italians in Southern Italy was, to start with, one of resentful co-operation with the British and considerable difficulty was at first experienced in obtaining from them full civil administrative co-operation. This hesitancy eventually disappeared and the Italian ground forces took part in active fighting in the Ravenna area on the side of the Allies.

Simultaneously with the invasion of Southern Italy a landing was made in the Salerno area, thrusting forward towards Naples, and this was covered by the Desert Air Force and by the longer-ranged aircraft of the British and American units based in Sicily.

By this time German resistance in Italy had stiffened to some degree both in the air and more notably on the ground. By December 1943, the British ground forces were slowed down north of a line stretching from north of the Sangro River on M. Massico, north of the Volturno River and north of Naples, in which fierce fighting took place during the winter months. The Eighth Army advanced up the Adriatic coast and the Fifth Army, which was largely composed of American Forces, advanced up the west coast of Italy.

At the end of December 1943, the Eighth Army swept onward up through Ortona and had captured Ancona by the early summer. The

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\* This contrasts most strikingly with the efforts of the Greek and Balkan Partisans.

Fifth Army, assisted by units of the Desert Air Force and long-range bombers from other formations, began an assault on Cassino in the early spring; a bridgehead had previously been established to the rear of the German line in the Anzio sector at the end of January 1944 and air attack in this area was intensified.

In May 1944, the forces pushed on for a successful drive on Rome and the Desert Air Force, with its advanced and rear headquarters, together with the majority of its fighter wings, had been brought over from the eastern side of Italy to the Roman Campagna.

The campaign swept north on both fronts and ended in the winter of 1944 with Florence captured and the German (Gothic) line extending along the mountains north of Florence to Rimini; during the latter part of the year both Forli and Ravenna capitulated to the Allied Forces.

During the late summer of 1944, the Eighth Army and the Desert Air Force, whose main forces were in the centre of Italy, swept over from the Florence area to occupy the Iesi-Falconara triangle. This movement was carried out in great secrecy and was intended to be a surprise thrust to drive the Germans out of the east side of Italy; the movement was, however, known to the enemy and the Germans dug in their heels harder than ever and fought resolutely until the end of the Italian campaign.

The left flank of Italy was mainly held by the Fifth Army—preponderantly American—while the Eighth Army, mostly British, freed the east coast of Italy. The Eighth Army was given close ground support and tactical light bombing support of bridges, convoys, road and rail targets by fighter and medium bomber units of the Desert Air Force, while the American Air Force supplied the main light and medium bomber forces to Fifth Army targets, though considerable air support was given to the Fifth Army from time to time by Desert Air Force wings.

Throughout the campaign strategic raids, which became consistently heavier, were carried out by heavy and medium bombers of the American and British Forces based on the Foggia plain and elsewhere in Southern Italy. The Foggia plain became the headquarters of No. 205 Group organisation and many of its wings; it is also of interest to note that the British air reconnaissance squadrons were based in the Foggia and Serracapriola areas and, of course, co-operated in the strategic bombing which was taking place in Northern Italy, Southern Germany and Austria.

In the early spring of 1944, Yugoslav resistance against the Germans stiffened, chiefly because Tito had unified the Yugoslav nation into a Partisan 'People's Army'. This resulted in increased German activity against the Tito Forces, in which there were approximately 10,000 casualties for which Tito had no adequate medical assistance. The People's Army needed supplies of arms, ammunition and the loan of

British staff officers, who were transported in increasing numbers after the autumn of 1944 by the R.A.F. and Royal Navy. The organisation of Balkan air supplies had been built up by No. 334 Wing, a part of the Desert Air Force, and close co-operation was maintained with the naval coastal forces of small craft which operated from the Italian bases and from Vis.

The formation of the Balkan Air Force in June 1944, was an indication of the growing importance attached to operations in the Balkan theatre. The new force was allotted six airfields in Italy and an advanced fighter control and landing ground at Vis. To deal with the casualties, a large air evacuation service was gradually built up between Bari and Yugoslavia, No. 31 M.F.H. becoming primarily responsible for the casualty air evacuation work at Bari Airport. The number of Yugoslav casualties evacuated by air was enormous. This casualty air evacuation unit dealt with approximately 50,000 casualties (including British casualties from Italy) from its formation in May 1944 to June 1945.

The end of the war in Italy came suddenly on May 2, 1944 as a result of the severe fighting following a large Army build-up south of the Po. Bologna capitulated first and at the end of April ten days of fighting ensued in which extremely heavy bombing by waves of Liberators of the American Air Forces and Lancasters and Liberators of the Allied Air Forces pounded the enemy relentlessly for forty-eight hours before the initial Army attack. The enemy forces were utterly defeated and the surrender was immediate. The bombing of enemy communications throughout the year had been intensive and continuous so that eventually he was unable to move his supplies except by night and his transport suffered enormously.

The nationalities which comprised the Armies and Air Forces in Italy were very mixed. During the last year of the war Brazilians were co-operating with the Fifth Army, Poles and Czechoslovaks with the Eighth Army. South African ground forces combined with both the Army and the Desert Air Force; there were three S.A.A.F. Wings serving with the Desert Air Force and others with No. 205 Group. One United States Army Air Force Group was attached to the Desert Air Force; also a Royal Hellenic squadron, two Polish squadrons, a Polish A.O.P. squadron, one Canadian squadron, two Australian squadrons and a Yugoslav squadron, and other squadrons served with the R.A.F. organisation farther south in Italy. The Free French supplied ground and naval forces for the Italian campaign.

In all these vast organisations comprising different nationalities the greatest co-operation and friendship existed.

Maps showing the main phases and outlines of the campaign will be found in Appendix I.

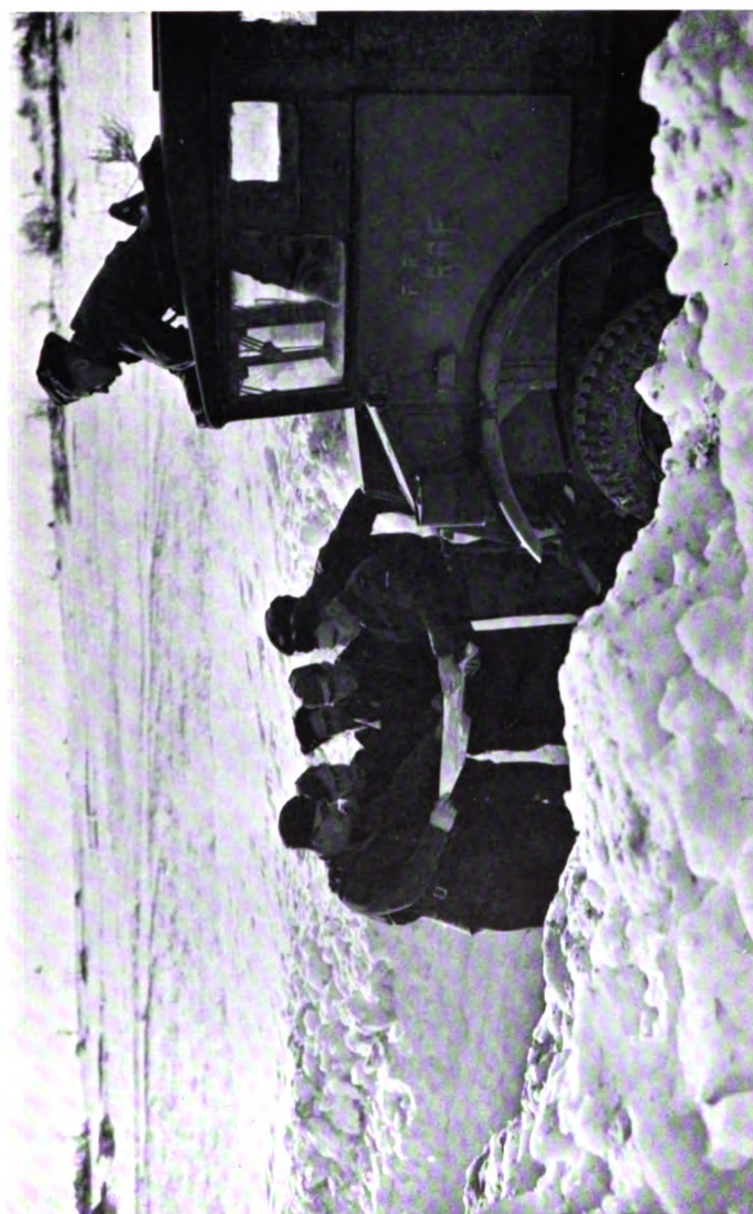


PLATE XXXVIII : The snow conditions encountered in the Italian Campaign



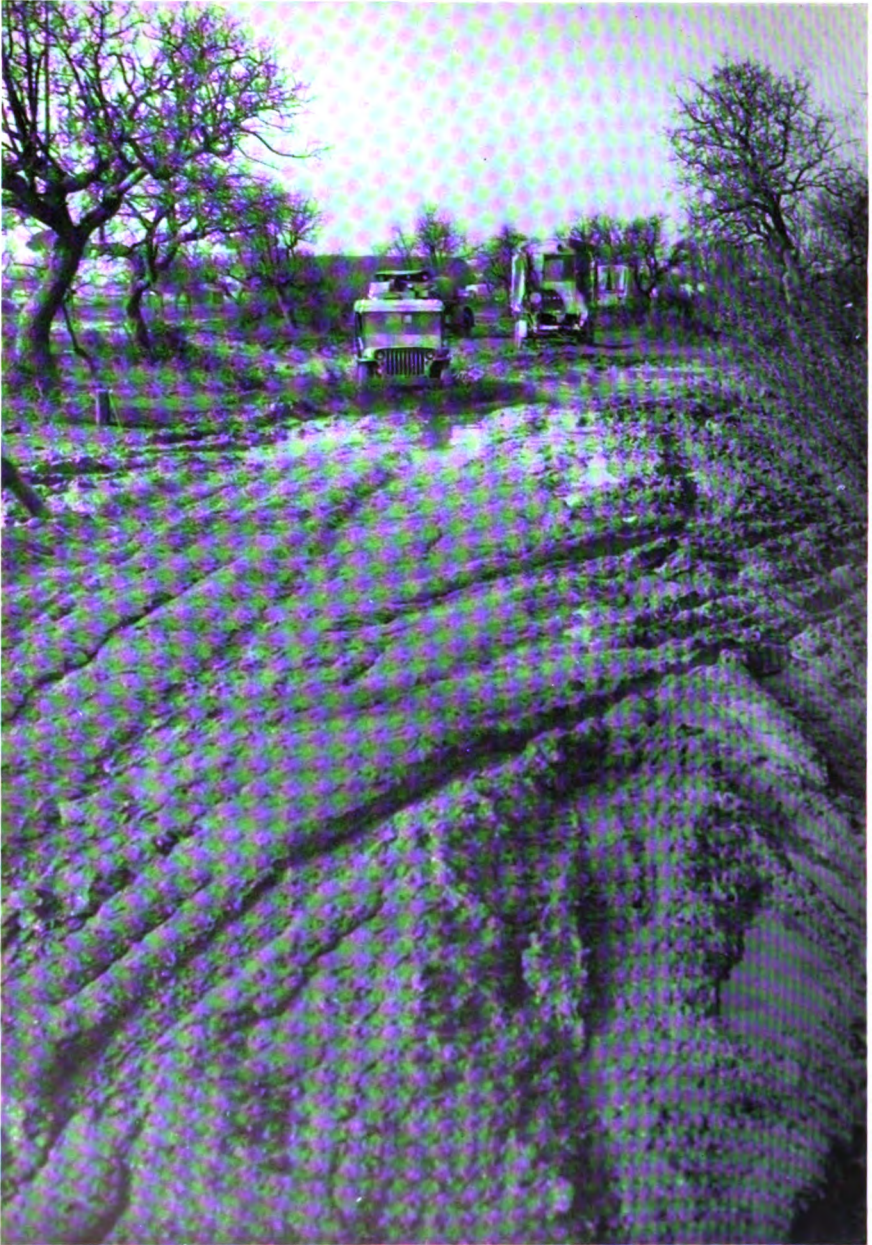


PLATE XXXIX : The conditions encountered in the Italian Campaign in rainy weather



PLATE XL: Central Sick Quarters, Naples. Service patients with Italian V.A.Ds.



PLATE XLI: A medical officer holding a sick parade for Italian children



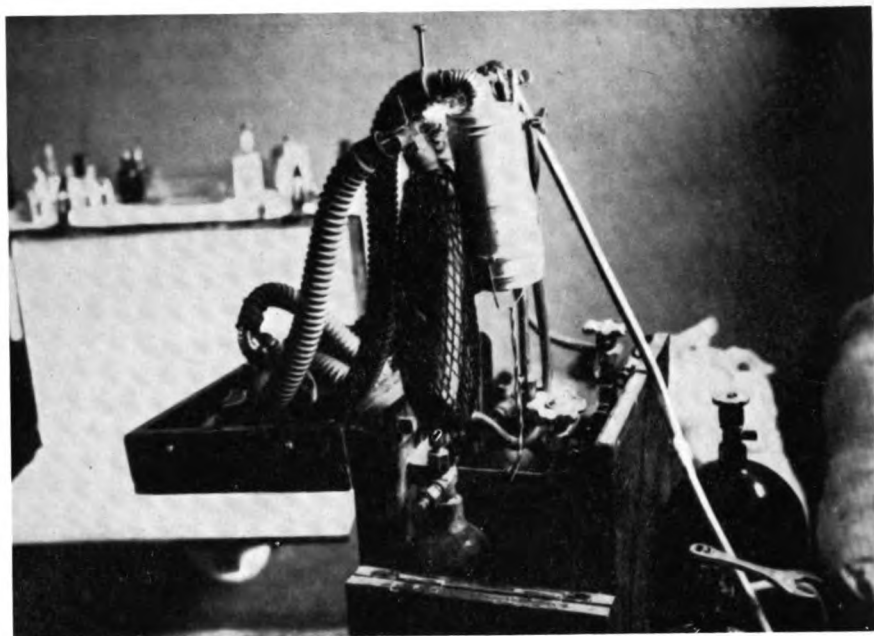


PLATE XLII: Rebreathing apparatus made from discarded 'Elastoplast' tins and rubber tubing



PLATE XLIII: German centrifuge in a mobile laboratory

## MEDICAL ARRANGEMENTS IN SICILY

The policy and organisation of the air transport of casualties within the 15th Army Group Operations Area, Sicily, Tunisia, Tripoli and Algeria, were the responsibility of the Senior Medical Officer, No. 242 Group. The intention of the organisation was twofold, (a) to evacuate casualties from Sicily to advanced North African base hospitals and (b) to transfer casualties from advanced base hospitals to rear base hospitals.

Comprehensive policy, which was detailed before the commencement of operations, was briefly as follows. Transport aircraft, which were expected to operate between Sicily and North Africa after D-day +2, would carry casualties during their return flights giving priority over casualties only to returning ferry-crews. To minimise the time taken for the turn-round of the aircraft patients were to be held on the airfield and stretcher cases were to be limited to four per aircraft in order to reduce loading time. The remaining space in the aircraft was to be filled by ambulant cases. Approval was given, subject to the concurrence of the controlling Group (Advanced Headquarters, No. 216 Group), for the diversion of returning aircraft should medical exigencies necessitate a landing elsewhere than on their base. The air ambulances, consisting of aircraft protected under the Geneva Convention, were to be used first on the North African mainland transporting cases from advanced to rear base hospitals—their use in Sicily at Air Transport terminals being dependent on fighter supremacy.

Aircraft utilised for the transport of casualties were provided by No. 216 Group (R.A.F.) and Troop Carrier Group (U.S.A.A.F.) while ground organisation consisted of Aircraft Despatch and Reception Units (A.D.R.U.s.), and Casualty Air Evacuation Units (C.A.E.U.s.). Two such units working in collaboration were responsible for the local organisation of the service and were located on the prearranged forward, intermediate and rear landing grounds through which the air evacuation service would pass. The Air Reception and Evacuation Units (A.R.E.U.s.), were to act as holding units, organising the reception of cases from Casualty Clearing Stations (C.C.S.s.), and Mobile Field Hospitals (M.F.H.s.), while A.D.R.U.s. were responsible for the reception, loading and despatch of casualties, acting upon information supplied by the Commanding Officer, A.R.E.U., regarding the number and type of casualties requiring air transport.

Before the beginning of operations on July 10, 1943, A.R.E.U.s. were established at the receiving centres at Castel Benito (near Tripoli), El Aquina (near Tunis), Telergma (near Constantine), Maison Blanche (near Algiers) and Luqa (Malta).

It was planned that American casualties were to be transported to Mateur (north of Tunis) and British casualties to El Aquina (near

Tunis). Should hospital accommodation in the Tunis area become taxed, hospital facilities in the Tripoli and Sousse areas were to be used by aircraft operating from those areas or by diversionary flights from El Aquina. Other air transport services flying between Cairo, Castel Benito and Malta would evacuate cases from advanced to rear base hospitals, as would the Air Supply Control (A.S.C.) operating between Algiers and El Aquina.

On the days before the invasion it was shown from the daily bed-state of the Tunis and Sousse areas that Tunis was not in a position to receive many casualties. Accordingly between July 7 and 10, 312 patients were transferred westwards to Philippeville or Telerghma. This, combined with intensive railroad evacuation, left sufficient beds in the Tunis area for the reception of casualties by air. Similarly, a small number of cases were evacuated from Malta and Lampedusa in the same period.

On July 14, 1943, the first batch of casualties (65) was evacuated from Sicily and this service continued daily with gradually increasing numbers. In the meantime the air ambulance unit was despatched from North Africa to Malta and operated a shuttle service from Pachino (Sicily) to Gozo and Luqa (Malta). Later in the month this unit was based in Sicily transporting cases from outlying airfields at Lentini, Francesco and Pachino to Cassibile whence casualties were evacuated by air transport aircraft. On two occasions the A.R.E.U.s. became overcrowded, once at Lentini (No. 322 Wing) and once at Cassibile (159 Field Ambulance). These units were cleared by transport aircraft obtained from Air Transport Control Centre (A.T.C.C.) on special request, and also by diverting some of the casualties from Cassibile A.R.E.U. to the hospital ship *Syracuse*.

Air evacuation was no new thing at the time of the Sicilian invasion. The Desert Air Force had by then several years' experience of air evacuation in the Desert, where it had had its own M.F.H.s. and experienced personnel in all its wings, well accustomed to setting up casualty evacuation centres in all the hazards of Desert warfare. There, the M.F.H.s. had acted as holding units and treatment units as the occasion demanded and had evacuated cases most speedily when reverses of movement occurred; in fact, modern air evacuation on a large scale, had originated in the Desert Air Force.\* The well-organised evacuation that was later carried out in Italy and effected almost entirely with U.S.A.A.F. air transportation is referred to later.

The following observations are made on events during the first twenty-eight days in Sicily: The Royal Air Force had prepared definite plans for the air evacuation of casualties. Comprehensive instructions

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\* See R.A.F. Volume I, Chapter 10, page 485.

and propaganda material had been drawn up and instilled into all formation commanders as to the risk of malaria which was believed to exist in the island. As medical cover for the invasion of Sicily was conditioned by shipping space, which did not permit the setting up of a mobile field hospital in the island until after the first month, a small advanced section of each M.F.H. was formed, with ten beds and ten stretchers and a complete operating theatre carried on three-ton lorries which had been converted to take four stretchers. A similar organisation, but without the three-ton lorries, was formed in order that a surgical team might be flown in by air. This surgical team was scheduled to work in co-operation with wing sick quarters and casualty air evacuation centres. The advanced section of the M.F.H. was to provide surgical cover and the wing sick quarters was to act as the holding unit.

Whether or not this organisation could have taken a very large load of battle casualties and ordinary cases of sickness remained unproven because the Royal Air Force casualties, including sickness and battle cases, during the first twenty-eight days of the Sicilian invasion were practically negligible.

The air forces coming from the Western Desert had been well disciplined in field hygiene and sanitation and in consequence the sickness incidence was low. Medical planning difficulties were encountered in persuading the administrative authorities to realise that, if adequate medical cover was to be provided, medical officers and orderlies with appropriate surgical equipment must follow immediately the landing of other personnel on D-day. It was absolutely essential that medical officers should accompany their equipment, because the medical officer without his equipment is as much use as the infantryman without his rifle or the fitter without his tools. In addition, difficulty was experienced in convincing the authorities of the necessity for ensuring that adequate mosquito nets, mosquito cream and mepacrine should accompany the invading forces. It was evidently considered that these essentials could be provided at a later date than D-day!

It would also appear that units were despatched from the United Kingdom *via* North Africa to take part in the invasion of a country where epidemics of dysentery and malaria were known to be prevalent and yet were not equipped with nets, mepacrine or mosquito cream and apparently had had no training whatever in the elements of field sanitation. This was especially true of the R.A.F. Regiment.

In regard to the air evacuation which actually took place, No. 244 Wing was the first wing to occupy an airfield in Sicily, *viz.*, Pachino. On D-day + 6 (September 16) the first transport aircraft landed, but the C.C.S. concerned in the evacuation of casualties had moved in the night; the field dressing station, which had just come out from the United Kingdom, was not familiar with the system of evacuating

casualties by returning air transport and only three Royal Air Force cases were evacuated.

During the period September 19 to 26, 804 cases were evacuated by air transport from the casualty air evacuation centre at Cassibile landing ground. On September 27, the Army holding unit transferred its cases to the air evacuation centre, which had now moved under the auspices of No. 244 Wing to Lentini West airfield and in the following four days 557 cases were evacuated. At the same time No. 322 Wing was operating a casualty air evacuation centre at Francesco landing ground and during the period up to August 1 they had evacuated 504 cases. It should be particularly noticed that No. 224 Wing, the first to operate, went in on D-day and that their wing sick quarters, with the aid of No. 21 M.F.H. surgical team, was operating at Pachino on D-day + 1.

In connexion with this air evacuation the same system was implemented in Sicily as had been used with the Western Desert Air Forces from Alamein to Tunis. The Australian Air Ambulance Unit shuttled the patients from the forward landing grounds where air transport aircraft were off-loaded and thus enabled patients from the forward C.C.Ss.—which served XIII and XXX Corps—to be returned to the air transport airfield by air ambulance. Thereafter they were transferred to the holding unit and shuttled back to Malta, Tripoli and Tunis by air transport which was returning from delivering supplies and personnel to the battle area. The table opposite gives some idea of the total number of patients dealt with by air evacuation to North Africa (including Malta and Tripoli).

The figures include both Royal Air Force and Army personnel of whom the latter comprised by far the greater number. At the same time an elaborate organisation came into being for the medical arrangements as regards air sea rescue for personnel taking part in this invasion and No. 242 Group was the controlling authority. The intention was to effect prompt medical assistance to aircrew following rescue over the invasion area and demanded the location of widely scattered medical units to receive casualties. At these locations resuscitation and immediate first aid were deemed to be provisional necessities. The scheme was controlled at No. 242 Group Headquarters Command Post at Palermo Airfield and it controlled reception stations on the Depot Ship *Antwerp*, Ustica Island, Bonizza Airfield, Salina Island, Termini Airfield, Bizerta and the Tunis Sector, Air Sea Rescue.

One nursing orderly with first-aid equipment was established with each of the high-speed launches at Bizerta, Palermo, Ustica and Salina. Aircraft employed for search and rescue duties were not provided with a medical staff. These medical facilities were all in position before operations commenced on September 10. A number of air sea rescues

were reported by No. 242 Group between September 10 and October 1, but it is known that other rescues were effected by services outside the organisation controlled by No. 242 Group.

*Analysis of Numbers of Casualties Transported by Air during Sicilian Campaign ending August 21, 1943*

(A) Air Transport	Lying	Sitting	Totals
From Sicily to El Aquina . . . .	1,536	1,765	3,301
From Sicily to Malta . . . . .	787	652	1,439
From Sicily to Mateur . . . . .	2,136	1,589	3,725
From Sicily to Castel Benito . . . .	463	450	913
From Malta to El Aquina . . . . .	6	45	51
From Malta to Castel Benito . . . .	194	505	699
From El Aquina to Algiers, Philippeville, Telergma and Oran . . . . .	1,014	843	1,857
From Mateur and Fochfield to Algiers, Phillipallo and Telegina . . . . .	519	345	864
<b>(B) Air Ambulance Unit</b>			
From forward airfields in Sicily to Trans- port Airfields . . . . .	Not known		2,016
From Fochfield to Algiers, Phillipallo and Telegina . . . . .	450	478	928
Totals, Sicily to Malta . . . . .	787	652	1,439
Totals, Sicily to Tripoli . . . . .	463	450	913
Totals, Sicily to Tunisia . . . . .	3,672	3,354	7,026
Totals, Malta to Tripoli . . . . .	194	505	699
Totals, Malta to Tunisia . . . . .	6	45	51
Totals, Tunisia to Algiers . . . . .	1,983	1,666	3,649
Totals, forward airfields in Sicily to Transport Airfields . . . . .	Not known		2,016
<b>Grand Total of casualties carried by air</b>	<b>7,105</b>	<b>6,672</b>	<b>15,793</b>

MEDICAL ARRANGEMENTS IN ITALY

LIVING CONDITIONS AND EQUIPMENT

A force which takes the field adequately prepared with medical advice as to the stores and equipment it should carry, and with adequate hygienic instruction as to the conditions which it is to encounter, is always superior in health to a force which has not been so prepared.

In this campaign two forces combined, one having had years of experience in the Western Desert and the other comparatively little in North Africa. These forces were organised for mobility; their tentage and equipment satisfied minimum requirements, this being particularly the case in the Desert Air Force, whose winter equipment was one suit of khaki battledress, which had been adequate for conditions in the Desert, but had to be supplemented in Italy after experience



of the first very wet winter. The units of No. 205 Group, when they had been encamped for only two days upon the Foggia plain, experienced a rain and wind storm on New Year's Day, 1944, which levelled almost every tent and completely soaked every item of clothing which the airmen possessed. On this occasion, elaborate arrangements were made for drying the airmen's kit in the various occupied buildings within a radius of twenty-five miles around Foggia.

Equipment, although light, compared unfavourably with that of the Americans in many respects but it was much more readily transportable, and in the hot weather the Americans were the first to admit the superiority of the British lighter and cooler tentage. During the Italian campaign most of the units contrived to occupy requisitioned Italian buildings, but many were nevertheless compelled to use tentage; it was surprising how units with initiative could develop a tented town adequately warmed by the most ingeniously contrived petrol stoves, while in many camps it was even possible to use baths with running hot water.

The Desert Air Force and those units concerned in its administration and supply services moved much more frequently than the heavier bombing squadrons and consequently they were allotted three field hygiene units which were, from their previous experience in the Desert, invaluable in organising mobile field showers, providing fly-proof meat safes, fly-proof latrine buckets and seats and a multitude of other requirements necessary for the preservation of good health and hygiene in a highly mobile force. They had had plenty of experience in this because of the rapidity of moves and limited transport—which very often necessitated the jettisoning of the items of equipment listed above before the move could be effected and subsequent complete refurbishing at the new site.

In Italy it was a constant source of surprise to see the comfort which an ingenious squadron could provide for itself from captured and requisitioned articles even at the height of the campaign. At units in the base areas some of the living conditions were extremely comfortable. In many of the requisitioned billets the cold of the Italian climate was pronounced, as the Italians, except in Northern Italy, did not provide any permanent heating for their living rooms, relying upon portable charcoal burners which certainly did not provide the warmth required during the two winters of the Italian campaign.

No great difficulty was experienced in providing laundry facilities during the campaign, as, immediately upon site-occupation, the number of Italian washerwomen who sought this type of work was greater than the amount of work available for them. The Italians were more than willing to provide laundry services, eggs, and indeed all essential commodities for goods in kind rather than accept the regulation lire currency.

The black market thrived in Italy and everything had its price in cigarettes !

The ration food provided from R.A.S.C. sources was always sufficient in quality and quantity, but often lacked variety. There was in Italy plenty of luxurious food to be obtained at a price and most of the units availed themselves of such supplies. In the base units almost all the cooking was done by Italian cooks under British supervision.

The majority of cooks and food-handlers, even in the mobile Desert Air Force, were periodically examined for elimination of intestinal parasites and enteric carriers. The majority of these examinations were carried out at R.A.F. general hospitals, mobile field hospitals and larger sick quarters.

#### WATER SUPPLIES

The Desert campaign was a death bed for the standard R.A.F. 500 gallon per hour water purification trailer in use at the beginning of the war, for it utterly failed to stand up to the rigours of desert warfare and to operation by insufficiently skilled operators. Although a well-designed scientific piece of mechanism it did not compare with the Army water cart which was simpler to operate, easier to transport and much more fool-proof. In consequence units had substituted their own arrangements by capturing enemy water tanks, mounting requisitioned water containers on lorries and by using the official R.A.F. water trailer as a means of carrying water and hand chlorinating the water in it—as was necessary in all containers.

Such was the condition in which water transporters arrived in Italy; fortunately the water was, in most instances, collected from Army water points at which the water was chlorinated before being dispensed to units. In the majority of buildings in which water was laid on, water tanks were interpositioned in the supply line wherever possible and hand chlorination effected, but this was naturally only applicable to the more permanently occupied accommodation. In the smaller villages, unless the water was guaranteed by the Army, it was always necessary either to boil or hand chlorinate the water in small tanks and containers, or else to use small water sterilisers of the Bell type. Units were extremely careful in the sterilising of water and only one case of an absurdity can be quoted, where a unit was found to be drawing water from what was a grossly contaminated source and did not treat the water in any way because the water came from a well which had a local religious reputation for miraculous cures!

#### MEDICAL CO-OPERATION

Relationship between the medical branches of the R.A.F. and the other Services was extremely good. Owing to the nature of the forces

engaged in the campaign, close liaison was necessary between the Army and the R.A.F. medical services; there was also close liaison on matters affecting policy between the United States Army and the R.A.F. medical organisations at Headquarters, M.A.A.F. One result of this liaison was that every possible assistance was given by the United States Army Air Force in providing aircraft and personnel to operate most of the air evacuation schemes during the main part of the Italian campaign. No request seemed too much trouble though at times the American organisation seemed to create problems for which there did not appear to be reasonable grounds; they probably found our organisation just as difficult to understand.

The R.A.M.C. provided hospital services for personnel who could not be admitted to the R.A.F. hospitals and both in this respect and in the provision of medical stores, the most cordial co-operation existed. The peculiar problems of the R.A.F. are only fully understood by the R.A.F. medical officer, but during the whole campaign the greatest courtesy and consideration was shown by all members of the R.A.M.C. and other branches of the Army. 'Q' Branch was most co-operative in the allocation and repair of buildings for the mobile field hospitals during the winter months. The R.A.M.C. received in return help in their problems, especially in dealing with the air evacuation of their casualties—and they were most appreciative of such assistance.

The war, in this campaign as elsewhere, emphasised the importance of the R.A.F. having its own medical service. The R.A.F. Medical Branch is not, probably on account of its size, as impersonal as is, of necessity, the medical service of the Army, and Air Force fighting morale was maintained to a great extent by the fact that injured aircrew knew they would be dealt with, whenever possible, at a R.A.F. general hospital or mobile field hospital by medical officers who shared many of their problems and appreciated the peculiarities of their work. It was obvious, however, that especially in the base areas there was much duplication of administrative work, as it was not infrequent to have an Army headquarters medical staff in the same town, often in the same building, as the R.A.F. medical authorities administering health and hygiene to soldiers and airmen all within the same area. It was frequently apparent that much of the work of one administration could have been absorbed into the other and an overall reduction of the total medical administrative staff could have been effected; in particular it seemed that a R.A.F. medical officer, if attached to the Base Area Army Headquarters, could have adequately ensured that the R.A.F. point of view and special items of R.A.F. administration were not overlooked. A considerable saving of medical man-power could thus have been effected and efficiency, particularly in the matter of documentation, greatly increased.

Very little was seen of the medical service of the Royal Navy during the campaign, partly because the main naval base was at Malta and little other than social contact was made with ships' medical officers when they came into port.

The units serving under R.A.F. administration in the air forces in Italy included many of different nationalities—South African, Polish, Greek and Yugoslav among others—all having their own medical officers and many their own nursing orderlies; their day-to-day administration, including the supply of medical stores, was directly implemented by the R.A.F. Medical Branch. Their co-operation was admirable and each individual fitted into the general organisation without difficulty.

The Italian civil medical services were as co-operative as they could be with the limited resources at their disposal—they did not seem to be in a position to run even a satisfactory service to ensure the hygiene of their own people, this being especially noticeable in Southern Italy and particularly in Naples. No great difficulty was experienced in requisitioning their hospital buildings when this was necessary, but it was the policy to leave the Italians their own hospitals wherever possible and for the Army and R.A.F. to use inferior substitute buildings, such as schools, in order that the Italians might preserve a sufficient nucleus to guarantee their own medical services. The Italians were keen for our medical officers to attend their hospitals and clinics, some of which were old and dilapidated buildings, others surprisingly modern. The standard of surgery appeared good, but ethical standards vastly different from those existing in England, the poor seeming to experience difficulty in getting treatment while the rich had no difficulty at all. On every occasion of capture of enemy territory it required American or British administration to stimulate the Italians to reorganise matters on hygienic lines. Left to themselves they might have continued to wallow in a slough of despair and despondency, and there might have been large epidemic outbreaks among Italian civilians.

#### UNIT ARRANGEMENTS

The existence of a separate R.A.F. medical service certainly gave a sense of well-being and special interest which could not possibly have been given to R.A.F. personnel by any other medical service. A great deal of interest was shown by the individual squadron medical officer in the medical aspects of flying and he was usually, next to the commanding officer, the most influential member of the Officers' Mess, knowing his pilots and the problems they presented to a degree that could not be attained by any other member of the squadron. The medical officer was most frequently consulted by the commanding officer as being the only person whose intimate knowledge of the

pilot could determine his limit of flying stress endurance. Firstly he was a doctor who enjoyed the confidence of all his brother officers, secondly he was the officer in charge of the hygienic administration of his unit. It is of interest to note that the South African Air Forces received medical attention from the South African Army Medical Service, but it was the policy to allocate medical officers for prolonged duty with the Air Force so that they were, in effect, almost members of the South African Air Force.

Considerable care was taken to select the right type of medical officer for this position, for the usefulness of a medical officer for the various duties he might be called upon to perform, depended to a great extent on his personality; a squadron medical officer of the wrong type could materially affect the efficiency of the unit to which he was posted.

In the small isolated units the medical officer operated his own sick quarters, but wherever possible, when two or more units were operating in close proximity to each other, a central or combined sick quarters was established—such an arrangement having repeatedly proved its value in the flying wings and among the units settled in a base area; by this means better professional care and attention could be given to the patients.

In the Desert Air Force in Sicily and to a limited extent in Italy wing sick quarters had in the past acted as air evacuation units; they had also been provided with a surgical detachment from a M.F.H. On the Italian mainland improved communications and shorter distances rendered such an improvisation highly undesirable and the wing sick quarters was discouraged from treating all but short-term minor sick as the comparatively more accessible mobile field hospital could provide more specialised treatment and more comfortable conditions.

#### BASE AREA CENTRAL SICK QUARTERS

Two excellent central sick quarters existed in the base areas at Bari and Naples (*see* Plates XL and XLI); these were buildings which had originally been intended for hospitals and provided sick quarters accommodation for some seventy persons in each. The large villa at Portici resembled a nursing home in layout and appearance and six Italian V.A.D. nurses were co-opted on to the staff. These sick quarters were non-dieted and were not, of course, provided with medical, surgical or other specialists but they served very well for the short-term cases who did not require specialised treatment.

#### MOBILE FIELD HOSPITALS\*

The mobile field hospitals, originally designated 'medical receiving stations', had had a wealth of experience in the Desert. They had

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\* *See* R.A.F. Volume I, Chapter 5, page 265.

advanced and retreated through the Desert for two years and as regards their medical and general equipment and *savoir faire* were far in advance of any other mobile hospital existing in the R.A.F. at that time. Each hospital had its own individuality usually stemming from the personality of the commanding officer; medical and surgical staff, likewise, competed with each other to improve the standard of work each hospital could undertake and the keenest rivalry developed between all these M.F.Hs.

One of the M.F.Hs. had a few members of the Princess Mary's Royal Air Force Nursing Service attached to it, but the other commanding officers preferred an all male staff; in many instances under field conditions this was an advantage, yet nursing sisters could provide a standard of supervision not obtainable otherwise and were extremely helpful in organising and nursing the sick especially when in winter quarters.

The equipment of these hospitals, even when they came out of the Desert, in no way resembled that officially laid down for them. They were equipped with their own transport and tentage and were provided with stretchers for the nursing of some seventy cases. By the time they arrived in Italy they had come into possession of a considerable amount of captured enemy tentage, operating tables, theatre lights, laboratory equipment (*see* Plate XLIII) and even enemy bus transport which was used for the comfortable transfer of sitting patients. Moreover all hospitals had come into possession of beds from one source or another and thanks to the invaluable aid of the British Red Cross Society they were provided with sheets, pillow cases, dressing gowns, pyjamas, towels and in fact every item of equipment which could be, but is not, supplied from public funds and is essential for the comfort of patients.

Usually two or three hospitals had been operated together on a 'leap-frog' principle and this system was continued in Italy. During the summer months the hospitals remained under canvas but in the winter it was essential that they should be housed in buildings and they were invariably placed in a requisitioned Italian school or hospital. One of the hospitals usually occupied a superior building and served as a general hospital until such a hospital could be brought up; in this fashion the R.A.F. General Hospitals at Benghazi, Naples and Foggia were founded. At Tripoli, No. 24 M.F.H. was established in a large building providing accommodation for 450 patients; this hospital was extensively used for the reception of casualties from the Sicilian invasion. The amount and type of work done was sometimes beyond the capabilities of the hospital staff and in Italy the Principal Medical Officer, M.A.A.F. quickly realised that mobile field hospitals should not, and in fact could not, provide facilities for highly specialised treatment

such as is usually supplied by a R.A.F. general hospital whose equipment is far superior and staff much more specialised. Consequently, No. 25 M.F.H., occupying a most suitable building at Naples, remained there only for a short while until No. 1 R.A.F. General Hospital was transferred from Carthage to take its place. No. 25 M.F.H. then proceeded to Foggia where it occupied a building under joint command with No. 30 M.F.H. and provided hospital facilities until June 1944 when No. 4 R.A.F. General Hospital was transferred from Benghazi. It is of interest to note that No. 25 M.F.H. had occupied suitable buildings in Catania which were never developed further owing to the rate of the advance, and that No. 30 M.F.H. had occupied a very good building in Bari which was retained as a permanent central sick quarters.

The M.F.Hs. were highly mobile and rivalled each other in the speed with which they became operational on transfer to a new site. It was customary for a hospital, on moving its site some thirty or forty miles, to evacuate its cases to a nearby hospital, perhaps twenty or thirty miles away, to pack up the whole of its tentage, bedding and complete medical equipment and to have become operational in its new site within thirty-six hours from the time of receipt of the instructions to move. The hospitals differed in the individual method of equipment pack-ups which were most ingeniously designed for the quick and efficient stowage and accessibility of equipment. Most elaborate pack-ups for the operating theatre, X-ray and laboratory equipment were, of course, necessary to prevent breakage.

The mobile field hospitals swept up through the west and central side of Italy until they occupied a static position during the winter months; No. 30 M.F.H. was then allocated to the Balkan Air Force for casualty evacuation duties and eventually work in Yugoslavia for which, under R.A.F. command, it combined with a casualty clearing station, providing medical services to the hard-pressed Yugoslavs.

It was usual to place a M.F.H. in an area where the wings were actually operating and one hospital could deal with a population up to 7,000—though to cover an isolated force of considerably smaller size would still require one hospital. June 1944 could be selected as a good example of a period showing the medical and surgical cover provided by the R.A.F. Medical Branch. On the east side No. 22 M.F.H. was at Pescara with an isolated wing of fighter-bombers supporting the Polish troops; the only other medical units available were a Polish casualty clearing station thirty-five miles forward and a British hospital fifty miles to the rear—the roads being almost impassable. Nos. 21 and 30 M.F.Hs. were operating with the fighter and light-bomber aircraft supporting the Army on the west side. No. 22 M.F.H. evacuated, when necessary, by air to No. 4 R.A.F. General Hospital at Foggia or to No. 1 R.A.F. General Hospital at Naples, while Nos. 21 and 30 M.F.Hs.

evacuated direct to Naples by either road or air. No. 25 M.F.H. was in Corsica covering fighter and coastal units and evacuated by air to Naples—this hospital was shortly to proceed to cover the advance in Southern France and return to Italy in the autumn of 1944.

As the R.A.F. did not sustain very numerous casualties it was possible for R.A.F. unit sick quarters to retain and treat many cases which the Army, for operational reasons, would have sent to casualty clearing stations. The casualty clearing station, as its name denotes, is most efficiently run when it is empty and the patients evacuated, the seriously ill and slightly sick alike, to base hospitals, which may be hundreds of miles away. In fact patients admitted to Army hospitals in Bari were later found to have been evacuated to Sicily or North Africa in order to make room for fresh battle casualties. The mass transfer of patients is an extremely difficult operation to organise but it was one not often suffered by patients in R.A.F. hospitals as it was found possible to treat many casualties adequately in unit sick quarters or the accompanying R.A.F. mobile field hospitals, which proved very useful for this purpose and had the advantage of ensuring the patient's speedy return to duty.

The Army hospital organisation is, of necessity, based on the need for keeping beds available in the forward units for battle casualties, hence the tactical distribution of aid posts, dressing stations, field ambulances, casualty clearing stations and general hospitals. Such a system works well when the lines of communication are short, as during the static period in Italy in the first six months of 1944. Then the tactical distribution of Army and Air Force units was so similar that, except as will be seen below, there might have appeared little justification for separate Air Force field hospitals. During a rapid advance the R.A.F. mobile field hospitals accompanying fighter wings sometimes outstripped the casualty clearing stations of the Army and for their immediate needs the R.A.F. units continued to receive the hospital service to which they had been accustomed. The R.A.F. mobile field hospital, by its design and evolution, met the needs of the force it served.

The loss of a highly trained member of aircrew or technical airman suffering from a minor ailment, through compulsory transfer to an Army hospital several hundred miles to the rear and the consequent enforced absence from his unit for as many as six to eight weeks, was always a grave cause of anxiety to the operational Air Force commander. The fact that a R.A.F. M.F.H. was near to which an individual could be admitted and returned to duty within a week meant that fighting efficiency was not needlessly reduced on that account. For example, at one M.F.H. in the first six months of 1944 there were 325 surgical admissions as against 573 medical and 202 venereal, while 496 surgical



out-patient X-ray examinations were carried out. Translated into terms of operational man-hours saved this record is striking. Cases of possible back injury, e.g. the painful back after an aircraft crash or the sprained wrist and ankle, could be seen, properly examined and sifted close to their units instead of having to travel to a general hospital several days' journey away. The care of the more gravely injured needs no special comment for the value of good handling in the early treatment of burns, fractures and gun-shot wounds is obvious. In the Italian campaign the wastage in the R.A.F. from various forms of sepsis was greater than that caused by bullets and shells (disregarding the large number of casualties posted as missing).

The amount of work done by these hospitals varied with their situation and with the number of wings they were covering; it was influenced in Italy by the fact that M.F.Hs. were soon able to transfer their cases to a R.A.F. general hospital within reasonable access and it was not necessary for one hospital to function as a 'holding hospital' as it had been in the Desert. The following is a typical example of the work done in one hospital during the period January 1 to June 30, 1944:

Number of patients seen and treated . . . . .	2,514
Grand total of admissions . . . . .	1,269
Average daily bedstate . . . . .	67

Total number of surgical operations during the half-year

Major . . . . .	16
Minor . . . . .	236

X-ray department

Total number of X-rays taken during the half-year

R.A.F. . . . .	466
Army and Others . . . . .	134

Laboratory examinations

Total number of Laboratory examinations during the half-year

R.A.F. . . . .	2,819
Army and Others . . . . .	199

Venereal Diseases

Total admissions . . . . .	205
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At the end of the war the location of the field hospitals was as follows:

No. 21 Mobile Field Hospital . . . . .	Klagenfurt (for disposal of Allied Prisoners-of-War)
No. 22 Mobile Field Hospital . . . . .	Udine
No. 25 Mobile Field Hospital . . . . .	Treviso
No. 30 Mobile Field Hospital . . . . .	Yugoslavia
No. 31 Mobile Field Hospital . . . . .	Converted into an air evacuation unit on the Adriatic Coast.

## ROYAL AIR FORCE GENERAL HOSPITALS

Shortly after the beginning of the Italian campaign the R.A.F. general hospitals were situated at Benghazi, Carthage and Tunis.

No. 4 R.A.F. General Hospital had been established at Benghazi on March 8, 1943, having been founded by a combination of Nos. 21 and 22 Mobile Field Hospitals which at that time operated 148 beds and formed the nucleus to which seven medical officers and eight P.M.R.A.F.N.S. sisters had been posted. The hospital had been augmented by the seizure of German medical stores at Appolonia and much non-expendible equipment had been obtained from the R.A.F. Medical Stores Depot at Aboukir. The building had been used as a hospital by the Germans and a considerable number of German surgical instruments were appropriated while a further consignment of surgical instruments was obtained from the American Red Cross.

No. 21 M.F.H. proceeded into the Desert and No. 22 M.F.H. handed over this nucleus to R.A.F. General Hospital, Benghazi, which was eventually redesignated No. 4 R.A.F. General Hospital and transferred to Foggia in June 1944.

It was obvious to the Principal Medical Officer, British North African Air Force, that one general hospital would be required immediately in Italy because air transport facilities provided by No. 216 Group, and operating through El Aquina, were becoming congested on the westward route and the routine transfer of patients from Italy could no longer be undertaken with the certainty of admittance to a R.A.F. hospital in North Africa. Further, patients could not be returned to their units on discharge from hospital and the time taken in transit would deprive the unit of the airman's services for a most unreasonable period. Again, the admittance of R.A.F. cases to Army hospitals was not economical from the R.A.F. point of view.

No. 1 R.A.F. Hospital, situated in two convents in Carthage since its arrival in July, had been opened with equipment obtained from the British Red Cross and the Army Medical Services, which was returned as R.A.F. equipment became available. (*See Plate XXI.*) On September 12, 1943, No. 1 R.A.F. General Hospital split into two sections in order that No. 2 R.A.F. General Hospital could be formed to remain in North Africa while No. 1 R.A.F. General Hospital could eventually proceed to Italy. Accordingly, instructions were issued that on December 6, No. 31 M.F.H. was to move in and take over the remaining patients, other than those who could be transferred to No. 2 R.A.F. General Hospital by air. The huts and tents were emptied and all the heavy equipment packed and collected by the quartermaster's department. On December 9 the move commenced, using approximately 65 three-ton lorries to move personnel and equipment.

On December 21, the unit, with equipment, crossed by sea in United States landing craft, the majority of the officers and sisters following six days later in two C.47 aircraft. Suitable buildings had previously been found for the hospital by the Principal Medical Officer, D.A.F., who had instructed No. 25 M.F.H. to occupy the buildings temporarily and to function therein as an M.F.H. The buildings were situated at Torre del Greco some six miles out of Naples, off the Auto Strada, in a residential district close to the fringe of the slum area. The buildings were also situated some six miles from Vesuvius, which at that time was showing ominous signs of activity. The main building was the 'Convalescenziario Principe Di Napoli', a convalescent home designed for 150 patients and requiring little adaptation—with the exception of the enlargement of the operating theatre and the provision of a burns centre. It stood in three acres of attractive grounds and was surrounded by various villas which were occupied as additional wards and as officers' and sisters' messes, for which, after adaptation, they were well suited. An elementary school, some seven minutes away, was developed into a satisfactory unit barrack block.

The necessary repair work was, at first, difficult to get done but about six months later the hospital was functioning as a 450-bed establishment providing the usual features of a R.A.F. general hospital, viz., medical and surgical departments, orthopaedic, burns and venereal departments and a neuropsychiatric ward, etc. It became necessary to erect tentage in the grounds for the rehabilitative treatment of orthopaedic cases.

In the early days the requisitioning of the various villas was not without its problems and in particular a suitable building for the officers' mess was difficult to obtain. Extremely good liaison existed with the British Red Cross, who opened a convalescent aircrew sergeants depot at Sorrento and greatly relieved the hospital by providing the right psychological surroundings which are so necessary in rehabilitating aircrew to their duties. Much of the equipment had been brought over from Carthage, a considerable amount was already available in the hospital and some was acquired from local sources, while the British Red Cross were beyond all praise in the equipment they supplied to this hospital.

The staff of the hospital varied from time to time but averaged 17 medical officers, 2 quartermasters and 35 members of the P.M.R.A.F.N.S. The Group 'M' trades of the nursing personnel averaged 65. In a typical month there were some 750 admissions.

The early history of the hospital was alarmingly jeopardised by the eruption of Vesuvius—an event which, if it had not been for the war, would have occasioned front page headlines in the newspapers of the world (*see* Plate XLIV). Ordinarily Vesuvius emits a small column of



PLATE XLIV : General view of No. 1 Royal Air Force General Hospital, Naples, showing Mount Vesuvius



PLATE XLV : Ravenna-Cervia. A typical area flooded by the enemy before drainage



PLATE XLVI : Ravenna-Cervia. A flooded area after drainage



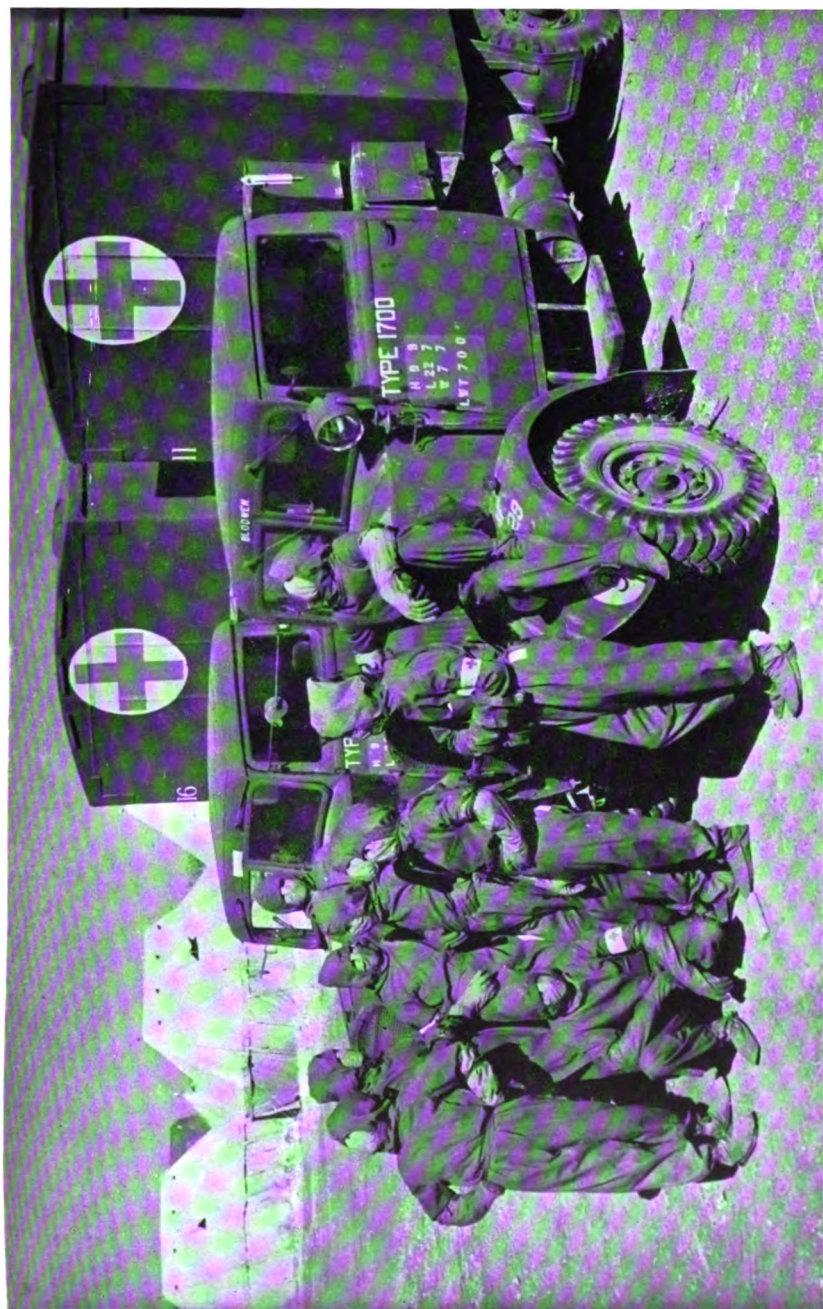


PLATE XLVII : Typhus team awaiting the Yugoslavian casualties



PLATE XLVIII : Ambulances awaiting the emergency evacuation of Yugoslav wounded, women and children

steam and smoke by day and an occasional shower of sparks by night and this became intensified during January and February 1944. On March 14-15 the emission almost ceased and this was regarded by the local inhabitants as a bad sign. In the next two days there was abnormal activity, with repeated explosive sounds causing the doors and windows in the hospital to rattle. Smoke and flame were thrown up to a greater height than was normal. On March 18, lava was seen to be pouring over the lip of the cone and one stream was directed roughly to the west. It advanced very slowly and on March 20, all movement in this stream was stilled, but on the night of the 21st the explosions became more frequent and the lava advanced again. At 0100 hours on the 22nd the explosions were replaced by a tremendous roaring sound; sparks, red hot boulders, clouds of steam and smoke were forced out of the mountain top and carried up several thousand feet; cascades of glowing lava fell in showers around the cone and augmented the stream running down the side—this was followed by an exacerbation and at 0800 hours on the 22nd the eruption developed its full fury which lasted all day.

There were, in the hospital, 341 patients and apprehension was felt in view of what might happen; fortunately the wind was blowing from the north-west and clouds of ash and cinders blocked the roads for twenty-five miles around on the south-east side of the volcano; even so, hot ash was falling on the hospital roof and great concern was evinced as to the possible collapse of the roof under this additional load—indeed a nearby Army hospital did experience the collapse of a building from this cause. The whole occurrence was extremely alarming for the patients who were in bed and evacuation was decided upon and took place throughout the 22nd to a nearby Army hospital. It might have been possible to defer the evacuation until the situation grew worse but should the wind have changed obstruction might have come from ashes or fleeing civilians blocking the nearby roads.

On the 23rd the violence died out but huge clouds of dust and ashes billowed continuously from within the crater and continued until the 27th when it was decided that patients should be returned to the hospital. Events proved that it had not been necessary to empty the building but the decision had to be made on speculation and in the light of the happenings at the time it certainly appears to have been the right course. Fortunately there was no lava flow in the direction of the hospital which was adequately protected by the nature of the intervening countryside. The eruption could have been a great deal worse; as it was, it was a most alarming and awe-inspiring sight in which some four hundred feet of mountain top had been blown away completely.

No. 1 R.A.F. General Hospital was kept constantly busy until the end of the Italian campaign; thereafter it assumed increasing responsibility for the admittance of R.A.F. cases necessitated by the closing of



No. 4 R.A.F. General Hospital and of the various sick quarters and consequently, while the number of admissions appeared to be high, the number of medical and surgical cases and particularly the work of the specialist departments, decreased in importance. The hospital finally closed down in May 1946. During the last eighteen months of its existence it played an important part in the air evacuation of Army and R.A.F. patients from Italy who needed more advanced surgical treatment in the United Kingdom. The work undertaken by this hospital throughout its existence was similar to that of any other R.A.F. general hospital and calls for no special comment.

No. 4 R.A.F. General Hospital was transferred from Benghazi to Foggia in June 1944 in order to deal with the increasing numbers of personnel on the east side of Italy, especially in the Foggia group of airfields, for it was in this area that the strategic air forces became most concentrated.

The buildings used in Foggia were situated on the west side of the town and consisted of a main hospital of fairly recent construction which was originally an Italian geriatric institution; near to it was the administrative block. The officers' mess was contained in a small block of flats about 150 yards from the main building and similar accommodation was provided for the sisters.

The main building was in a comparatively good state of repair and had been for some months operated jointly by Nos. 25 and 30 M.F.Hs. which offered some of the facilities of a R.A.F. General Hospital. During this time a considerable amount of structural work had been carried out to attain, in the surgical department especially, the standard required in a R.A.F. hospital; frequent advisory visits had been paid by the Consultant in Surgery and by the Senior Medical Officer, No. 214 Group in achieving this object. A considerable amount of furniture for the messes and also for the hospital itself was obtained from No. 214 Group sources.

Foggia had been most severely damaged and was a good example of the effects of the American pattern bombing. The town was full of rubble and ruined buildings, looking dirty and dismal, and it took many months before a satisfactory clean-up had been effected—as always, it was surprising how many of the damaged houses were rehabilitated. The town supply services had been most extensively damaged and the water supply to the hospital was always intermittent; despite the special installation of roof tanks and pumps the irregular water supply was such that a satisfactory head could not be guaranteed and consequently much of the water had to be carried to the upper floors in buckets.

Despite the unsavoury and depressing atmosphere of Foggia the hospital itself was quickly developed into an attractive R.A.F. establishment and closely rivalled the facilities presented by No. 1 R.A.F.

General Hospital in Naples, which was much more aesthetically situated. Most of the medical equipment—and much of the barrack equipment, including beds and other furniture—had been shipped over from Benghazi and within a comparatively short time the hospital offered accommodation for some 400 patients including, among the general facilities usually offered by a R.A.F. hospital, a neuropsychiatric department and a small maxillo-facial clinic. The staff of the hospital comprised 13 medical officers, a quartermaster, 32 nursing sisters and 68 nursing orderlies. The hospital also operated an efficient burns centre which was particularly needed in the Foggia area because of the air activity in this sector.

During the period at Foggia various improvements were made in connexion with the requisitioning of buildings for the airmen's barrack rooms and the facilities for the officers' and sergeants' messes were, after a time, greatly improved.

A convalescent depot, with accommodation for 14 patients, was opened in July 1944 at Peschici on the Manfredonian Peninsula and consisted of a villa in extensive, attractive grounds with ample lounge, and dining, accommodation. A hospital marquee was erected to provide additional sleeping facilities, excellent sea bathing was enjoyed half a mile away and the gardens provided an abundance of fresh fruit.

After the war ended, only the existence of one general hospital in Italy could be justified and No. 4 R.A.F. General Hospital was closed on September 24, 1945. During the period of its existence it rendered particularly valuable work especially in the treatment of burns, neuropsychiatric cases and in limited maxillo-facial surgery.

#### COMMAND MEDICAL BOARD

In the summer of 1943 the need for a Command Medical Board in the Italian theatre became imperative and accordingly two Italian villas were taken over in the Portici area of Naples, under the administrative control of No. 3 Base Personnel Depot, and provided with a Commanding Officer. The Command Consultants in Surgery, Neuropsychiatry and Ophthalmology were attached to this Medical Board in advisory capacities on the Principal Medical Officers' staff, Headquarters M.A.A.F. Indeed, as the Consultant in Ophthalmology was also employed on consultant duties in Egypt, Iraq and India, his sphere of activities entailed a vast amount of air travel and his mileage was probably more than any other medical officer serving in the R.A.F. at that time.

#### HEADQUARTERS, M.A.A.F.

Supreme medical administrative control was vested in the Principal Medical Officer, M.A.A.F. This officer had previously been Principal Medical Officer, British North African Air Forces, and shortly after

the formation of M.A.A.F. the administrative services were transferred from North Africa to Caserta. The post was for an Air Vice-Marshal, who was assisted by a Deputy Principal Medical Officer (Group Captain), a D.P.M.O. Hygiene (Wing Commander) and a Flying Personnel Medical Officer (Squadron Leader). The Command Quartermaster, whose services during this campaign were most valuable, was borne on the same establishment; at this headquarters there was also attached a Consultant in Tropical Medicine (Group Captain). Various subsidiary posts were held by subordinate medical officers.

BRITISH RED CROSS SOCIETY AND THE ORDER OF  
ST. JOHN OF JERUSALEM

Although the activities of the above joint organisation\* have already been referred to in this narrative, no history of the Italian campaign would be complete without full acknowledgement of the splendid services and co-operation of these Societies. Their help and assistance in the running of the welfare organisation in the hospitals was of immense value and included the provision of hospital comforts of every conceivable description. Even unit sick quarters were provided with essential items of equipment which could not be obtained from any other sources. Their supplies varied from outfits of surgical instruments to the sheets, dressing gowns, blankets, towels, fly netting and pillows without which the discomfort of the patients would have been pronounced.

Particular acknowledgement is due to the excellent convalescent depots which were provided by the Joint War Organisation in various parts of Italy. The main convalescent depots were situated on the Sorrento Peninsula and were shared with the Army but the Organisation recognised the extreme desirability of providing, wherever possible, separate accommodation for aircrew. Following in the wake of the advance of the mobile forces in Italy, it established various convalescent homes, e.g., at Rome, Portricco and Cervia, which were chiefly used by the Desert Air Force personnel. Eventually, after opening and closing the various depots, as the advance progressed northwards, at the cessation of hostilities a magnificent castle was operated as an Officers' Convalescent Depot on the shores of a lake near Klagenfurt.

REST AND LEAVE CAMPS

There were established throughout Italy a number of rest and leave camps, some being operated solely by the R.A.F. for the use of R.A.F. personnel. The largest and oldest established was provided at Sorrento and another was opened in Rome. The accepted procedure was to requisition an Italian hotel and to operate it with British-controlled

\* See also R.A.F. Volume I, Chapter 6, page 345.

Italian staff on the basic ration allowance which was, of course, augmented. The Army, likewise, in every place of importance operated officers' transit accommodation on similar lines.

These hotel rest camps were most useful for providing comfortable living conditions at most reasonable prices for officers in transit and also provided tourist facilities which were greatly appreciated. The Italian is a born hotelier and he was anxious to please as it meant the hotel continued in use instead of probably having to close down for the duration of the war.

Similar accommodation was, wherever practicable, made available to other-rank personnel. Particular reference is made to the rest and leave camps of this type operated by the Desert Air Force in Northern Italy towards the end of the war. The scenery was magnificent and wherever it was possible to requisition accommodation for this purpose every encouragement was given to the unit to do so. A most successful ski-ing camp was operated by the Desert Air Force during the winter of 1944 in the vicinity of San Marino, at which a very considerable number of aircrew mentally and physically refreshed themselves for the coming Spring Offensive and in addition became quite efficient skiers.

#### AIR EVACUATION

Air evacuation, although limited by the number of aircraft available, had played a most important part in the Desert campaigns, especially in view of the long distances to base hospitals. In Italy air evacuation became increasingly important, chiefly because the number of suitable aircraft had been augmented by large numbers of American aircraft made available through the excellent co-operation of the American element in M.A.A.F. Detailed reference has already been made to the evacuation of 15,793 casualties in the Sicilian invasion; these were transported by returning Allied operational aircraft, in difficult operational conditions. In Italy the picture changed. In 1944 the fact that the Yugoslavs had over 10,000 soldiers awaiting treatment necessitated the formation of a casualty air evacuation service, which was first located at Bari airfield, and specially organised to deal with these cases. Beginning with a limited number of cases in operational aircraft, returning after conveying stores and equipment to Yugoslavia, the flow gradually developed and in eighteen months about 50,000 Yugoslav casualties had been evacuated by air through the casualty air evacuation unit controlled by No. 31 M.F.H. with operational quarters at Bari and branches at individual airfields on the Adriatic coast.

After the fall of Rome the Eighth Army casualties in Italy became a commitment with which the D.A.F. was directly interested operationally. During the summer of 1944 there was a 150 mile onward thrust

which resulted in a winter stalemate on the Bologna–Ravenna battle front. So rapid was the advance of the Eighth Army that great difficulty was experienced in evacuating their casualties from the casualty clearing stations to base hospitals, which were situated mainly at Naples, Bari and Rome. The Army, for their own reasons, were hesitant about bringing their base hospital forward and the transfer of casualties from the battle front by road to the base hospitals was limited by the lack of sufficient ambulances and by the deplorable state of the Italian mountain roads. The Army relied more and more on air evacuation as a quick and comfortable method for the transfer of their casualties from forward areas. This air evacuation service was provided almost entirely by American transport planes accompanied by their own female air-ambulance orderlies. The R.A.F. had not sufficient aircraft to spare for this operation, being engaged upon operational duties in the Balkans and other theatres.

All through the summer months regular daily air evacuation transport planes were operated by the United States Air Force to and from D.A.F. flying strips sited at such bases as Oriella and Civita Castellana, often situated in the heart of the Apennines and ten miles from the enemy front line. Some twenty aircraft operated each day and in the 'Big Lift' they sometimes completed double sorties, evacuating chiefly to hospitals in Naples. Considerable organisation was needed to arrange this lift from airfields which were in offensive operational use and usually consisted of a recently constructed strip designed for the use of Spitfire or Kittyhawk aircraft.

Great credit is due to the D.A.F. operational staff and the commanders of wings who never failed to make the daily evacuation programme fit in with their own operational sorties. During the whole period of air evacuation provided for the Eighth Army no crash occurred when patients were emplaned. In one day over 500 patients were cleared; this was a peak figure, the usual figure being 350 to 400 patients. As the weather deteriorated and the lines of communication lengthened the task became increasingly difficult and from October 1944 to March 1945 only a skeleton evacuation service operated from the air evacuation centre at Rimini to the specialist hospitals at Naples or Bari and for the routine transfer of R.A.F. cases to Foggia or Naples.

In the final stages of the campaign, April to May 1945, heavy Army casualties were expected and plans were laid to step up air evacuation to a large scale; fortunately, however, casualties were never heavy and only ten aircraft operated each day in this phase. It is certain that, had not American aircraft been made available, the lot of the wounded might have been one of greater hardship, as they would have travelled by ambulance train or motor convoy. The Army relied exclusively upon air evacuation yet did not appear fully to appreciate the principles

involved in the transport of casualties by air and the operational difficulties, not only in obtaining aircraft when offensive operational needs must have first call, but also in servicing aircraft, flying aircraft in bad weather over most difficult country and landing them on airstrips in the midst of the take-off and return of operational sorties. Fortunately the enemy had completely vanished from the Italian skies, otherwise this evacuation would have been an extremely hazardous undertaking.

Air evacuation was also carried out in sporadic isolated incidence from other places in the Italian theatre (e.g. Corsica, Fifth Army Front—British element—etc.). Appendix II shows the number of casualties transported by air in the campaign during the period December 1943 to May 31, 1945, and it will be seen that 153,550 casualties were thus transported in the Central Mediterranean campaign, these figures including United States personnel. It is not possible to differentiate between the number of casualties carried in British or American aircraft or to specify the nationalities further; therefore it can only be repeated that, but for American co-operation, the number of British casualties evacuated by air would have been small.

Particularly hard work was done by the British air evacuation units which handled the majority of the British casualties, almost the whole of the Yugoslav casualties and not a few of the American casualties, from the time of landing to their dispersal to hospital; they held and fed them and arranged their despatch, and did much to correlate the necessary flight arrangements.

#### PRINCIPAL DISEASES

##### VENEREAL DISEASE

Venereal disease accounted for much of the non-effectiveness in this campaign, being a problem for all units. The main source of infection was Naples whose streets were, in war-time, a paradise for the pimp and professional prostitute; her amateur sister also thrived throughout Italy and in all districts there were women who were willing to bargain their bodies for a bar of soap, a stick of chocolate or a packet of cigarettes. Venereal disease thrived, the black market thrived and the vicious circle continued. Unfortunately, the Germans during their occupation, seemed to have dispensed venereal disease freely and to have attempted treatment with 'sulpha' drugs which, probably owing to their unintelligent use, had not been successful and, in consequence, a particularly virulent form of the disease remained which was extremely difficult to treat. Propaganda seemed to have little effect among the airmen except that attendance at the unit early treatment centre was popularly regarded by them as an infallible safeguard.

Treatment of venereal disease was, during the summer of 1944, concentrated at the R.A.F. general hospitals and prohibited at M.F.Hs.,

as much more effective and rapid cures could be obtained by experienced specialists who were able to use penicillin which was introduced on September 1, 1944, and which gradually became increasingly available.

The incidence of venereal disease might have decreased if the introduction of penicillin had not led personnel to consider its acquisition a matter of small moment. In the Mediterranean theatre in 1944, 3,706 cases caused an incidence of 45·29 per 1,000 as against 43·44 per 1,000 for 1943.

Beside the usual propaganda methods employed, all brothels were placed out of bounds and twelve anti-vice sections were set up in 1944 by the R.A.F. Provost Marshal Branch for the worst V.D. areas; these sections were responsible for the arrest of 3,641 prostitutes in Naples alone, of whom 44 per cent. were found to be diseased. Unfortunately little control could be exercised on these women after they had been detained except to provide compulsory treatment. The women were free to restart their trade and as most of them operated independently, rather than in brothels, the prostitutes unfortunately really won the victory.

#### MALARIA

Malaria was endemic in parts of Algeria, Tunisia, Sicily, Sardinia, Corsica and Italy and to some extent in Yugoslavia. During 1944, 3,395 cases were reported of which 2,465 occurred in Italy, 351 in North Africa and 204 in Corsica. The season for malaria extended from early May to late November with anopheline breeding peaks in May, June, September and October, depending upon geographical and climatic factors. In 1943, malaria had accounted for an incidence of 33·68 per 1,000 as against 47·30 per 1,000 in 1944. (These figures include North African stations in this theatre.) The chief vector was *A. maculipennis*, var. *labranchiae* whose breeding propensities are affected by neither sewage contamination nor by salinity to 1·7 per cent.

Although other tropical diseases required constant vigilance, it is unquestionable that the threat of malaria caused most anxiety in this campaign because, without adequate protection, the greatest number of casualties would have been occasioned by malaria. Possibly in Italy the malaria threat was over-emphasised—personnel were frequently informed by local Italians that there was no malaria at all in that region, but this was not so for malaria existed throughout the country districts of Italy, chiefly in the mountain valleys and especially in the marshes. Undoubtedly, however, the Fascists had reduced the amount of malaria in the Po Valley and in the Pontine marshes south of Rome, which previously had had a most unenviable reputation.

A Malaria Advisory Board under the chairmanship of the Army Deputy Director of Hygiene, with representatives of the British and

United States Armies, Royal Navy and Royal Air Force, was set up, with personal protection as the keynote of the propaganda and suppressive medication as an adjunct. Difficulty was experienced in establishing tolerance to mepacrine and the dose was adjusted to one tablet four times per week for R.A.F. personnel. Malariol spraying was carried out by the R.A.F., British and United States Army organisations. The R.A.F. accepted responsibility for malaria control up to a radius of one mile from its own sites; there were, however, four R.A.F. anti-malaria control units in operation, all employed with D.A.F. until No. 12 A.M.C.U. went to Corsica in May and No. 1 A.M.C.U. was transferred to the Balkan Air Force in September 1944. These anti-malaria control units of course worked outside the one mile radius and usually in the closest conjunction with the Army. Air spraying and dusting were carried out by United States Anti-malaria Squadrons and by a few R.A.F. aircraft. The introduction of D.D.T. was the most powerful ally of the A.M.C.U., as it guaranteed that hibernating infected mosquitoes could be destroyed by winter spraying of Italian houses, barns, cowsheds, etc.; such spraying greatly reduced the local risk of malaria.

Difficulty was experienced in obtaining accurate returns—or even any returns from some units—in such an extensive theatre of active operations, so that the recorded figures can only be considered as approximate. It was only in D.A.F. that the issue of mosquito nets was made a personal issue and undoubtedly in many other units personnel were infected because they were not supplied with nets in sufficient time.\*

Two important anti-malaria preventive schemes were implemented by the R.A.F., firstly in Corsica and then in the Cervia-Cesenatico-Ravenna marshes. Both schemes were enterprises of considerable magnitude and are worthy of historical record. In Corsica the marshes were pre-existing, and as the pumping apparatus previously in use had been destroyed beyond immediate local repair, they could only be dealt with by drainage, oiling and spraying. In the Ravenna area it was considered that the pumping machinery could be restored and the flooded land returned to normal before the onset of the breeding season. The Corsica scheme is described first.

*Corsica.* Malaria was rife in Corsica, being regarded by the population as an ever-present scourge, and it had caused the Germans considerable anxiety in 1943 when the incidence of the disease was very high in their forces of occupation. Before the war, as part of a malaria control and land-reclamation scheme, the French had constructed a canal and pumping system for the marshes along the shores of Lake Biguglia and

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\* It should be remembered that mosquito nets were, at this time, in very great demand for personnel engaged in the Far East campaign.



in the coastal area as far south as the Alto River. All pumping stations, as stated earlier, were destroyed or damaged by the enemy before the evacuation of the island.

In January 1944, following a survey of Corsica by U.S. Army 2655th Malaria Control Detachment, a memorandum was issued which disclosed that larvae control would be necessary on 2,413 acres of open pond, 1,280 acres of marsh and 259 miles of stream. It would also call for spray-killing of adult mosquitoes in 800 structures and for the provision of approximately 4,000 square yards of window screening.

As a result of the survey undertaken in January, responsibility for anti-malaria measures in the Calvi and Ajaccio areas and over the eastern coastal plain north of the Alto River was delegated to the R.A.F.—leaving the French to supervise the large towns and the Americans to control the remainder of the island.

For this task the R.A.F. had available No. 12 A.M.C.U. (*ex* Levant) and two Army M.C.U.s. on temporary attachment. At the commencement of operations in April 1944, No. 12 A.M.C.U. was allotted the area between the Golo and Alto Rivers, 'B' M.C.U. the Calvi and Ajaccio sectors, and 'D' M.C.U. the area north of the Golo River. At the end of May when Serragia airfield was occupied, 'D' unit took over territory from south of its original boundary up to this airfield, the area reverting to No. 12 A.M.C.U. in August on increase in establishment of that unit. From the Alto River to the southern tip of the island, control was exercised by the American unit, 21st M.C.U.

The strength of No. 12 A.M.C.U. before its increase in establishment was one flight sergeant and seven airmen, while that of each of the Army M.C.U.s. was one officer, one sergeant and six other ranks. In addition to the Service personnel, approximately 230 Yugoslavs—conscripted originally by the Italians for duty in Sardinia—were employed as labourers. It is satisfactory to note that these men turned out to be prodigious workers and that their efforts contributed in no small measure to the success of the undertaking.

The large areas of waterways, ponds and marshland being regarded as the major and most urgent commitment, measures chosen for their control were those considered most likely to prove satisfactory in the shortest period of time—viz: heavy oiling on the water, and aircraft dusting over the marshland.

While most of the stream oiling was done by knapsack sprayers, many of the larger areas were covered by pressure pumps operated from trucks. 'D' M.C.U., controlling the seventeen miles of canals from Bevinco airfield to Alto, used an American chemical warfare decontamination wagon mounted on a ten-wheeler chassis, this vehicle carrying 300 gallons and providing a spray at 200 to 250 pounds pressure, which penetrated the thickest reeds and burnt up the vegetation,

causing decomposition on the surface of the water. The heaviest concentration of oil by this method was about one gallon to 200 square feet.

Most of the oil used was grade 2 diesel, this being easily obtainable and appearing to have a less injurious effect upon rubber parts than did malariol. In the concentration in which oil was used, malariol appeared to have no appreciable advantage.

For the extensive marshes which stretch for about eighteen miles along the east coast, fifty yards across at their northern extremity by the upper end of Lake Biguglia and three-quarters of a mile wide at the lower end of the lake by Poretta airfield, aircraft dusting with Paris green was the only practicable method of cover. In most places these districts were heavily overgrown with reeds, and in some cases trees and bushes added to the difficulty of searching out the swamp areas.

Aircraft dusting was also employed around the airfield and along the Gravone River at Ajaccio, over the stream at Lozari, over the marsh and river at Ostriconi and in the Calvi area.

Most of the work fell to a Lysander (two were provided, but one remained unserviceable for the whole period), but some was undertaken by an American Boston and on a few occasions a Fairchild Argus was employed. The Boston had the great advantage of carrying one and a half tons of dusting compound and could cover the whole of the British area in five hours twenty minutes, whereas the Lysander, although superior for operating in confined spaces, carried only 300 pounds. The Argus was unsatisfactory, being under-powered and slow to respond to the controls—the latter a serious handicap in this type of work which had to be carried out at a low level.

The mixture used was 25–33 per cent. Paris green diluted with lime of diatomaceous earth. Of the 100,650 pounds used, 68,300 pounds were distributed by the Boston and 32,350 pounds by the Lysander. While only about 10 per cent. was considered to have been profitably expended, it is thought that such of the dust as fell on breeding places killed approximately 90 per cent. of the larvae. Evidence in support of this was found at Poretta pumping station where as a result of spraying no mosquitoes were identified in August or September.

Bevinco airfield was the most important of the five airfields on the east coast and was considered likely to be the most malarious. Half a mile to the north lay the Bevinco River, which in this part of its course dried up during the summer, leaving pool formations. Between the airfield and the river was a low-lying area of market garden with two canals and a network of neglected ditches, and on its east side ran a collecting canal bordered by about seventy yards of marsh. The only dry area was that to the west.

All the ditches were cleared out and treated by knapsack oilers, the canals oiled by bowser and the area on the east side dusted by aircraft.

Borgo airfield lay two and a half miles south of Bevinco, and three-quarters of a mile from the canal and marshes forming the edge of Lake Biguglia. North-east and west of the field was the Rau de Rasignini, south of the runway was an area of seepage, and east a dry irrigation canal. Treatment here followed the measures used at Bevinco—air dusting of the canal and marshland, knapsack oiling of the upper reaches of the Rau de Rasignini, and bowser spraying of the lower and broader waterways.

Poretta airfield, two miles south-east of Borgo, was just north of the Golo River and adjoined a canal two-and-a-half miles long and overgrown with blackthorn and reeds. It was also within one mile of the canals and marshes forming the border of the southern end of Lake Biguglia—these about three-quarters of a mile wide. After cutting the main canal from its source, it was first cleared and trenched from the swamp backwards to the river and then oiled by bowser. The marshes, impossible to cross even when labourers were clad in thigh boots, were dusted by aircraft.

Serragia airfield, south of the Golo and just north of the Rau de Serragia, had an area of marshland and two canals, the nearest half a mile from the runway. As with the others, the canals were bowser-oiled and the marshes along the coast dusted from the air.

Alto, the remaining airfield north of the river, was bordered on its eastern and northern sides by a heavily overgrown network of drains (tributaries of the canals adjoining Serragia airfield). There were also marshes east and north-east of the site. A considerable amount of heavy manual work was required to clear this area. After preparation, part of the drain network was oiled by knapsack and the remainder by bowser. All marshes were air dusted and the lower four miles of the river cleared and oiled.

The districts described above were the most heavily populated by Service personnel, and consequently it was essential to search out and deal with all probable anopheline breeding grounds. Throughout this area there were numerous rocky streams originating in the mountains which tended to dry up east of the main road while holding water in pools in the upper reaches. Much time and labour was expended in canalising and oiling, and all the major waterways and pockets were brought under control.

On the west side of the Island, Ajaccio and Calvi were the principal areas, with Lozari a minor area. Ajaccio was the headquarters of the Northern Base Section organisation and the majority of units were camped along the Ajaccio-Corté road. The problem here was simple of solution and consisted of clearing and oiling drains and attending to wet areas caused through leaks from the open concrete canal carrying the town water supply. The other area was the airfield on the delta at the mouth of the Gravone River, and for control of this the northern branch

of the river was cleared and canalised. On the west side heavily overgrown ditches were cleared and in the centre sector five miles of the Gravone River were air dusted.

Calvi had three airfields, one opposite the railway station (Calvi Main), another between the Ficarella and the Calvi-Bonifatto road (St. Catherine) and the third along the Calvi-Calenzana road (Calenzana). Calvi Main was bordered by the lower reaches of the Rivers Fiume Secco and De Ficarella, St. Catherine had a series of small streams west of the runway, and Calenzana formed a watershed for the Rau de Bartasca. Oiling and air dusting were adopted as for other aerodromes. Lozari was a beach used first as a rest camp, then as a landing ground and finally as a training camp for A.A. gunners. The only danger area was a small stream at the western end, and this was cleared, oiled and air dusted.

Reference was made earlier to a canal and pumping system constructed by the French before the war for malaria control and land reclamation along the shores of Lake Biguglia and the coastal marshes of the Alto River. Each section of this system comprised a collecting canal, at the centre of which was a pumping station for transferring the water back to the lake or into the sea, as was most convenient. All seven stations had been destroyed or damaged by the Germans, with the result that the marshes which lay between the five airfields, Bevinco, Borgo, Poretta, Serragia and Alto, were constantly flooded.

The most northerly station had only a few breaks in the electric cable; these were repaired and the station put into action for a short time. The next one, by the Bevinco airfield, had been damaged by a hand grenade and was repairable. The three stations Bevinco, Borgo and Poretta were supplied by a common line which had been destroyed, and the station near Borgo was completely wrecked. The two southern stations, opposite Serragia and Alto airfields, were in good order but the line supplying them had been destroyed. A plan to control the level of these canals would have been practicable had suitable pumps been available.

In addition to the dusting of 100,650 pounds of Paris green from aircraft referred to above, units under the administration of the R.A.F. Medical Branch undertook 100,383 square yards of clearing, 26,851 square yards of new ditching and 199,760 square yards of maintenance. They expended 31,613 gallons of oil as a larvicide and sprayed over 4,000 rooms in 856 buildings.

The most important fact of the season, and the practical result of the undertaking, was that no unit suffered operationally from the effects of malaria. In the R.A.F. only 4 per cent. of the strength became infected during April and May, 6 per cent. in June and 10 per cent. in July and August. In the American forces the rate was more steady and averaged five per cent. over the five months April-August 1944.

*Ravenna-Cervia Flooded Area.* In this area, an extensive system of land-drainage had been installed by the Fascists to reclaim the marsh areas in what was originally a notoriously malarious area.

In the Cervia area the system was complicated by the inclusion of salt drying pans in the drainage scheme which was operated by various pump houses at Cervia, Cesenatico and at the San Vitale marsh at Ravenna. Some 15,000 acres of land were flooded as the enemy had either removed the essential parts or destroyed the mechanism of the pumps; he had also destroyed flood-water control gates.

In January 1945, it became apparent that some of our airfields might still remain within this area if the campaign did not progress according to plan; indeed the D.A.F. medium bombers would certainly have used these airfields if vacated by the fighter bombers. In consequence the Principal Medical Officer, D.A.F., consulted the United States Officer controlling the local AMGOT\*, and it was decided that there was a reasonable chance of clearing the land if substitute pumping arrangements could be made and put into force. 'Q' Branch of the Eighth Army was approached after attempts to interest the local C.R.Es. but it was hard to awaken any enthusiasm in what seemed rather a hopeless task, especially four months before the onset of the malaria season.

Accordingly the Principal Medical Officer, D.A.F. with other D.A.F. medical officers, No. 1 Field Hygiene Unit aided by an A.M.C.U. and the officer in charge of AMGOT decided to see what they could do themselves. Two 'Archimedes' type pumps were installed, driven by two agricultural tractors requisitioned by AMGOT. By the middle of February the water had fallen considerably; 156 C.R.E. had helped maintain the machinery by providing more reliable tractors and what seemed at first to have been a doubtful venture (chiefly because of the continual liability of the Italian machines to break down) now appeared to have a reasonably successful chance of draining the land.

However, the problem of the other pump houses remained. There were two large marshes south of Ravenna, the San Vitale marsh and the Rasponi marsh, which were drained by pumping machinery and a complicated system of waterways which were partly tidal. Mechanically operated flood-control gates had been extensively damaged by the enemy and could not be repaired. The area involved was very large and, in view of the success in the Cesenatico area, it was decided to repair the pumps. The D.M.S., Eighth Army was most helpful in inducing 'Q' Branch to release engines held in reserve for drainage of anticipated flooding in the Po Valley. As the Po Valley was still in enemy occupation and there was no sign of flooding in that area, it seemed more

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\* Allied Military Government, Occupied Territories.

sensible to drain the land now flooded, especially when the malaria season was so close at hand, than to hold pumps in reserve and do nothing. This fact, together with the result at Cesenatico, led to great help and co-operation being given by the Eighth Army 'Q' and Engineering Branches.

Drainage of the Ravenna marsh area was difficult and tedious and immense quantities of water were removed. In both areas by the end of April some twelve to fifteen thousand acres of land had been drained and most of it became bone dry. The Field Hygiene Unit and A.M.C.U. with their labourers carried out magnificent work, which involved a great deal of digging, in order to free water from cupped depressions which would otherwise have become stagnant breeding pools. However, the war ended rapidly, the area was relieved of air forces and the benefit went almost exclusively to the Italian civilians who experienced less malaria than they had ever done before (probably due more to winter spraying of hibernating mosquitoes than to any other factor). The Italians immediately cultivated the reclaimed land and enjoyed a substantial wheat crop with consequent relief to Allied shipping. As the waters receded in the Ravenna area, 150,000 kilos of fish were scooped up by the local Italian population. The indisputable fact remains that, had the war been prolonged and Allied air forces continued in occupation, as seemed extremely likely, this potential mosquito breeding area, unless treated by drainage, would have presented a most difficult problem in malaria control.

Plates XLV and XLVI give a good idea of the condition of the land, the first showing conditions at the end of March and the second photograph the conditions which existed in mid-May. There was still some pocketing but this water rapidly evaporated and the land was bone dry by the middle of June. A large prisoner-of-war camp can be seen in the middle of the picture and most of the fields were, by then, growing crops.

A copy of the R.A.F. Commander-in-Chief's reference to this work is appended below:

Headquarters, Royal Air Force,  
Mediterranean and Middle East,  
Caserta, C.M.F.

*Ref.—MEDME/2145/4/MED.*

*September 30, 1945*

REPORT ON FLOOD DRAINAGE AT RAVENNA AND CESENATICO

Sir,

I have the honour to forward herewith a report by the Principal Medical Officer, Desert Air Force, on the extensive anti-malaria work initiated and carried out in the RAVENNA—CESENATICO area of Italy during the early months of 1945.

2. Close to the airfields occupied by the Desert Air Force at that time there were altogether about 15,000 acres of flooded agricultural land, the result of demolition by the enemy. This large mosquito breeding area, which constituted such a potential danger of malaria to the Desert Air Force Units, was successfully drained despite many difficulties, physical and material, through the initiative and persistence of Headquarters, Desert Air Force.

3. By this work the risk of malaria, not only to the Forces but to the civilian population, was considerably reduced and, moreover, it enabled the land to be brought back into wheat cultivation. It is considered that this was a praiseworthy effort, which you will be interested in studying.

I have the honour to be, Sir,

Your obedient Servant,

J. SLESSOR,

Air Marshal, Commander-in-Chief, Royal Air Force  
Mediterranean and Middle East.

The Under Secretary of State,  
Air Ministry, Dept. Q.J.,  
Kingsway, W.C.2.

#### TYPHOID FEVER

The amount of typhoid fever in this campaign was remarkably low; for example, during the period June 1944 to June 1945 only three cases of enteric occurred in D.A.F. (a force then of approximately 23,000), two of these being in South African native soldiers. Reference to the Infectious Diseases Table (Appendix III) reveals that only eighteen cases of typhoid fever were notified between July 1943 and April 1945 in the whole of the forces operating in the Central Mediterranean. When it is remembered that this force averaged some 75,000 men the figures are a remarkable tribute to the strict hygienic measures which were enforced as regards the consumption of foodstuffs and the purity of the water supply.

#### DYSENTERY

It will be seen from Appendix III that the cases of dysentery were as follows: amoebic—89, bacillary—145, clinical—747. As with typhoid these figures relate to the total personnel employed in the Central Mediterranean, it being impossible to separate statistically the forces employed in Italy. The amount of dysentery in Italy was correspondingly small, bacillary and clinical dysentery being substantially controlled by the introduction of D.D.T. which had a marked effect in the reduction of flies in camp areas. The flies were, at first, a great nuisance in Italy but during the campaign sufficient D.D.T. became available and the amount of fly-proofing, for both permanent buildings and tented kitchens, was always sufficient to satisfy demands. It is

interesting to note that fish-netting was found to be the most satisfactory form of fly-proofing under tented conditions.

There was little amoebic infection among the Italian food-handlers who, nevertheless, suffered from helminth infection to a high degree. Strict control of food-handlers was maintained in all air force units.

#### ACUTE INFECTIVE HEPATITIS

During the autumn months of 1943 there was an outbreak of acute infective hepatitis in Italy; this occurred throughout the Central Mediterranean Area but was particularly pronounced in the Italian theatre. There was a recrudescence of the disease in the following autumn and it is noteworthy that in both periods the months of epidemic were autumnal. Reference to Appendix III will show that a total of 1,934 cases occurred during the campaign; 256 occurred in October 1943 and 148 in November 1943, followed by 152 in September 1944, 187 in October, 151 in November and 210 in December. It was difficult to distinguish any particular cause as the aetiological factor; a special analysis of 734 cases sought to show a relationship to work connected with oil, petrol, chemicals and metals but there was little support for certain assumptions in the figures given. The camps with poor hygiene were affected more than those with good hygiene. Camp sites which had been vacated, and then reoccupied, presented a greater number of cases than camps which were continually occupied. Officers and air-crew formed the bulk of the cases and it was difficult to understand why this should be so when mess hygiene was rather higher in the officers' messes than among the airmen.

The actual incidence per 1,000 in the Central Mediterranean Forces was 80.5 in 1943 and only 19 in 1944—this drop, in spite of the increased number of cases recorded, being due to the increase of strength in the Central Mediterranean Forces. While it is not possible to differentiate the incidence in the parts of the Mediterranean littoral where the C.M.F. operated, it is a fact that Italy suffered more heavily from the epidemic than did other areas in the region.

#### OTHER DISEASES

There was only one case of undulant fever and 71 cases of food poisoning. Sandfly fever does not appear as a recorded disease but the number of cases is known to have been negligible; a few cases may have occurred in North Africa but this disease was not endemic in Italy. Typhus, an outbreak of which occurred in Naples, has been dealt with at length in Volume I, Chapter 7, page 394.

#### HEALTH STATISTICS

The health of the R.A.F. throughout the campaign may be considered as excellent, if the venereal figures be disregarded as a voluntarily



acquired disease, the control of which is an administrative and moral rather than a direct medical responsibility. From the tables in Appendix IV, it will be seen that the incidence of sickness in 1943 and 1944 in the Central Mediterranean area was exceptionally low.

During 1943, the total disease incidence, excluding forty-eight hour cases, was 479·54 per 1,000, of which the incidence of communicable diseases was as follows:

1943 <i>Total Sickness</i> (excluding 48-hour cases) 479·54 per 1,000.		
Infective Hepatitis . . . . .	80·5	per 1,000 (mortality ·6 per 1,000)
Malaria . . . . .	64·5	„ „
Venereal Disease . . . . .	43·44	„ „
Dysentery . . . . .	24·48	„ „
Enteric Fever . . . . .	1·59	„ „
Tuberculosis . . . . .	1·47	„ „
Diphtheria . . . . .	1·34	„ „
Scarlet Fever . . . . .	0·19	„ „
Cerebro-spinal Meningitis	0·14	„ „
Typhus . . . . .	0·15	„ „ (six cases, two deaths)
Erysipelas . . . . .	0·14	„ „
Smallpox . . . . .	0·12	„ „

1944 *Total Sickness* (excluding 48-hour cases) 569·77 per 1,000.

Malaria . . . . .	47·30	per 1,000
Infective Hepatitis . . . . .	19·04	„ „
Dysentery (Amoebic) . . . . .	1·76	„ „
Dysentery (All other forms)	6·84	„ „
Cerebro-spinal Meningitis	0·07	„ „
Relapsing Fever . . . . .	0·03	„ „
Pneumonia . . . . .	3·69	„ „
Jaundice . . . . .	0·08	„ „
Jaundice (Arsenical)	0·20	„ „
Undulant Fever . . . . .	0·04	„ „
Enteric Fever . . . . .	0·00	„ „
Glandular Fever . . . . .	0·30	„ „
Chickenpox . . . . .	0·32	„ „
Smallpox . . . . .	0·08	„ „
Erysipelas . . . . .	0·08	„ „
Poliomyelitis . . . . .	0·14	„ „
Scarlet Fever . . . . .	0·22	„ „
Measles . . . . .	0·02	„ „
Dengue . . . . .	0·02	„ „
Diphtheria . . . . .	1·22	„ „
Leishmaniasis . . . . .	0·03	„ „
Tuberculosis (Pulmonary)	1·02	„ „
„ (other forms)	0·04	„ „
Venereal Disease (all types)	45·29	„ „

It should be noted that the above statistics include all Central Mediterranean Forces; it is not possible to show the figures for Italy

separately. The numbers given do, however, form a good indication of the state of health of the air forces, the majority of whom were in Italy, and the diseases which were encountered. The majority of the cases of enteric fever occurred in North Africa, and of typhus elsewhere than in Italy.

It can be assumed that this high standard of health was due to recent advances in preventive medicine, hygiene and sanitation and an appreciation of these factors by both officers and airmen. This result was remarkable in a country notoriously poverty-stricken and slum-ridden, accentuated in war-time by the mass movements of Italian and Yugoslav refugees—many of the latter suffering from gross malnutrition, wounds and sickness of all descriptions, including much typhus.

#### BALKAN AIR FORCE

Some reference has already been made to the activities of the Balkan Air Force in air evacuation. The question of air support for the Partisans in Yugoslavia and Albania first became of importance in November 1943 after the capitulation of Italy and the arrival of the Tactical Air Force, which was primarily concerned with the battle in Italy. Shipping in the Adriatic offered good targets—as did road and rail communications—and it was appreciated that every advantage should be taken of the fact that Partisan forces were holding fifteen to twenty German Divisions in the Balkans. Contact had already been made with the Partisans by Allied officers and Brigadier Fitzroy MacLean's mission was at Marshal Tito's headquarters.

The Allies at first supported the Cetniks, but it was soon recognised that the Yugoslav National Army of Liberation, controlled by Tito, was the only stable force which could be relied upon to be effective against German strength and since 1943 advantage had been taken of the return trips of aircraft on 'special mission' duties for the evacuation of small numbers of Yugoslav casualties, who were usually transported in the hours of darkness to the Bari airfield.

While air operations over the Adriatic and Yugoslavia had been carried out as far as commitments permitted, the Balkans had seen no large scale air operations until May 25, 1944, the date of a determined attack on Tito's headquarters carried out by picked German troops. Marshal Tito was compelled to transfer his headquarters to the island of Vis and the Allies decided to attach much greater importance to Balkan air operations as the only immediate way of giving help to Tito, whose elimination would have had serious repercussions on Balkan affairs. In consequence it was decided to form a central co-ordinating Air Force headquarters which would co-operate with other Service headquarters engaged in Balkan operations of all types, generally engage the enemy, thereby increasing his commitments and difficulties, and aid Partisan

forces by direct air offensive operations and by carrying on the task, already under way, of bringing arms, food and clothing and evacuating their wounded.

So the Balkan Air Force was formed in June 1944, and assumed operational control of units on July 1. The Balkan Air Force differed considerably in several ways from the normal conception of a composite group. The biggest difference was the fact that, to all intents and purposes, the only land forces with which it co-operated were those of the Yugoslav National Army of Liberation. At the start, these were purely guerilla forces and although, with the Russian advance and the liberation of large areas of Yugoslavia, they were later used in a more normal way with the support of limited armour and artillery, they never really lost their guerilla characteristics; moreover, they acted throughout completely independently of, and received no directives from, the Supreme Allied Commander.

Some support was given to our own land forces in the Balkans, but excepting in Greece, these were small and only involved raiding parties so that their operations call for no special comment from the air support aspect.

Secondly, Balkan Air Force operations always had a distinctly maritime flavour, since operations in support of the Partisans inevitably called for constant attack on the enemy's sea communications along the Adriatic coast. Furthermore, considerable effort was required to neutralise the enemy's development of bases for small marine craft, such as minor submersibles and explosive motor boats in the Northern Adriatic islands which came into B.A.F.'s sphere of operations. In the winter of 1944 to 1945, sorties from these bases seriously threatened our own sea communications on the Yugoslav and Italian coasts.

Lastly, Balkan Air Force was charged with the control of all special operations aircraft in the Mediterranean theatre, which involved sorties not only to the Balkans but to Poland, Czechoslovakia, Hungary, Germany and Northern Italy. Early in 1945, this responsibility was modified slightly by the withdrawal of certain American units which operated from Northern Italy under the control of M.A.T.A.F.

In Special Operations, Balkan Air Force took over a 'going concern,' whose work involved special operations (air) in the Mediterranean. Suffice it to say that this was a constant commitment which involved special organisation in the field and a special element in Balkan Air Force Headquarters. On the purely operational side it involved constant, though not serious, demands for fighter escort for aircraft operating by day to Partisan forces. On certain major occasions these escorts called for a very big diversion of effort.

Medical conditions in the Yugoslav National Army of Liberation were restricted by the inadequacy of supplies, total absence of field

hospitals, such as we know them, and by the lack of qualified medical personnel serving with the forces, yet the keenest *esprit-de-corps* existed in all branches and all ranks of Tito's armed forces. Personnel acting as battalion medical officers were not always doctors and Yugoslav girls became front line nurses; they were most keen but lacked equipment and training. The Balkans were an area in which typhus fever, bacillary dysentery and tuberculosis were always endemic and these diseases assumed epidemic proportions during the war. It was therefore necessary to arrange for specially equipped typhus hospitals to be ready to deal with outbreaks promptly and effectively. Plate XLVII shows one of the typhus teams, prepared for duty.

Particular reference is made to the typhus epidemics which occurred around Bos, Dubice, Gradiska, Bihac, Sanski Most and at Djakovo, Jesenovac and Nova Gradiska concentration camps, where conditions were appalling and thousands perished.

In May 1944, Marshal Tito had 10,000 casualties in need of treatment, embarrassing him by being non-effective individuals to feed. They could not be allowed to fall into German hands, and restricted the mobility of the Partisan forces. It was arranged that these patients should be flown to hospital in Italy and that the R.A.F. would be responsible for their transportation and reception at Bari. No. 31 M.F.H., which had previous experience of air evacuation work, was sited on the airfield. A small part of the air lift was provided by American aircraft. The first organised evacuation was carried out on May 8, 1944, when 52 Yugoslav casualties were disembarked at 0300 hours. At first most of the work could only be carried out at night, but during the summer months it became possible to operate from various strips in daytime. Advantage was taken to transport the casualties in returning aircraft and the evacuation of Yugoslav wounded had an immense effect upon the morale of the people. Altogether some 50,000 persons were evacuated through the Balkan Air Force Casualty Air Evacuation Section.

On August 22, 1944, the biggest air evacuation that was ever undertaken from Yugoslavia took place and the British Air Commander-in-Chief commented as follows in his letter to the Senior Medical Officer at the Headquarters of Balkan Air Force:

'I have read your report on the daylight air evacuation of Partisan wounded on August 22, and I would like to take this opportunity to congratulate you on the fine work which you and your staff did on that day. I know from conversation with Marshal Tito and the Partisan leaders how greatly our efforts to help Partisan wounded are appreciated, and how grateful all from the highest to the lowest are for them. I am only sorry that we cannot always meet the full needs, but as you know we are doing our best.

'Will you convey my thanks and warm appreciation to all officers, non-commissioned officers, airmen and sisters, who have been engaged under you in this work both in Yugoslavia itself and Bari'.

The details of this air evacuation are recorded below as being typical of the work undertaken in Yugoslavia:

'During August 1944, the position of the Partisan forces in eastern Montenegro deteriorated as a result of a full scale resumption of the German offensive. Andrijevica was captured; the enemy occupied Kolasin; the Partisans evacuated Berano, and the Germans began moving into the main liberated area west of the Plevlje-Niksic road.

'Partisan casualties were heavy, and it soon became evident that only immediate evacuation would save them and numbers of women and children as well, from possible massacre if they fell into German hands. On Monday August 21, 1944, the Senior Medical Officer at Bari was informed by the Senior Air Staff Officer that it might be necessary to carry out a mass air evacuation in the immediate future, and that he would be advised when the plan was to be put into operation.

'Steps were taken to ascertain the accommodation available, but the urgency of the position developed more quickly than expected owing to the increasing threat of enemy action near Polje. On the following morning, August 22, Special Operations told the S.M.O. that a flight of six Dakotas was to evacuate most of the stretcher cases that morning, and that plans were being made to evacuate the remainder on the following day. Arrangements were made with the appropriate Army Medical Services for the reception and transportation of these stretcher cases. (*See* Plate XLVIII.) The first mission was successfully completed by six Dakotas with an escort of four Mustangs of No. 249 Squadron between 0740 and 1020 hours.

'At 1230 hours a message was received from Special Operations saying that continuous evacuation had become essential, as there was every danger of the air strip falling into enemy hands before the next morning. All units concerned were warned of this large commitment, and were requested to do their utmost to handle it. The response was excellent; an ambulance supply column promised to work a shuttle service for stretcher cases, and the Yugoslav Military Mission promised lorries for sitting cases.

'Having made all possible arrangements in Italy, the S.M.O. then flew to the air strip at Polje to supervise the sorting and loading of casualties. A pathetic and seemingly hopeless situation awaited him. Sitting or lying around the edge of the temporary air strip were hundreds of wounded Partisans and refugees, in a starved and exhausted condition. With more than half a day gone, and the threat of enemy occupation on the morrow, it was evident that all the wounded could not be evacuated

that day. Those who could walk would have to take to the hills to avoid capture or annihilation.

'The problem was tackled boldly and further evacuation was begun at once. The first wave of the afternoon aircraft had landed bringing food and supplies, and now stood awaiting their human freight. The lack of trained medical personnel caused some confusion at first, but later on the loading was carried out efficiently and rapidly, largely due to the magnificent effort and untiring energy of a Partisan girl named Alice. Her knowledge of English and efficient handling of her fellow countrymen no doubt saved many lives, and by her efforts every available space in the aircraft was occupied. In fact, every aircraft took off with more than its normal load. A total of thirty aircraft took off during the day and each of the five waves competed successfully with its predecessor in carrying more weight. The last flight of six Dakotas brought out a total of 212 casualties in addition to their own crews. One plane alone carried 66 children and three nurses—one of the largest number of persons ever carried by a single aircraft in a similar operation; it says much for the pilot's skill that he was able to take off with such heavy loads from a bumpy undulating runway only 900 yards long, which had been hurriedly prepared in less than two days. Escort to the Dakotas was provided by Mustangs and Spitfires of Balkan Air Force.

'When the last aircraft had taken off, there remained on the landing ground between 300 and 400 Partisans with minor wounds, and very old or very young refugees, all in an exhausted state. On the edge of the strip were grim reminders of the enemy's attack of the year before—the shells of houses in which bound women and children had been burnt to death and the graves where their mangled corpses were buried. A plan was made to try and evacuate the remaining Partisans and refugees on the following morning, and to send in additional food, providing the strip could be held. A signal code was arranged to inform the R.A.F. if this was possible or not, and the S.M.O. took off to supervise the disposal of the wounded and refugees already in Italy.

'On his return to Bari, the S.M.O. found the reception and disposal of casualties was proceeding at an amazing rate under the direction of two R.A.F. medical officers and a N.C.O. nursing orderly. All casualties were cleared by midnight, although the last six aircraft did not land until 2030 hours. Twenty-four aircraft of No. 60 Troop Carrier Group, U.S.A.A.F., had brought out 721 casualties and six aircraft of No. 267 Squadron, R.A.F., had brought out 219. A further 138 wounded Partisans were brought in by the Russian Air Group during the night, bringing the total evacuated to 1,059 Partisans, 16 Allied aircrew and three personnel of the Allied Control Commission.

'During the night the signal was received signifying the impossibility of holding the landing strip until the morning; the evacuation could not

therefore be continued, but arrangements were made to drop food by parachute to the unlucky ones left behind.'

It should be emphasised that until the spring of 1945, when No. 281 Wing was transferred to the Zadar area, the whole of Balkan Air Force had, with certain exceptions, been operating from the east Italian coast, but the exceptions were that certain isolated units on special missions, including the R.A.F. Regiment, had been filtered into Yugoslavia and were, of course, accompanied by their medical orderlies. This disregards the island of Vis which had formed a base for operations since Autumn 1943, and at which much R.A.F. medical and dental aid had been given to the Yugoslavs. Air evacuation units were established at several of the airfields on the east coast of Italy, all being controlled by No. 31 M.F.H.

In the spring of 1945 Operation 'Bingham' was undertaken whereby No. 281 Wing, R.A.F., was introduced into the Zadar area together with the minimum of Army units necessary for maintenance and administration. The Army strength was 1,500 and the total force strength about 5,000. Medical cover was provided by No. 30 M.F.H., R.A.F. (150 beds) augmented by 33 Hospital Expansion (100 beds) and 3 Field Surgical Unit. The last two mentioned were both Army units and for the first time in the Central Mediterranean Theatre an officer commanding a mobile field hospital extended his command to include Army units. A most successful smooth-working organisation was developed and the combined units did very useful work in Yugoslavia, although as events turned out, the full resources of these combined units were never fully utilised, as the majority of the Yugoslav casualties were still evacuated to Italy. Much useful work was done in providing medical attention for Yugoslav civilians when No. 30 M.F.H. moved north towards Trieste.

Between July 1, 1944, and May 9, 1945—date of the last operational mission—aircraft of Balkan Air Force, including A.H.Q. Greece, flew 38,089 sorties and inflicted heavy damage on the enemy.

Apart from the air support given to land operations and attacks on enemy bases and rear positions, B.A.F. aircraft made repeated strikes against shipping in the Adriatic, played a leading part in the airborne landings in Greece, dropped and landed supplies—often at the rate of 2,000 tons a month—to Yugoslav troops and civilians, and organised the evacuation of wounded. They also gave cover to the many amphibious operations undertaken by both Marshal Tito's forces and Land Forces Adriatic, and carried out a number of special and hazardous missions.

Great credit is due to the medical officers, the majority of whom operated with the bases in Italy and not a few who accompanied various special missions into Yugoslavia as part of their routine.

## CASUALTIES

Appendix V summarises the casualties occurring in the North African and Mediterranean Campaigns from November 8, 1942 to May 7, 1945. Statistics also include the casualties which occurred in Southern France in that force which was temporarily detached from August 15, 1944 to May 7, 1945 from Central Mediterranean Forces. Section 'A' gives North Africa November 8, 1942 to May 13, 1944; Section 'B' Sicily July 10, 1943 to August 18, 1943; Section 'C' Italy September 9, 1943 to May 7, 1945; Section 'D' Southern France August 15, 1944 to May 7, 1945.

In these campaigns, the number of formations concerned was considerable and this led to certain administrative difficulties over the casualty 'returns'; nevertheless, Appendix V shows figures which are known to be relatively accurate.



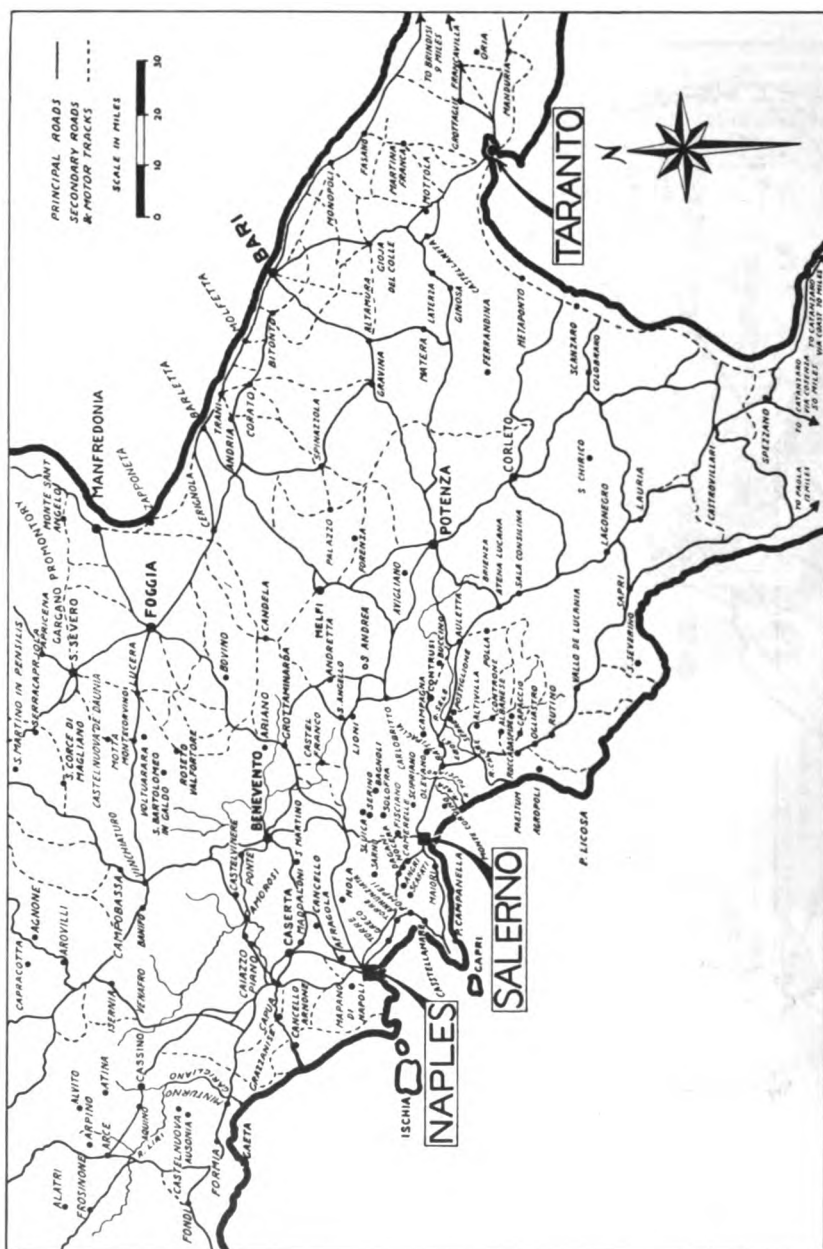
## APPENDIX I

*Maps of the campaign*

The following maps referred to in the text give a comprehensive pictorial survey of the principal areas in which fighting occurred during the campaign, and are included to assist the reader in correlating the text to definite geographical locations:

1. Strategic Bombing. May-June, 1943.
2. The Battle Area. September-October, 1943.
3. Strategic Bombing. South-east Europe. March-May, 1944.





MAP 2. The battle area September 9-October 2, 1943.



MAP 3. Strategic bombing against targets in South-east Europe.

## APPENDIX II

*Transportation of Casualties by Air, Italy, December 1943 to May 1945*

	From rear areas				From forward areas*			Grand totals
	U.S.	British	Others	Totals	Litter	Walking	Totals	
Dec. 1943	910	4,135	1,680	6,725	—	—	—	6,725
Jan. 1944	3,182	1,071	98	4,351	—	—	—	4,351
Feb. 1944	1,467	722	400	2,589	—	—	—	2,589
Mar. 1944	350	2,323	381	3,054	—	—	—	3,054
Apr. 1944	97	977	—	1,074	—	—	—	1,074
May 1944	456	414	10	880	—	—	—	880
June 1944	11,741	4,868	3,588	20,197	—	—	—	20,197
July 1944	10,486	5,102	3,073	18,661	—	—	—	18,661
Aug. 1944	4,001	2,537	808	7,346	—	—	—	7,346
Sep. 1944	11,328	6,839	951	19,118	—	—	—	19,118
Oct. 1944	16,308	1,554	760	18,622	—	—	—	18,622
Nov. 1944	1,239	31	2	1,272	2,974	2,538	5,512	6,784
Dec. 1944	1,427	277	13	1,717	2,416	2,003	4,419	6,136
Jan. 1945	1,027	211	5	1,243	1,781	1,386	3,167	4,410
Feb. 1945	881	49	—	930	859	924	1,783	2,713
Mar. 1945	608	36	—	644	1,273	1,442	2,715	3,359
April 1945	307	426	52	785	3,236	1,738	4,974	5,759
May 1945	2,030	1,248	494	3,772	1,493	714	2,207	5,979

\* During the period December 1943 to October 1944 no separation was made between evacuations from rear and forward areas.

Total . . .	137,757
Sicily total . . .	15,793*
Grand total . . .	<u>153,550</u>

## NOTE:

As full records are not available these figures can only be considered approximate.

Civil Health Authority.

	INDIRECT CONTACT				DIRECT CONTACT					VITAMIN DEFICIENCY		Totals	
	Trench fever	Typhus	Yellow fever	Tick-bite fever	Anthrax	Erysipelas	Glanders	Rabies	Smallpox	Tetanus	Beri-beri		Scurvy
<b>1943</b>													
July													549
August													373
September													300
October													1,059
November													610
December								I					368
<b>1944</b>													
January													243
February													167
March					2		I						360
April													216
May					4								306
June													221
July													597
August						I							511
September						3							615
October						I							559
November										I			409
December										I			425
<b>1945</b>													
January						I							200
February													203
March													218
April													256



APPENDIX IV

TABLE I: M.A.A.F.: Incidence of Disabilities for Period July 1943-April 1945\*

Dates	Average strength for period of return	DISEASES					INJURIES					DEATHS						
		Veneral diseases	Notifiable diseases	Other diseases (excluding 48-hr. cases)	Total diseases (excluding 48-hr. cases)	Enemy action or (sea)	Flying accidents	All others	Total injuries (excluding 48-hr. cases)	48-hr. cases	Total disabilities (including 48-hr. cases)	Enemy action or (air, ground or sea)	Flying accidents	All others	Total deaths			
1943																		
July	34,327	72	548	1,738	2,358	57	40	208	305	2,663	2,917	5,580	15	18	8	41		
August	36,236	76	371	1,552	1,999	13	17	129	159	2,138	2,748	4,906	—	8	4	12		
September	38,875	66	299	1,864	2,169	3	15	134	152	2,321	3,724	6,045	2	9	3	14		
October	71,196	177	1,950	3,981	5,268	20	43	279	342	5,559	5,847	11,397	1	16	1	20		
November	75,462	213	608	3,405	4,226	9	20	239	268	4,494	4,204	8,698	1	12	3	16		
December	74,751	358	365	3,112	3,835	16	34	258	308	4,143	3,534	7,677	—	18	9	27		
1944																		
January	71,998	330	243	2,401	2,974	15	59	271	345	3,319	2,761	6,080	8	24	3	35		
February	68,430	239	167	1,860	2,266	—	73	238	311	2,577	2,099	4,676	—	41	1	42		
March	69,924	238	360	2,153	2,751	5	71	339	415	3,166	2,489	5,655	1	47	4	52		
April	40,366	146	214	1,012	1,372	3	58	138	199	1,571	1,052	2,623	—	30	—	30		
May	67,739	176	306	1,375	1,857	23	38	308	359	2,216	1,439	3,655	24	28	4	56		
June	41,133	118	221	1,511	1,850	6	25	226	257	2,107	1,522	3,629	2	13	12	27		
July	75,975	110	597	2,500	3,207	17	49	258	324	3,531	2,543	6,074	—	26	9	35		
August	75,139	248	511	2,531	3,209	13	56	356	425	3,715	2,699	6,414	1	27	5	33		
September	76,667	168	615	3,316	4,099	22	55	390	467	4,566	3,298	7,864	2	28	8	39		
October	72,769	280	559	1,991	2,857	6	15	318	339	3,166	3,298	7,864	2	28	3	39		
November	73,082	238	409	2,004	2,651	21	62	297	380	3,031	1,954	4,985	10	40	7	57		
December	72,187	397	425	2,269	3,091	13	36	390	439	3,530	2,456	5,986	1	16	3	20		
1945																		
January	56,268	201	200	1,992	2,393	17	18	266	301	2,604	1,797	4,491	—	7	2	9		
February	81,342	276	203	1,976	2,455	6	58	349	413	2,868	2,010	4,878	—	44	11	55		
March	78,113	310	218	2,359	2,887	15	60	436	511	3,398	2,085	5,483	3	32	7	42		
April	73,673	235	256	1,652	2,143	20	53	349	422	2,565	1,335	3,900	—	36	5	41		

\* The figures from July-September 1943 refer to the British North African Forces only.



TABLE 2: M.A.A.F.: Corresponding Ratios per 1,000 per annum. Period July 1943-April 1945\*

Dates	Deaths	Venereal diseases		Notifiable diseases	Other diseases (excluding 48-hr. cases)	Total injuries	Total disabilities (excluding 48-hr. cases)	48-hr. cases	Total disabilities (including 48-hr. cases)
		Primary	Total						
1943									
July . . . . .	12.4	21.8	21.8	166.0	526.6	92.4	806.8	883.8	1,690.6
August . . . . .	4.3	26.5	27.3	133.1	550.8	57.0	774.2	985.9	1,760.1
September . . . . .	4.7	22.1	22.1	100.0	603.3	50.8	776.2	1,245.3	2,021.5
October . . . . .	2.9	23.7	25.9	153.4	581.5	50.0	810.7	854.1	1,664.8
November . . . . .	2.8	35.5	36.7	104.7	586.6	40.2	774.2	724.2	1,498.4
December . . . . .	3.8	48.4	49.9	50.9	434.2	43.0	578.0	493.1	1,071.1
1944									
January . . . . .	6.3	53.8	59.6	43.9	433.5	62.3	599.3	498.5	1,097.8
February . . . . .	7.9	42.0	45.4	31.7	353.4	59.1	489.6	398.7	888.3
March . . . . .	7.7	30.8	35.4	53.5	320.2	61.7	470.8	370.2	841.0
April . . . . .	9.6	40.3	47.0	68.0	326.0	64.0	595.9	338.8	844.7
May . . . . .	10.7	27.8	33.8	58.7	263.9	68.9	425.3	276.2	701.4
June . . . . .	6.8	29.8	29.8	55.8	382.1	65.0	532.7	384.8	917.5
July . . . . .	6.0	18.5	18.8	102.2	427.8	55.4	604.2	435.2	1,039.3
August . . . . .	5.7	40.5	42.9	88.4	437.9	73.5	642.7	467.0	1,109.7
September . . . . .	5.3	22.2	22.8	83.4	449.8	63.4	619.4	447.4	1,066.8
October . . . . .	2.2	47.0	50.0	99.9	355.7	60.6	565.6	391.0	957.5
November . . . . .	10.2	42.4	42.4	72.7	350.5	67.6	539.2	347.6	886.8
December . . . . .	2.7	52.1	54.4	58.2	310.9	60.2	483.7	336.6	820.3
1945									
January . . . . .	2.2	50.2	50.2	49.9	497.0	75.1	672.2	448.3	1,120.4
February . . . . .	8.8	41.9	44.2	32.5	315.8	66.0	458.4	321.3	779.6
March . . . . .	5.6	41.3	41.3	29.0	314.1	68.0	452.4	277.0	730.0
April . . . . .	7.2	38.6	41.5	45.2	291.5	74.5	452.6	235.6	688.2

\* The figures from July-September 1943 refer to the British North African Forces only.

APPENDIX V

*Summary of Casualties: November 8, 1942 to May 7, 1945*

TABLE I

Operational—North Africa and Mediterranean campaigns			
„	Sicilian campaign (including softening-up operations)		
„	Italian campaign	„	„
„	Southern France campaign	„	„

TABLE 2

Non-operational (Flying)—North Africa and Mediterranean campaigns			
„	„	„	Sicilian campaign
„	„	„	Italian campaign
„	„	„	Southern France campaign

TABLE 3

Non-operational (Miscellaneous)—North Africa and Mediterranean campaigns			
„	„	„	Sicilian campaign
„	„	„	Italian campaign
„	„	„	Southern France campaign

DATES:

- North Africa . . . November 8, 1942–May 13, 1943
- Sicily . . . . . July 10, 1943–August 18, 1943
- Italy . . . . . September 9, 1943–May 7, 1945
- Southern France . . August 15, 1944–May 7, 1945
- November 8, 1942 = Date Allied Forces landed in North Africa
- May 7, 1945 = Date of cessation of hostilities in Europe.

**TABLE I**  
**Casualties—Operational: Overall Period November 8, 1942 to May 7, 1945**  
 (See preceding page)

	R.A.F.	R.C.A.F.	R.A.A.F.	R.N.Z.A.F.	S.A.A.F.	Rhodesian	Polish	Yugoslav	Greek	Belgian	Egyptian	Totals
<b>A. North Africa and Mediterranean</b>												
Killed	1,586	267	246	56	167	10	25	8	9	2	1	2,377
Wounded	735	91	115	22	186	3	24	5	8	—	—	1,189
Missing	1,315	115	160	58	527	9	111	18	4	1	—	2,318
Totals	3,636	473	521	136	880	22	160	31	21	3	1	5,884
<b>B. Sicily (included in 'A')</b>												
Killed	129	72	21	6	—	—	—	—	—	—	—	228
Wounded	40	19	4	—	—	—	—	—	—	—	—	63
Missing	14	2	5	2	—	—	—	—	—	—	—	23
Totals	183	93	30	8	—	—	—	—	—	—	—	314
<b>C. Italy (included in 'A')</b>												
Killed	1,136	142	187	31	167	9	25	8	9	1	1	1,716
Wounded	524	60	98	17	185	3	24	5	8	—	—	924
Missing	1,236	94	148	52	520	9	111	18	4	1	—	2,193
Totals	2,896	296	433	100	872	21	160	31	21	2	1	4,833
<b>D. Southern France (included in 'A')</b>												
Killed	48	6	8	4	—	—	—	—	—	1	—	67
Wounded	31	1	3	1	1	—	—	—	—	—	—	37
Missing	40	15	3	2	7	—	—	—	—	—	—	67
Totals	119	22	14	7	8	—	—	—	—	1	—	171

TABLE 2  
*Casualties—Non-operational (Flying): Overall Period November 8, 1942 to May 7, 1945*  
 (See page 441)

	R.A.F.	R.C.A.F.	R.A.A.F.	R.N.Z.A.F.	S.A.A.F.	Rhodesian	Polish	Yugoslav	Greek	Totals
<i>A. North Africa and Mediterranean</i>										
Killed	180	24	23	10	31	1	4	3	9	285
Wounded	155	15	19	5	33	—	—	—	2	229
Missing	51	9	9	1	17	—	—	—	4	91
Totals	386	48	51	16	81	1	4	3	15	605
<i>B. Sicily (included in 'A')</i>										
Killed	1	—	3	—	—	—	—	—	—	4
Wounded	5	2	—	—	—	—	—	—	—	7
Missing	1	—	—	—	—	—	—	—	—	1
Totals	7	2	3	—	—	—	—	—	—	12
<i>C. Italy (included in 'A')</i>										
Killed	158	19	14	6	31	1	4	3	9	245
Wounded	134	11	17	5	33	—	—	—	2	202
Missing	49	9	9	1	17	—	—	—	4	89
Totals	341	39	40	12	81	1	4	3	15	536
<i>D. Southern France (included in 'A')</i>										
Killed	1	—	—	—	—	—	—	—	—	1
Wounded	1	—	—	—	—	—	—	—	—	1
Missing	—	—	—	—	—	—	—	—	—	—
Totals	2	—	—	—	—	—	—	—	—	2

TABLE 3  
*Casualties—Non-operational (Miscellaneous): Overall Period November 8, 1942 to May 7, 1945*  
 (See page 441)

	R.A.F.	R.C.A.F.	R.A.A.F.	R.N.Z.A.F.	S.A.A.F.	Polish	Yugoslav	Greek	Palestinians	Totals
<b>A. North Africa and Mediterranean</b>										
Accidental deaths	247	9	2	—	23	1	3	2	—	287
Deaths (natural and self-inflicted)	109	4	—	1	10	1	3	—	—	128
Injuries (accidental or self-inflicted)	396	9	3	1	47	1	5	—	—	462
Dangerous illness	88	2	—	—	7	1	—	—	—	98
Serious illness	151	2	3	—	25	—	2	—	—	183
Missing (accidental)	—	—	—	—	—	—	—	—	1	1
<b>Totals</b>	<b>991</b>	<b>26</b>	<b>8</b>	<b>2</b>	<b>112</b>	<b>4</b>	<b>13</b>	<b>2</b>	<b>1</b>	<b>1,159</b>
<b>B. Sicily (included in 'A')</b>										
Accidental deaths	26	1	—	—	—	—	—	—	—	27
Deaths (natural and self-inflicted)	7	—	—	—	—	—	—	—	—	7
Injuries (accidental or self-inflicted)	24	—	—	—	—	—	—	—	—	24
Dangerous illness	5	—	—	—	—	—	—	—	—	5
Serious illness	13	—	—	—	—	—	—	—	—	13
<b>Totals</b>	<b>75</b>	<b>1</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>76</b>
<b>C. Italy (included in 'A')</b>										
Accidental deaths	183	6	2	—	23	1	3	2	—	220
Deaths (natural and self-inflicted)	90	3	—	—	10	1	3	—	—	107
Injuries (accidental or self-inflicted)	239	5	2	—	47	1	5	—	—	299
Dangerous illness	63	2	—	—	7	1	—	—	—	73
Serious illness	96	2	3	—	25	—	2	—	—	128
Missing (accidental)	—	—	—	—	—	—	—	—	1	1
<b>Totals</b>	<b>671</b>	<b>18</b>	<b>7</b>	<b>—</b>	<b>112</b>	<b>4</b>	<b>13</b>	<b>2</b>	<b>1</b>	<b>828</b>
<b>D. Southern France (included in 'A')</b>										
Accidental deaths	2	—	—	—	—	—	—	—	—	2
Injuries (accidental or self-inflicted)	11	—	—	—	—	—	—	—	—	11
<b>Totals</b>	<b>13</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>13</b>

## CHAPTER 9

# THE RETURN TO GREECE

### 1944-45

#### INTRODUCTION

**D**URING THE PERIOD of German occupation the internal position in occupied Greece was well known, thanks to an efficient secret service which operated throughout the country; the situation, however, was difficult to understand, mainly because of the Greek attitude towards politics. During the occupation there were innumerable political parties, some very closely allied in thinking, but all quite incapable of composing their personal differences. Two main political parties (out of 40 or so who presented themselves at the first elections after liberation) led the field, E.A.M. and E.D.E.S. E.A.M. (National Liberation Party), of which E.L.A.S. was the main military instrument and which was controlled by Communists, was the most powerful element in Greece and exercised dictatorship in the main towns, villages and mountain settlements. E.L.A.S. comprised about two-thirds of the effective guerrilla population and during the occupation controlled most of 'Free Greece'; it did give battle to the Germans but most of its operations were of a more political, long term nature. E.D.E.S. (Democratic National League) which was the main rival party, was more conservative in outlook and less terroristic in method.

The Emigré Government in Cairo underwent frequent changes, largely because of the difficulty it had in co-ordinating efforts of the Greek guerrillas and the Greek Fighting Forces outside the country. In May 1944, M. Papandreou and his Socialist Democratic Party came into power and represented the Constitutional Government of Greece.

However, up to the time of the British occupation of Athens, E.A.M./E.L.A.S. showed no real inclination to co-operate. In May 1944, E.A.M. and E.D.E.S. held a conference to try to settle their respective spheres of influence but this broke down over the usual failure to compromise politically. Later that month at a meeting in the Lebanon between the Papandreou Cabinet and the leaders of the main parties in Greece, including E.A.M., provisional agreement was reached to establish a joint government to assume power in Athens when the city was freed from German rule.

This agreement unfortunately had little effect and fighting continued between E.L.A.S. and E.D.E.S. and between E.L.A.S. and the Rallis Security Battalions—a force of Greeks armed by the Germans and

declaring for an anti-communist programme. They were based on centres of population and were employed defending towns and convoys from E.L.A.S. attack—also carrying out official reprisals such as burning villages.

At the end of July, E.A.M. placed new terms before the Greek Government in exile which the latter found unacceptable; E.A.M. countered with an offer to join the Government if Papandreou resigned, but this offer was later withdrawn and at the end of August five members of the P.E.E.A. (Political Committee of National Liberation) arrived in Cairo for discussions. On September 7, with Allied landings in the Peloponnese imminent, the Emigré Government moved to H.Q., M.A.A.F. at Caserta in Italy, making a formal entry into Athens on October 18; E.A.M. joined enthusiastically in the welcome and was apparently in open support of the Government.

#### TOPOGRAPHY

The main R.A.F. components in Greece were located eventually in the immediate neighbourhood of Athens. (*See map.*)

The climate is typically Northern Mediterranean, being warm and sunny for most of the year with a relatively short, cold, wet winter period. The city is the centre of government, industry and shipping, and enjoys a standard of living, education and public services comparable to any European capital and virtually unknown to the rest of Greece. Roads in the city and its vicinity generally were good and in some cases excellent, whereas to travel some twenty miles or so outside Athens was tantamount to stepping back to Ancient Greece where transport was, and still is, by ox carts. Outside of Athens railways were rare and primitive and industry virtually non-existent. Apart from the town dwellers the people were almost entirely peasants who scraped a bare living from the thin soil covering rocky hillsides.

Salonika in the north also evidenced considerable signs of industry and culture, largely owing to its shipping contacts with other nations; it has, on the whole, a less kindly climate than Athens with longer, colder winters. Araxos in the North-western Peloponnese is a barren and primitive area best known for its very high spleen rate arising from a high incidence of malaria.

#### OPERATIONAL NARRATIVE

##### OBJECT OF THE OPERATIONS

In planning the Allied return to Greece the predominant factor which had to be kept constantly in mind was that sufficient Allied forces were not available to give major battle to those of the Axis. Policy, therefore, had to be directed towards harassing the enemy by sea and air warfare until such pressure, added to that of the advancing



MAP I. General map of area of operations.

Soviet forces towards Northern Yugoslavia, made the position too costly to be defended by the Axis powers.

Operations in the Aegean area had been in progress from the beginning of 1943 and gradually built up into the integrated pattern shown in coastal areas of Greece and Yugoslavia. It was to concentrate these operations under one command that Balkan Air Force was brought into being in June 1944. In the autumn of 1943, the islands of Kos, Leros and Samos were invaded by Allied forces but the German reaction to these attacks on their flank was to throw in large forces so that by November 1943 all three islands were once more in enemy hands. German policy appeared to be to hold on to the outer ring of Aegean islands at all costs in order to prevent interruption of their lines of communication up through Greece and Yugoslavia and consequently the flow of vital supplies to these two countries was



continually being impeded. The immediate result of the Allies' temporary hold on the islands was to increase German strength, in quantity if not in quality, in spite of their very pressing man-power problems elsewhere.

The chief British objective was to re-establish the Greek Government in its constitutional capital and so obtain maximum Greek effort to free the country. Furthermore, material aid to the Greek people could then be brought in and a start made on the economic and social reorganisation of the country. From a health point of view it was noted, when the above aim was achieved, that the incidence and degree of malnutrition was lower than had been expected.

#### OPERATIONS

As stated earlier, operations against the enemy-held islands and mainland began early in 1943, and gradually increased in frequency and intensity. Naval, surface and submarine, craft made numerous attacks on Axis shipping and were very successful in aggravating the enemy's problems of transportation and supply between the islands and the mainland, for German shipping was limited and the possibility of more being made available and penetrating the Allied net was slight; at the same time the air effort from both Italy and the Middle East against land, sea and air communications was increasing rapidly and in addition to normal bombing operations, mine-laying in harbours, troop and gun emplacement strafing, air intruder and torpedo operations, were carried out intensively.

By mid-summer 1944, it was becoming apparent that, as a result of the increasing threat of being cut off in the north by the advancing Russians and the impossibility of maintaining adequate supplies to the island troops in the Aegean, the German position on the Greek mainland was rapidly becoming untenable and that preparations were being made to pull out northwards. Nevertheless, the enemy was increasing his garrisons on previously lightly held or unoccupied islands, his nervousness in this respect being considerably increased by repeated raids on the islands by landing parties whose objective was to destroy stores, equipment and even ships, and who several times succeeded in capturing or killing garrison commanders.

In early September the time was judged to be ripe and on the 16th of that month a seaborne Commando force landed at Kythera, a small island at the extreme Southern tip of the Peloponnese, this move being followed on September 23 by the dropping of a small party of paratroops at Araxos in the North-west Peloponnese; these two parties carried out reconnaissance and succeeded in clearing the major portion of the Peloponnese of Axis troops. By October 10, Megara airfield 20 miles west of Athens was in British hands. It had been planned to make

a mass parachute drop there at a later date but owing to the rapid advance of the two small parties and the desirability of exploiting their success by pressing straight through to Athens with the minimum of delay, certain changes were made in British plans and a small force, was dropped on the airfield on the 12th and the balance brought up later. Meanwhile, on the 11th, sea convoys were mounted from Italy and the Middle East. The first drop on Megara on the 12th (by the 2nd Independent Parachute Brigade) was little troubled by enemy action except for sporadic shelling but suffered serious casualties and loss of stores owing to high winds. By the 14th, the Commandos from Kythera had crossed from Poros to Piraeus and moved into Athens on the heels of the retreating Germans. It was fortunate that opposition was slight as high winds prevented the back-up para-drop on the 13th, although gliders succeeded in landing airfield construction equipment. The para-drop was completed on the 15th although aircraft landings were still impossible owing to heavy rains which had caused subsidence of the runway patches hastily put in to repair the damage caused by German demolition.

By the 17th, Kalamaki airfield was serviceable and this was used henceforward for re-supply and landings of personnel. Delay and casualties due to enemy mines also held up the sea parties for some 24 hours. During this period and the following week, aircraft of Balkan Air Force flew many hundreds of sorties in support of the landings and also raided enemy concentrations in ports and inland road and rail communication centres, as Axis troops retreated northwards. Guerrilla and Allied air forces continued to harry the retreating enemy north from the Athens area toward Salonika and eventually out of Greece altogether. This clearance left the Axis troops on the Aegean Island ring so completely cut off from shipping or air lift that none but very senior officers or top technicians could ever hope to escape, while re-supply was also made practically impossible. To add to Axis difficulties, Greek-based aircraft and ships were in an excellent position to step up attacks on the little remaining inter-island shipping and occasional night flying aircraft from the north.

#### THE GREEK ISLANDS

On October 4, 1944, the island of Samos was once again in British hands and most of the other small islands fell rapidly. Syros, in the Cyclades, fell on October 13 and was followed on the 15th by Naxos and Lemnos—commanding the approach to the Dardanelles; Scarpanto (between Rhodes and Crete) and Santorin (at the base of the Cyclades) fell on the 17th and 18th respectively. After the fall of Naxos and Santorin only Melos of the Cycladean group remained in German hands and this they appeared determined to hold at all costs.

By October 30 Salonika, the last of the escape ports, fell to British troops but still the Germans on the islands continued to fight and not infrequently raiding parties sallied forth to attack islands where our stores were being received.

By the end of the year only Crete, Rhodes, Leros, Kos and Melos remained in German hands and there were ever-growing signs of unrest among their troops in the form of refusal to work, desertion and mutiny. On the islands were approximately 19,000 German and 5,000 collaborationist Italian troops, the majority—some 13,000 Germans—being on Crete, concentrated mainly in the north-west corner; their food supplies were fairly adequate but distribution between the islands had become very difficult by the end of the year, because of the attacks by Allied naval and air forces.

It was British policy not to 'winkle' out these outposts but to leave them alone except for periodic bombing and raiding, the latter being carried out mainly by Greek forces.

On May 9, 1945, the surrender of all Germans and Italians on the islands was negotiated on the island of Symio. An interesting feature at this juncture was the holding of the 13,000 Germans in north-west Crete by less than 100 Army and R.A.F. Regiment personnel.

#### MEDICAL NARRATIVE

Air Headquarters, Greece (known as Air Headquarters, 'X' in the planning stages), was formed in Italy in the late summer of 1944. Under its control was a Wing Headquarters with a varying number of squadrons, an Air Stores Park and a Repair and Salvage Unit. Certain units of the new formation were to come from the Middle East Air Forces, being transferred to the control of Air Headquarters, Greece, on their arrival in that country; Air Headquarters, Greece, was, in turn, controlled by Headquarters, Balkan Air Force in Italy.

The Senior Medical Officer, Balkan Air Force, was kept constantly informed as plans to return to Greece began to harden, and when Air Headquarters, 'X' was formed he was in a position to discuss with the S.M.O. designate the necessary plans for medical and other personnel, equipment and casualty evacuation. As plans for the operation advanced, they held a conference with the D.D.M.S. of the Army Forces and the S.M.O. of the 2nd Independent Parachute Brigade. At this meeting it was arranged that the Parachute Brigade's surgical team would treat and hold all casualties from any Service in the initial stages and that Balkan Air Force aircraft would evacuate them to Italy until Army hospitals could be set up in Greece. It was also agreed that urgent medical requirements in respect of stores or special equipment should be notified to the S.M.O., Balkan Air Force, who would arrange for the materials needed to be flown in without delay. Arrangements

were also made for ultimate air evacuation from Greece to Italy as a routine measure once the British Forces were established in Greece and suitable airfields were available.

The first Royal Air Force party in Greece was a refuelling and rearming unit which landed in Araxos in the northern Peloponnese at the beginning of October, while the main party landed by sea at Athens on the 17th. Air headquarters was established at Kephissia some 10 miles north of Athens and a unit station sick quarters was opened there, operating initially on its Z.1 equipment. Wing headquarters was set up at Hassani (formerly known as Kalamaki) airfield and established a 30-bed sick quarters which in the main catered for the smaller units in the vicinity.

Both of these sick quarters admitted their more serious cases to, and drew their medical supplies from, 97 British General Hospital, which was located about half way between Athens and Kephissia and consequently cut off during the E.L.A.S. rising. During this rising the Air Headquarters was overrun by E.L.A.S. troops but some personnel of the station sick quarters, including the M.O., were rescued and subsequently set up an air headquarters unit station sick quarters in a building in Athens which had formerly been an industrial medical clinic. Subsequent to the E.L.A.S. truce a further British Army general hospital was opened, close to Hassani airfield and later, another was opened at Salonika.

Living conditions for R.A.F. personnel in Greece were extremely varied and depended largely on the extent of Allied bombing and German demolition in the area. Many otherwise suitable buildings had lost doors and windows through blast, and sanitary fittings had frequently been put out of action by retreating Germans. Consequently much patching up was necessary and often latrine buckets had to be used in relatively modern buildings. Water supplies were a further difficulty in Athens as the low level of the Marathon dam made frequent 'water off' periods a necessity. With these considerations in mind it was decided that for many units tented accommodation was preferable to such buildings as existed in the areas in which they were required to operate. However, as time went on, much improvement was achieved by self-help\* and with the assistance of the Royal Engineers both in living and recreational accommodation.

#### MEDICAL PROBLEMS

*Endemic Diseases.* With the background of medical knowledge gained in the campaign in 1941 the endemic disease situation found on entry to Greece was less serious than had been expected. Water supplies were

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\* Most of the troops involved in the operations were 'seasoned' and adept at improvising reasonably comfortable living conditions.

in general untainted although a few localised outbreaks of waterborne disease did occur, being due apparently to the cracking of adjoining water and sewage mains through bombing or, in a few instances, deliberate enemy sabotage.

During the E.L.A.S. uprising it was feared that typhus might break out in Athens but although cases were reported the numbers never reached epidemic proportions. Typhoid, except for waterborne cases as mentioned above, was negligible.

*Malaria.* Malaria was a major problem in Greece and one which German occupation forces had apparently made no effort to combat except in their own immediate areas. R.A.F.-Army-U.N.R.R.A.-Greek collaboration on the problem was established as quickly as possible. The R.A.F. operated two D.D.T.-spraying Baltimores flown by Greek Air Force crews and in the areas sprayed were credited with 100 per cent. kills. R.A.F. casualties from malaria were not unduly high and were largely due to failure to take full personal precautions. Sandfly fever, on the other hand, claimed many victims, especially at the Rest Camp in its early days in the warm spring of 1945.

*Venereal Disease.* Venereal disease remained a permanent nightmare for M.Os. who served in the Athens area. In few other theatres was it so rife, or the facilities for contracting it so freely offered by amateur and professional prostitutes. Every known device was tried as a deterrent, including small-group talks, posters, films, brothel-raiding by Service police, appeals in daily routine orders and visits to a museum containing medical coloured wax exhibits.

*Food and Messing.* For British Servicemen food in Greece, except during the period of the E.L.A.S. rising, was adequate though monotonous. There were times when it seemed that all the remaining dehydrated food in the Mediterranean area was finding its way to Greece, but this was probably a general impression everywhere. The situation was relieved to some extent when it became possible to eat in local restaurants but high prices limited the extent to which this could be done.

*Morale.* On the whole R.A.F. morale in Greece was high. Many of the troops realised that for them the war was virtually at an end and that the war in Europe was nearly over. The local inhabitants were friendly and many spoke English. For British troops in the Athens area there were clubs, canteens, cinemas and sport and for the less affluent a rest camp was in operation near the beach a few miles from Hassani, with daily transport to and from Athens.

#### THE E.L.A.S. RISING

Although the E.A.M./E.L.A.S. party apparently joined wholeheartedly in welcoming the Greek Emigré Government back to Athens

on October 18, 1944, it soon became apparent that the political strife had not yet died down. By the end of November it was evident that E.A.M.'s. terms for peace were leading to a crisis.

On December 1, since it was known in London that E.L.A.S. planned to seize power in Athens by military force, General Scobie, British Military Commander in Greece, broadcast a promise to protect the Greek Government and people against acts of unjustifiable violence or any attempted *coup d'état*.

On December 3 a general strike began in Athens and as a result the Government withdrew permission for a political demonstration. The ban was ignored and eventually shots were exchanged between crowds and police. E.L.A.S. forces then began a rapid infiltration of the city and on the 4th fighting broke out in many parts of Athens. British troops, tanks and aircraft were soon heavily engaged in the city and the surrounding area.

On the 15th the S.M.O. Air Headquarters, Greece, was taken prisoner by E.L.A.S., together with 3 ambulance drivers and their vehicles, while on the way to 97 British General Hospital; on previous days E.L.A.S. had permitted this run but their action this day proved typical of their inconsistent attitude. The runs were made to assist the Army in transporting casualties between 97 British General Hospital and Hassani airfield for air evacuation. The hospital itself was completely cut off by E.L.A.S. forces, but the latter agreed to the movement of personnel between hospital and living quarters at specified hours to enable them to change duties without risk of being shot. This concession was undoubtedly influenced by the fact that E.L.A.S. personnel were being treated at the hospital.

After the capture of the S.M.O. the A.O.C. Greece directed the Wing S.M.O. at Hassani to take over air evacuation. The latter was not able to maintain contact with 97 British General Hospital, so from then onwards all casualties were taken to field ambulances and from there to wing sick quarters, Hassani.

On December 19 Air Headquarters ran out of ammunition and was forced to surrender some 4 hours before the relief column broke through. Some of the medical staff were rescued, however, and re-organised medical services in Athens as previously described.

By the end of December E.L.A.S. were breaking in Athens and the fighting which had spread outside the city was virtually over. Cease fire was eventually observed on January 12, 1945, and exchange of prisoners commenced at once.

From the time they were taken the marching columns of R.A.F. prisoners were followed by aircraft and as soon as agreement was reached with E.L.A.S. food and medical supplies were dropped to them. Up to that point the prisoners had marched a long way on

minimal rations and virtually without medical care except that which S.M.O. Greece, himself a prisoner, could provide. All were lousy, hungry and footsore, many had respiratory infections and a number were wounded. Once the truce was observed all were quickly given full medical care and no serious disabilities resulted.

# CHAPTER 10

## THE LIBERATION OF EUROPE: OPERATION 'OVERLORD' 1944-1945

### General Narrative

#### OPERATIONAL NARRATIVE

**T**HE IMMENSE STRATEGIC PLAN for the Liberation of Europe comprised three distinct but closely integrated operations: the assault on Normandy from Britain, the landings in the South of France from the Mediterranean and the attacks on the Eastern borders of German-occupied territory by the Russians. It is with the first named of these operations that the present narrative is concerned.

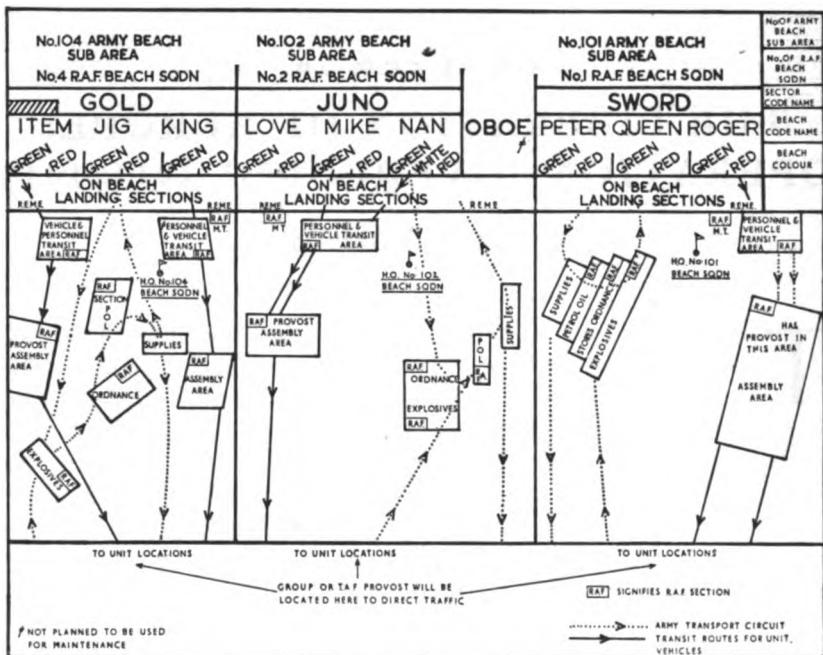
The plan for the invasion of Normandy was based, as far as British forces were concerned, on the most complete co-operation of the Royal Navy, Army and Royal Air Force which had been achieved in any campaign of the war.

The general plan was to assault the chosen areas with the specified number of divisions carried in landing ships and other craft, supported by airborne operations, on the first tide of D-day; to follow up with further formations landed on the second tide; to fly-in additional airborne forces the following day and on subsequent days to build up, at a specified rate, the forces so landed.

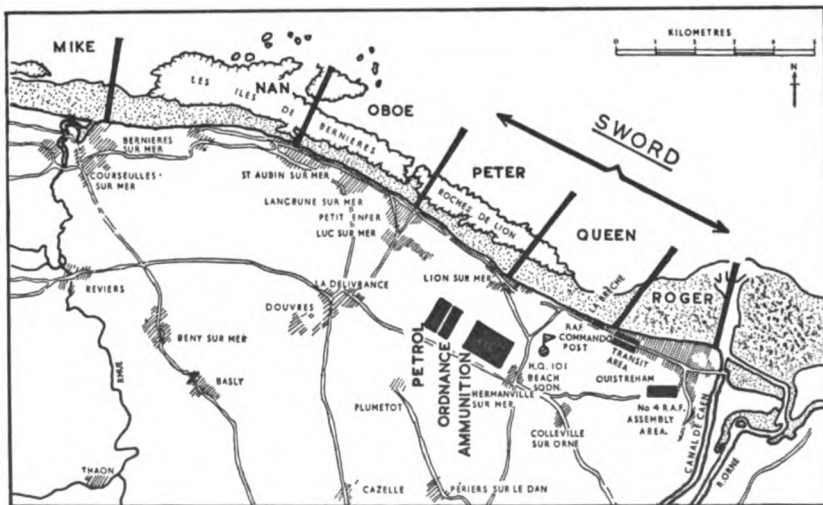
To ensure the smooth working of this vast plan it was essential that all key personnel should be aware not only of their immediate objective and duties on landing, but of the exact movements of their units throughout the whole phase; at the same time it was vital that no indication should be given of the actual areas concerned. Accordingly, while in the concentration area, after the camps had been 'sealed', all key personnel were shown very large scale maps of the exact locations they were to take up in 'Enemy Occupied Territory', with details of their immediate objectives; the maps were marked with code names only and the scale used was so large that recognition was impossible. The code names used (*see* Maps 1 (a) and (b)) are now a matter of history, but at that time they fulfilled their purpose so effectively that nobody out of the vast number of personnel who were briefed had any inkling of his destination.

The aim of the air forces was to attain and maintain an air superiority which would ensure freedom of action for our forces without effective interference from the enemy, and to provide air support for our land and naval forces in the achievement of their objectives.





MAP I (a). Beachhead area as shown in code map.



MAP I (b). Relation of code map to actual area.

It was planned that air cover should be provided initially from United Kingdom bases during the early stages of the operation, but as fighter aircraft operating from Britain would use more than half their endurance in flying to and from the Normandy battle area, it

was important that there should be no delay in securing landing strips with adequate facilities for maintenance, rearming and refuelling in Normandy. The construction of landing grounds was therefore an immediate priority and suitable sites were among the initial objectives after storming the beaches. The possible areas were thoroughly surveyed from the air long before the day of invasion and sites, each with several alternatives, were selected. It was expected that on D-day one emergency landing strip would be prepared and that by D-day + 3 two refuelling and rearming strips would be ready which could later be developed into advanced landing grounds; by D-day + 8 there should be five advanced strips and by D-day + 40 this number, it was estimated, would have increased to twenty-seven.

Most of the Royal Air Force personnel and equipment were to go in by sea, but flying and key wing personnel (A Echelon) were to be sent in by transport aircraft to specified landing grounds when the latter were ready to become operational; urgent freight and ammunition was also to be carried in these aircraft.

Arrangements made for the supply of rations and other such essential commodities to the personnel of the invasion forces will be discussed fully later, but it is of interest to note here the consideration given to other matters directly or indirectly affecting the well-being of the men, and therefore of great importance to morale. An example of the minutiae of the planning was the organisation envisaged for the receipt and despatch of mail, which demonstrates, incidentally, the importance now attached to this subject in its relation to morale, in striking contrast to conditions in earlier campaigns—notably West Africa. From D-day + 1 onwards a daily sea service of mail to and from the United Kingdom was to be available, and parcels and packet mail was to be delivered and despatched from D-day + 6. Field post offices, where postal orders could be bought and cashed, were to be established in the Detail Issue Depots from D-day + 1 onwards and unit postal orderlies were to be appointed for the collection and delivery of mail.

#### JUNE 1944

Originally planned for June 5, the Invasion of Normandy had to be delayed for 24 hours as the weather in the Channel was unfavourable for the large number of ships, many of them of a small size, which would have to make the passage of 30 miles. It was also deemed unwise to risk the prefabricated sections of the Mulberry harbours, a cornerstone in the successful build-up of materials in the beachhead, in the relatively high seas—a decision which was justified when Mulberry sustained damage in less rough weather later in the month, and particularly in the gale of June 19–20. (*See* Plates XLIX (a) and (b).) Apart

from these considerations, it was realised that if the sea was unduly rough large numbers of men would arrive on the beaches in no condition to fight for their lives.\*

Even greater dependency was placed on the weather by the R.A.F.—conditions had to be suitable, both at home airfields and over the Continent, for the take off and accurate landing of gliders and paratroops, while good visibility on the Normandy coast was needed for both high and low level attacks by fighters and bombers.

Just before dusk on the evening of June 5, there crossed the coast of Southern England a vast air armada, comprising many hundreds of troop-carrying gliders, with their tugs and escort aircraft, all painted in the later familiar black and white stripes to aid recognition of friend from foe in the inevitable *mêlée* which would ensue. (See Plate L.) The vessels taking part in the sea invasion had already left and the initial assaults to gain the beachheads were timed for the small hours of the following morning, when it was hoped to consolidate the position of the considerable airborne forces which would already be in action. The success of the landings and the part played by airborne forces, Mulberry harbour and other projects are well known and do not properly form a part of this narrative.

Among the first medical personnel of the Royal Air Force to set foot in Normandy was the advanced surgical team of No. 50 Mobile Field Hospital, acting independently of the main field hospital which was to arrive on June 14. This advanced unit landed on the evening of D-day and took up a position near an emergency fighter landing strip, which had been constructed in an amazingly short time by the use of prefabricated steel planks (P.S.P.) and allowed any Allied fighter aircraft which were in difficulties due to enemy action or mechanical failure to make an emergency landing on the French side of the Channel even at this very early juncture. The team was able to offer full surgical aid to both R.A.F. and other Service units in the area.

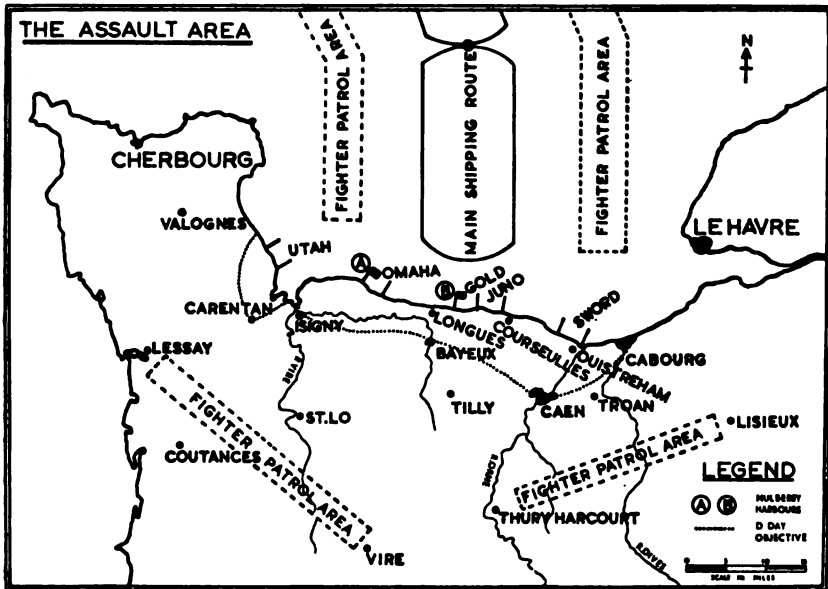
Other medical personnel included in the advance parties of early R.A.F. units were those of No. 83 Group Control Centre, Embarkation Units and the Senior Medical Officer of one of the advanced airfields, who acted as co-ordinating medical officer pending the arrival by destroyer of the Senior Medical Officer of No. 83 Group, to fill the gap caused by the death of Squadron Leader Grant (see R.A.F. Volume II, page 620). No. 83 Group S.M.O. arrived on D-day + 2, as did the advanced surgical team of No. 52 Mobile Field Hospital.

The work of the advanced surgical teams was less than expected owing to the relatively small amount of damage inflicted by the Luftwaffe; the latter found the beachhead area extremely unhealthy, for

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\* In fact, very many personnel, in spite of taking anti-seasickness tablets, arrived in a state of abject prostration.

Allied fighters had established overwhelming air superiority and, during the hours of daylight, formed a protective umbrella over the area. (See Map 2.) By D-day + 8 (June 14), when the remainder of



MAP 2. Area patrolled by fighter aircraft in protection of the Bridgehead.

No. 50 M.F.H. arrived, the unit was able to organise casualty evacuation from a nearby airfield (*see* section on Casualty Air Evacuation, page 502), utilising transport aircraft returning empty to England; in these duties they were greatly assisted by two nursing sisters whose presence had a very beneficial psychological effect on the casualties. On D-day + 12 (June 18) the first half section of the Casualty Air Evacuation Unit arrived and No. 50 and No. 52 M.F.H. (which had arrived earlier that day) reverted to their normal duties.

During June the whole of No. 83 Group became established in Normandy, approximately 30 squadrons using ten airfields, and their supporting units being suitably located. Most of the wings had the additional facilities of advanced airfields established on the South Coast of England, allowing pilots an alternative landing ground.

On D-day + 1 the bridgehead was approximately 22 miles long by 10 miles deep and three days later two refuelling and rearming strips had been prepared and were in constant use. From then on airfields were prepared at the amazing rate of one every two days, this being accomplished by the employment of special airfield construction units using American bulldozers and automatic graders. It was largely through such efforts that local air superiority was achieved.

Conditions for the R.A.F. in the beachhead area were not as unfavourable as had been expected and by day little enemy action was encountered, largely because of the almost continual sorties flown by our fighter aircraft based in the bridgehead area, who within a very few minutes of take off were in the combat zone. This constant activity, however, combined with the very rapid servicing on advanced airfields, meant that pilots were under a very considerable strain; the nights were noisy owing to prowling raiders and the almost ceaseless rumble of nearby guns, and many personnel found sleep difficult; nevertheless, morale was never higher.

#### JULY 1944

This month was notable for the continuous build up of all units in preparation for the expected breakout from the beachhead area. Medical arrangements were made in accordance with the static nature of the airfields and the relatively few casualties, the mobile field hospitals accepting casualties from all Services and passing them on to the casualty air evacuation units for speedy evacuation to Wroughton in England (*see* R.A.F. Volume I, page 252). Nos. 50 and 52 Mobile Field Hospitals were both moved several times and although this was done not so much for operational reasons as to conform with a policy of concentrating hospital facilities in a definite area, these moves in full operational conditions gave practice to the personnel of the units which later proved valuable.

#### AUGUST 1944

During August the entire picture of the battle changed in favour of the Allies and the Tactical Air Force was able to distinguish itself on two separate occasions. On August 2, Typhoon aircraft of the Tactical Air Force located and attacked the 9th and 10th S.S. Panzer Divisions which had been urgently called forward by General Bayerlein to counter the mounting attack on Caumont (Operation 'Bluecoat'), which had been launched by the British Second Army on July 30; these two crack Panzer divisions were most severely mauled by our aircraft before their counter attack at Mortain was mounted; subsequently, on August 7 and 8, even greater damage was inflicted.

These successes were followed by the historic battle of the 'Falaise Gap'. The United States Forces broke out from the beachhead area and struck southwards and then eastwards from Brittany to Argentan. Simultaneously with the American thrust northwards from Argentan, the Canadians and British attacked with all available forces from Caen in a southerly direction (Operation 'Totalize'). By August 17 the German High Command realised that the position was deteriorating rapidly with no signs of a slackening of Allied pressure, and they

ceased to pour reinforcements westwards and attempted to withdraw their forces through the narrowing Falaise Gap.

Air activity on our side increased to a maximum, the enemy being harried unceasingly by all available aircraft. The chaos among the retreating Germans during the four days of the main retreat was unimaginable; hundreds of tanks, mechanical vehicles, guns and all types of supplies were destroyed, and Allied aircraft as well as continually strafing the German forces, were blowing up bridges in their rear, sinking barges in canals, and disorganising railways. In short, the Tactical Air Force, in carrying out the task for which it was created, exploited this opportunity to the full extent of its power. Nevertheless, this effort was not accomplished without considerable loss.

Following hard on this advantage the breakout from the beachhead began. This action, coupled with the enemy's rapid withdrawal, resulted in our advanced land forces often being out of contact with the enemy and soon single-seater fighters and fighter/bombers, based in the beachhead area, were operating at extreme range; in fact, some of these aircraft, running short of petrol, landed at Lympne in preference to attempting a return to their airfields in Normandy. The British Army advanced rapidly towards Amiens, which was soon in our hands, and from whence two armoured divisions pressed on to the Belgian frontier and finally to Brussels. While the British advance was taking place the Canadian Army advanced rapidly north, taking the main Channel ports and destroying or capturing the V.1 launching sites, which were situated mostly in the Pas-de-Calais area; this provided welcome relief to those areas of London and Southern England which had been under fire from these missiles for the past two months.

The rapid advance of our forces and the extent of the area over which we now held control justified the setting up of a R.A.F. general hospital and in the middle of August the main party of No. 8 Royal Air Force General Hospital arrived, the hospital being fully operational in its tented accommodation in the Bayeux area by the end of the month. The arrival of this hospital allowed No. 50 Mobile Field Hospital to move forward on August 29 in support of the advancing airfields and to become established at Moiseville between Évreux and Nonancourt.

#### SEPTEMBER 1944

During September the rapid advance continued across France and Belgium with Holland as the objective. Advanced elements of British Army units reached Lille on the 2nd, Brussels on the 3rd and Antwerp on the 4th. The middle of the month saw the gallant tragedy of Arnhem in which the airborne troops, flown in by Nos. 38 and 46 Groups, so

distinguished themselves in a vain attempt to provide a link between the advancing Armies.

By this stage of the offensive a very close liaison had grown up between the Allied ground and air forces and when certain enemy strong points offered determined resistance, rocket firing aircraft would be summoned to deal with the situation.

The general advance eastwards of the armies necessitated a further re-distribution of medical and other R.A.F. units. In the early days of the campaign the movement of units was bound up with the construction of airfields, wings and their ancillary units moved forward as soon as airfields became operational, and medical units moving with them to provide the necessary cover. Moves which affected mobile field hospitals brought to the latter one particular problem which did not have to be faced by non-medical units—that of clearing the hospital before it advanced, as it was obviously impossible as well as pointless for it to move with its complement of patients. To meet this difficulty a method of 'leap-frog' advance was devised, particularly among units of Nos. 83 and 84 Groups; thus, an M.F.H. would be covering the most forward area, but when new airfields opened up, perhaps 40–50 miles ahead, instead of this M.F.H. moving forward, a rearward M.F.H. would advance, passing the first M.F.H. and camping to cover the new forward area; patients would then be evacuated from the M.F.H. now in the rear so that it in turn would be ready to 'leap-frog' ahead as soon as further airfields became operational. (*See Map 5.*) Patients were usually evacuated *en bloc* to England, using the casualty evacuation scheme, or transferred to other M.F.Hs. or base hospitals. Wherever the leap-frogging plan was not in operation it was found most necessary that a party from the M.F.H. should be sent ahead to find a site suitable for the hospital, for non-medical personnel would often allot sites which, though satisfactory from the field aspect, were entirely unsuitable for the work of a M.F.H. It was found most convenient to send the surgical section ahead to undertake this task, the party consisting of surgeon, anaesthetist and ten medical airmen, taking with them the operating tent and one tented ward. As soon as this party arrived and had approved the site, or selected a new one, tented accommodation was set up and the necessary local liaison carried out. The small surgical section could then begin work, usually before the rest of the M.F.H. arrived.

#### OCTOBER 1944

As might be expected this month saw the rate of advance steadily decreasing in view of the poorer weather and the obvious need to stabilise a line which could be held during the winter. To these factors must be added the stubborn and ever increasing resistance offered by

an enemy who recognised that our advances were becoming a serious menace to Germany. As part of his defensive strategy the enemy made use of dykes, rivers and canals, to flood large areas of low lying country with water—an aim not difficult to achieve in Holland and North Belgium. The stiffening enemy resistance combined with these not inconsiderable geographical hazards produced some of the most bitter fighting of the campaign.

On October 1, the Channel port of Calais fell to the Canadian Army after a most stubborn defence by the enemy. In the final attacks on the port heavy bombers and fighter/bombers of No. 2 Group provided invaluable aid in the liquidation of strong points and pockets of resistance and materially assisted in limiting the number of casualties sustained by the Canadian Forces. A further area of most determined fighting opened in the Bresken Pocket, this phase not being satisfactorily concluded until the 22nd; the enemy suffered many casualties but they were never completely encircled.

A new danger was encountered during this month when the Germans used their mobile V.1 and V.2\* launching units to bombard the Port of Antwerp, much used by the Allies for supply purposes, and Brussels; although the damage inflicted by these weapons was slight their morale destroying propensities were great, as had been noted in the earlier attacks from the Pas-de-Calais on the London area.

On October 13, His Majesty King George VI arrived in Antwerp and among the many units he visited was the casualty air evacuation unit at the Antwerp/Deurne airfield. His Majesty was pleased to talk to casualties and members of the R.A.F. staff handling them and expressed his satisfaction with the speedy methods of evacuation.

Towards the end of this month another factor which influenced the speed of advance began to be felt increasingly—namely, the now distant and attenuated lines of supply. It had not as yet been possible to open any port capable of handling the appreciable amount of traffic and cargo required to supply our now very considerable forces in the field, and it was still necessary to use the bridgehead, now so far in the rear, for this purpose.

#### NOVEMBER 1944

November, although again reflecting the tendency towards stability of the lines on both sides, was a month of considerable action. On the 3rd and 7th very heavy raids delivered by Bomber Command succeeded in breaching the dykes on the island of Walcheren; this was followed by a sea assault, closely supported by the Second Tactical Air Force

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\* V.1, known to the Germans as the FZG76, carried 2,000 lbs. of explosive and had a range of 130 miles at 350 m.p.h. V.2, known as A4, weighed 13½ tons and carried 1 ton of explosive; it had a range of 200 miles, ascended to a height of 60 miles and reached speeds equivalent to Mach 9.



which, despite most unfavourable weather for flying,\* pressed home attacks both behind the enemy lines and in immediate support of our troops, again demonstrating the high degree of co-ordination attained by our land and air forces. By the 4th all enemy resistance, with the exception of some small and unimportant pockets, had been crushed and our minesweepers were able to enter the Scheldt Estuary, thus opening the sea route into the important and relatively undamaged port of Antwerp; this was a major strategical advantage, for it gave the Allies the benefit of a deep water port and made it no longer necessary to rely solely on the long supply lines from the initial bridgehead.

Unfortunately the Germans were also aware of the value of Antwerp to the Allies and intensified their V.1 and V.2 attacks on the port, which not only caused considerable damage and a number of deaths but also affected the morale of the more timorous; these weapons were always found to cause more psychological trauma than actual damage, the V.1 because of the atmosphere of suspense created by each flying bomb and the V.2 by the sense of helplessness it engendered through the impossibility of taking defensive measures against it. This bombardment caused the P.M.O. to move the casualty air evacuation section from Antwerp to Brussels, largely because of the effect it was having on the casualties, who were, naturally enough, more apprehensive than those who were unwounded. The move proved timely, for a few days after it had been vacated, the large house on the outskirts of Antwerp which had accommodated the section was entirely demolished by a 'V' weapon.

Apart from the move of the C.A.E. section there were no changes of location among the M.F.Hs. during the month, most units now being in permanent accommodation for the first phase of the winter campaign.

#### DECEMBER 1944

In most campaigns an important part has been played, either directly or indirectly, by the weather; this was certainly the case in December of 1944, when the weather was very closely bound up with the dramatic occurrences at the end of the month. In the early part of December there was persistently bad weather, rainfall being both heavy and continuous and followed by fog, snow and ice, which turned the roads into quagmires and rendered life very unpleasant, even though troops were for the most part billeted in permanent buildings. But the most serious consequence was the effect such weather had on flying, which was often impossible and at best hazardous, so that reliable information could not be obtained from reconnaissance.

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\* A medical officer recalls that the briefing of one Typhoon Wing was 'to get back how they could, if necessary by baling out'. There were no airfields open when they took off.

It was under cover of these conditions that General von Rundstedt was able to build up, concentrate and initiate his counter-thrust through the Ardennes against the Allies who, although their suspicions had been aroused, had been unable to obtain accurate information; reconnaissance aircraft of the American Ninth Air Force had reported concentrations of troops suggestive of a full scale offensive, but this report had been obtained on one of the few days on which flying and observation were possible and unfortunately a period followed during which no flying could be attempted. For the first few days of the offensive, therefore, all troops were standing by to move at a moment's notice and a general air of uncertainty surrounded the whole situation.

This very natural apprehension was not lessened by reports of enemy troops waiting to strike south from Holland to Breda and Antwerp, as soon as the Ardennes 'push' approached Brussels; such a manoeuvre, if successful, would involve the encirclement of practically the whole of the Tactical Air Force—a disaster of the greatest magnitude.

However, with the reopening of communications and more accurate reconnaissance as the weather improved the true position became known and all faced the attack with confidence; as a result, the enemy advance was halted by the end of the year, although not without considerable cost to the Allies in both personnel and materials of war.

The enemy attack, which was heaviest in the American section, necessitated the transfer, as a temporary measure, of two wings from the Second Tactical Air Force in support of their American counterparts. The aircraft of these wings were most effective in destroying enemy armoured vehicles and tanks, material which von Rundstedt could, at this stage, ill afford. However, it was undoubtedly the intervention of our Bomber forces when the weather had cleared, which totally disrupted von Rundstedt's lines of communication, both halting the advance and materially hindering withdrawal.

This sudden increase in enemy activity and the redistribution of our forces necessitated moves by the medical supporting units; these are detailed below:

*No. 54 M.F.H.* Retired to Boom on December 11, taking over a school house and opening as a static hospital between Antwerp and Brussels.

*No. 53 M.F.H.* Moved to Oudenbosch, west of Breda, taking over a civilian hospital. Owing to reports of enemy action in the area withdrew to join *No. 54 M.F.H.* at Boom, on January 1, 1945.

During this period all medical units were kept busy and there was a continual flow of casualties into the M.F.Hs. As the latter were now

housed in relatively permanent buildings the immediate evacuation of casualties on medical grounds became less urgent, but from the administrative point of view it was gratifying to know that if the need should arise it was possible, by using the air evacuation chain, to empty the M.F.Hs. in a very short space of time; with the possibility of an enemy advance, this might become imperative.

The V.1 and V.2 bombardment, which at this time the enemy was mounting to his full ability, was a matter of some embarrassment to all units, including medical formations. On December 21 a V.1 landed approximately 200 yards from No. 8 R.A.F. General Hospital, Brussels; there were no serious casualties, but considerable damage was done to the windows of the building—a matter of some importance to a hospital in winter. Temporary measures to fill in windows met with some success but the efficiency of the hospital was considerably impaired.\*

One incident which resulted indirectly in a number of minor casualties was reported at Grimbergen, six miles from Brussels, where a Polish wing had been established on a temporary airfield. During the night a V.1 landed, fortunately without exploding, the missile completely blocking the entrance to a dormitory hut. The occupants of the hut, in their confusion, left *via* the windows without first stopping to open them and sustained cuts to feet and shoulders in the process.

#### JANUARY 1945

The new year began badly for the Allies, being heralded by a full scale air attack by Me.109s and F.W.190s on all airfields north of the Brussels–Ghent–Bruges line. The attack was well-timed, for apart from it being New Year's Day, the majority of the airfields were un-serviceable due to ice and snow, and the men, knowing that no flying would take place that day, were indulging in whatever celebrations it was possible to organise in a battle area.

The attacks were pressed home by the enemy with the greatest of determination and were over in 25 minutes; if the German aircraft had returned home immediately their losses might have been trifling, but as it was many of them stayed in the vicinity of the airfields attacked to assess damage and they were consequently met on their way home by Allied fighters which had taken off from the few serviceable airfields immediately they received news of the attack.

The numbers of Allied aircraft destroyed in this surprise attack were considerable and included the six Sparrow casualty air evacuation aircraft—a sad ending for aircraft which had given such sterling service in the early days of the campaign. (*See Plate LI.*)

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\* In view of this and similar occurrences, it is worthy of consideration whether hospitals which are likely to function in forward areas should be issued with supplies of temporary plastic glazing.

The figures for aircraft destroyed and damaged were as follows:

*Losses to Second T.A.F. and Ninth U.S.A.A.F.*

138 operational aircraft destroyed  
 111 " " damaged  
 17 non-operational aircraft destroyed  
 24 " " " damaged

*Losses to other R.A.F. Commands*

12 operational aircraft damaged  
 5 non-operational aircraft damaged

*Total Loss to Allies*

155 aircraft destroyed  
 152 " damaged

*Enemy Losses (Approx.)*

200 aircraft of all types destroyed or damaged.

Casualties to Royal Air Force personnel were less than might have been expected, totalling 40 killed and 145 seriously wounded, plus an unknown number who suffered slight injury. At B.56 airfield, Brussels, a large number of patients had been waiting in a holding unit for loading on to Dakota aircraft parked on the airfield; it was fortunate that emplaning had not commenced for the entire Dakota fleet was destroyed and if the aircraft had been loaded the casualty rate would inevitably have been very heavy.

Early in the month the German drive through the Ardennes lost impetus against a stiffening Allied resistance and by the middle of the month the attack had been halted and an enemy withdrawal from the salient began. This allowed No. 53 M.F.H. to leave No. 54 M.F.H. at Boom and return to its original site at Oudenbosch on January 23.

During the month all aircraft of the Tactical Air Force carried out strikes and reconnaissance whenever the appalling weather allowed. Their tasks included that of 'interdiction', involving the cutting of railway and road bridges behind the enemy in the Ardennes salient and also in those areas where it was known that rocket-firing units were situated; the units themselves, which were small and mobile, presented a difficult target, but the cutting off of their supplies proved effective, as was shown by the lessening bombardment.

The climatic conditions of rain, snow and cold had other effects besides that of interfering with flying; communications were interrupted as roads were turned into quagmires by heavy traffic and armoured vehicles, the movement of all supplies was similarly affected and as fuel in any form for heating was scarce the warming of living quarters was often well-nigh impossible; repercussions were seen in the general sickness rate in relation to minor illness, and as curtailment of the flying programme affected the transmission of casualties by air, all hospitals began to find the housing of their minor sick something of a problem.

It is interesting to note, however, that even in such conditions it was possible to arrange 'refresher' courses for medical officers who could be spared from their units. These courses, which were given in the light of medical experience of actual war conditions during the past month, were organised at No. 8 R.A.F. General Hospital at Brussels and lasted for 14 days; shorter courses, of 7 days' duration, were held at the M.F.Hs. The value of these courses was considerable, not only in the opportunity they afforded for making known the most recent advances in treatment, but also in welding medical personnel into a closer union by allowing people who until then had been only signatures on forms or instructions to meet one another and discuss their problems.

#### FEBRUARY 1945

Although the weather had been a vital factor in the fighting of the previous month, it became of even greater importance during February. In the early part of the month the thaw commenced, rendering the majority of roads well-nigh impassable; this was particularly the case on airfields where brick roads had been laid, for the surface of the road thawed and the underlay remained frozen, so that the passage of a single vehicle caused the road to break up; cobble and dirt roads were similarly affected and the only ones in any way usable were those constructed of tar macadam. After heavy units or armoured vehicles had passed conditions were chaotic, with the result that many units were forced to become static and any move was only accomplished with the greatest difficulty and discomfort to personnel. Conditions in the Nijmegen area were particularly serious and on numerous occasions stacked ammunitions and heavy stores sank irrecoverably into the ground. Nevertheless, despite these conditions (which were, incidentally, equally unfavourable for the enemy) the advance got under way.

The weather did, however, provide one good thing—winter sports! It was possible to open a rest camp at Mageve, which was used to provide a short rest for aircrew personnel of No. 83 Group, and this facility was greatly appreciated, particularly by the Canadian aircrew who were, not surprisingly, skilled in such sports.

Preparations were now in full swing for the advance to be mounted by the Canadian First Army and British XXX Corps striking south from Nijmegen between the Rivers Rhine and Maas (Operation 'Veritable'). The operation began with a 'softening up' raid carried out by 900 bomber aircraft on Goch and Cleve on February 7; this was followed on the 8th by the ground assault proper which resulted in some most bitter fighting owing to the determined resistance put up by the seasoned enemy paratroops defending the Siegfried Line. Nevertheless,

the fact that the fight had at last been carried on to German soil provided the greatest possible spur for the Allied troops.

The latter part of the month saw a marked general improvement in flying conditions and the number of sorties flown increased very considerably, although many of the airfields were still in poor condition because of partial flooding. One feature of the aerial warfare was the increasing use of rocket-firing aircraft operating in close support of the advancing Allied Army. Rocket fire, apart from the damage caused, appeared to have a very great effect on enemy personnel\* and it was noticeable that many of the Wehrmacht troops, after experiencing such attacks, surrendered strong points with little or no resistance; this might well have been the first indication of the enemy cracking, had it been appreciated at the time.

Operational flying by our aircraft was not carried out without loss to the Allies, but it was observed that our casualties in the air were more often due to well-directed anti-aircraft fire than to intervention by the Luftwaffe; the latter were only rarely encountered in strength and their tactical skill appeared to be less than that previously shown; this was probably due to the inadequate training which their replacement crews were receiving and also to the lack of aviation fuel, a result of the Allied bombing policy (which was at last showing considerable dividends) whereby synthetic petroleum plants received special attention.

The improved flying conditions reacted favourably on the hospitals, for the evacuation of casualties was resumed and was soon in full swing and the medical units which in the previous month had been unavoidably crowded were emptied in preparation for the big push into Germany which was obviously imminent.

It must be made clear at this point that air evacuation was not the only means used in this campaign to transfer casualties or other patients to the United Kingdom. Although possibly the majority travelled by the air route, a substantial number were despatched *via* ambulance—hospital train—hospital ship. This latter method was of particular value when the weather made flying impossible or when, owing to the operational situation, aircraft were not available.

In early February 1945, for example, the weather conditions prevailing over nearly all the airfields on the Continent rendered flying extremely hazardous and little reliance could be placed on air evacuation for casualties; the comparative numbers evacuated by each route, as shown in the graph in Fig. 1, provide ample justification for the retention of the land/sea route, and illustrate the fallibility of aircraft in the winter months.

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\* *Royal Air Force 1939-1945* (H.M.S.O.), Volume III, Chapter 7.

Furthermore, behind all casualty air evacuation work was the commercial principle that aircraft carrying freight should return with a pay-load of freight. Casualties were therefore, from the operational standpoint, regarded simply as 'freight' for the return journey, and only when transport aircraft, having delivered urgent freight, would otherwise have returned empty, could they be used for carrying patients to the United Kingdom. Only in the most exceptional circumstances could transport aircraft be flown solely for the purposes of casualty air evacuation.

On February 28, No. 54 Mobile Field Hospital received a direct hit from a flying bomb (V.1). Very considerable damage was caused to the fabric of the hospital, including the destruction of nearly all the glazing. Twelve members of the staff and a few civilians who received superficial cuts and bruises were the only casualties, this small number being due to the fact that the hospital had just been emptied of patients as it was due to move to Vught near 'sHertogenbosch. Among the personnel who were shaken but not injured was the surgeon of the M.F.H.

#### MARCH 1945

At the end of March the expected assault on the Rhine began. On the 24th, airborne troops landed and the entire weight of the Tactical Air Force was thrown into the battle. Previous experience in co-operating closely with Army units again proved valuable and was in many sectors responsible for the rapid advances which were made with the minimum of casualties.

As in all major forward moves, casualty air evacuation proved a very important feature, both in the economic use of medical man-power and in its propaganda value among our troops—a point which cannot be overstressed. Air evacuation was carried out first from B.100, two miles south-west of Goch, then from B.91 at Kluis, south of Nijmegen, on the west side of the Rhine and subsequently from B.108 at Rheine. All these evacuation points were manned by detachments of the casualty air evacuation unit, with the exception of B.100 where No. 52 M.F.H., which moved out of winter quarters at Eindhoven late in March, was called in to assist the C.A.E. unit pending its move forward over the Rhine.

All mobile field hospitals were alerted and instructed to be ready to move forward within 48 hours. By the end of the month nearly all units were again under canvas and it is interesting to note that the general health immediately showed a marked improvement through a decrease in minor illness; this was probably due mainly to better ventilation in the tents, for most billets had been so badly heated that doors and windows had been kept tightly shut, and upper respiratory disease had flourished in the resultant stuffy atmosphere.

APRIL 1945

This month was notable for the increasing impetus of our advance across Germany, overwhelming the crumbling and often disorganised and half-hearted German resistance, so that it soon became obvious that the final collapse of Germany as an organised opponent was not far distant.

As before, the evacuation of casualties by air played a most important, if not vital, rôle. During the crossing of the Rhine, a major military triumph of organisation and determination, a not inconsiderable number of casualties had occurred and, as there were no suitable hospitals in the immediate vicinity, evacuation by air was the logical, and in this case the only, means of disposal. Communications on and near the Rhine were practically non-existent, all roads and railway bridges in particular having been destroyed by units of the Tactical Air Force of Bomber Command during or immediately before the crossing, and the running of large ambulance convoys or hospital trains was out of the question; it was indeed fortunate that machinery existed for putting into operation the air evacuation of casualties, for inevitably considerable hardship and loss of life would otherwise have ensued.

A letter of thanks was received from D.M.S. Canadian First Army praising the R.A.F. casualty air evacuation organisation for their work in moving head injury cases from Schindjel; these patients were piling up in the Army hospital (Head Injury section) near 'sHertogenbosch. Only about 120 were moved, but the Canadian authorities were very worried at the time as any other means of transport may have caused a high mortality rate; at the time the roads were at their worst.

The changing operational disposition of Royal Air Force formations necessitated moves by the M.F.Hs. to keep in touch with the units to which they gave medical support. The main moves were as follows:

No. 50 M.F.H. moved from Eindhoven to Celle.

No. 52 M.F.H. moved from Eindhoven to Wunstorf.

No. 55 M.F.H. moved from Lens to St. Joseph's Hospital, Eindhoven, replacing No. 50 M.F.H.

This redistribution of mobile field hospitals worked well and it was found that through the policy of evacuation to England (Wroughton) or to Army base hospitals, casualties were dealt with both efficiently and smoothly and evacuation continued throughout the month. Some idea of the ramifications of the air evacuation organisation in operation at this period can be gained by a study of the diagram in Fig. 2.

MAY 1945

In view of the mounting pressure of the Allied advance and the slackening of the resistance put up by the Wehrmacht it came as no



surprise when on May 8 the announcement was made that the German forces in North Germany had surrendered unconditionally.

From this date onwards the work of the medical units became progressively more routine and the flow of battle casualties rapidly ceased. The latter was not only due to the cessation of hostilities, but also because those personnel needing hospital treatment were easily dealt with by the facilities available; the large Army hospitals in particular adopted a policy of holding and treating nearly all casualties except those needing specialised treatment, such as rehabilitation, and those with serious cranial or maxillo-facial injuries, to whom the appropriate units in England still offered the best chance of speedy recovery.

With this final phase the work of the mobile field hospitals as such ended and they were instructed to seek suitable permanent accommodation in selected areas where they could be housed and rendered effective by the autumn.

#### NO. 85 GROUP

In preparing for the invasion of France many new ideas were put into practice and old ones brought up to date, the whole plan being based on lessons that had been learned in previous campaigns and on an appreciation of the problems likely to be encountered in this vast operation for the liberation of the Continent, which can fairly be considered one of the greatest if not the greatest combined military strategy in history.

It was fully realised that supplies and communications would be the keystone of the operation and that all efforts must be made, regardless of weather conditions and enemy activity, to maintain an uninterrupted flow of materials of all descriptions to the forces in the front lines. Planning to ensure this object centred around No. 85 Group, whose terms of reference in the widest interpretation were the day and night defence of the base area and lines of communication, from the initial landings until the ultimate successful conclusion of the campaign.

No. 85 Group was formed in December 1943 in the Allied Expeditionary Air Force and came under the specific control of Second Tactical Air Force in August 1944. By this time the functions of the Group had crystallised in the light of the overall plan and during certain vital exercises, and may be listed in more detail as:

- (a) Provision of general control organisation for day and night fighter defence of base areas and lines of communication—later extended to include the interception of 'V' weapons.
- (b) Administration of all non-mobile units in the base area which were not directly controlled by Headquarters Second Tactical Air Force.
- (c) Provision of Air Sea Rescue, Surface Vessels Reporting Service and Anti-Aircraft and Searchlight Operational Control.

- (d) Control of day fighters operating in support of strategic bombers.
- (e) Day defence of base area west of Turnhout-Tirlemort line.
- (f) Fighter protection of shipping east of a line drawn north and south through Dunkirk and within 40 miles of the European coast.

During the actual invasion period the Group comprised six wings and one special squadron. The squadrons controlled by these wings employed a great diversity of aircraft, with consequent difficulties of supply and maintenance.

A detailed list of the ground units which were required in support of the air formations and an account of the necessary ground organisation are not relevant to this History, but some idea of the ramifications of the Group can be gained from the fact that in the Signals organisation alone there were over 200 fully-manned units of varying types.

#### MEDICAL ARRANGEMENTS

The medical cover required for such an organisation was considerable and basically was provided by units which, because they would not be in immediate support of front line formations (apart from the early days on a relatively restricted beach area), would not normally need to move with any urgency; at the same time they would have to be capable of moving swiftly if the areas in which they were established became menaced by enemy gains.

The following units comprised the medical formations of No. 85 Group and although minor alterations were made they remained basically the same throughout the campaign:

- No. 8 Royal Air Force General Hospital.
- Base Convalescent Depot.
- Nine Mobile Dental Surgeries.
- Eleven Mobile Dental Laboratories.

The activities of the Group will be evident through the whole of this narrative as it was, in a sense, the foundation on which the forward medical organisations were dependent and which, if circumstances deteriorated, could be looked to for immediate aid and supply. It should be emphasised that in every phase of the operation mutual aid and integration was essential and that although formations were complete in themselves, the whole was elastic and capable of internal adjustment to suit the need of the day.

#### REPORT BY A MEDICAL OFFICER OF NO. 85 GROUP ON THE INITIAL LANDING

In most instances R.A.F. personnel were not among the first wave of assault troops, as their duties were more in the nature of consolidating the gains of the latter and preparing facilities for the arrival of aircraft on the rearming and refuelling strips. Nevertheless, as mentioned in

the foregoing operational narrative, medical units such as the advanced surgical teams arrived early on D-day; similarly, advanced units of No. 85 (Base) Group made early landings to establish the necessary R.A.F. defence and transit areas. The following account is the substance of a report by a medical officer attached to No. 21 Beach Defence Sector, and describes his experiences on D-day in connexion with the initial landings in the Omaha beachhead. (*See* Map 2, page 459.)

'Tuesday, June 6. After waiting off shore since approximately 0900 hours, the L.C.T. (Landing Craft, Tank) were sent in at 1700 hours. I was in the centre of the landing craft and our vehicles were able to reach the shore without difficulty; we came under shell-fire five minutes after landing. The L.C.T. on either wing were less fortunate and a large percentage of the vehicles were drowned; these wings, however, were not subjected to shell-fire until about an hour had elapsed.

'We had been given to understand that when we reached the beach we should be told immediately where our transit area was, and be sent there without delay. In point of fact the beach was without any apparent organisation and, since there was no exit, the vehicles remained strung out for about 3 hours, the German Artillery taking full advantage of this and shelling us with great accuracy for several hours. The men took refuge under vehicles and in hastily dug fox-holes in the line of shingle at the upper limit of the beach, but after a short time my assistance was needed for severely wounded cases in the shingle area; the majority of wounds were compound fractures of the limbs, although the men were all lying down when injured. During the treatment of these freshly wounded men it was discovered that there were about 20 American soldiers, who had been wounded in the early morning assault, lying in holes in the shingle. They had only received elementary first aid and after 12 hours in the open were in some cases severely shocked. Their dressings were adjusted and measures taken to keep them warm. (The American wounded could give us no idea where we could contact American medical units and the first American medical officer I saw was at 2200 hours—I saw no more until 1200 hours on June 7.)

'By 2130 hours all the wounded had received attention and had been carried up the shingle away from the advancing tide. (The shelling had now ceased, except for spasmodic bursts.) The vehicles remaining were slowly moved through a gap in the wire and put in a small lane leading to a cluster of houses  $\frac{3}{4}$  mile inland. The problem of disposing of the wounded was next tackled; a radio van was cleared and used to transport some thirty casualties to the small village, where they were placed beside the road and in the gardens of houses, for none of the latter were fit to use as accommodation. It was considered likely that the enemy would shell the village during the night or early morning

so another 30 wounded were moved into a large 4-ft. deep gun emplacement 100 yards inland from the beach, which would afford protection against anything except a direct hit. The night was fortunately mild and was quiet except for one bomb dropped 50 yards from the emplacement; the hours of darkness were spent in moving the wounded, adjusting dressings and treating wounds which had not been discovered in the early confusion of the landing. (Since the wounded were so numerous it was not found practicable to attach labels to each patient, the time being fully occupied in carrying out first aid.) In view of the severe nature of many of the injuries and the elementary anti-shock measures applied, it was expected that many patients would not live through the night, but in fact only 3 out of 60 died and these were so severely wounded that they would probably not have recovered even if hospital treatment had been available.

'The expected dawn attack did not materialise, but there was much sniping at close range and half a dozen people were hit, although none was seriously hurt. When searching above the village for water at 0700 hours, I came across three U.S. medical orderlies in a trench; they had apparently left their first-aid post in the village during the previous evening, considering discretion to be the better part of valour! After some minutes they were persuaded to leave their security and during the rest of the morning did very valuable work in the village giving plasma transfusions to about a dozen selected cases while I was attending 16 U.S. soldiers who had evacuated themselves from the beach on the previous evening and were under the shelter of a wall half way up the village. They were discovered accidentally by one of our party at about 0800 hours, but apart from one head injury and two abdominal wounds the patients were not seriously injured. The first abdominal wound case died soon after I had reached the group, while the second had his rectum involved and was passing blood frequently; he was given a plasma transfusion on the spot and recovered sufficiently to be taken to the village by stretcher. At about 1200 hours several U.S. medical officers appeared in the village from a casualty clearing hospital about a mile and a half away; they took over from the medical orderlies and were able to look after the wounded in the village generally. The officers had apparently been unaware of the position on this smaller beach and were surprised to see the number of casualties. During the afternoon the wounded were moved off in available vehicles to the casualty clearing hospital at Omaha Beach; this operation was slow because of traffic blocking the narrow lanes, but the last patient was removed from the vicinity of the beach by 1700 hours—i.e. 24 hours after we had landed.'

This report, one of the few made by a R.A.F. medical officer on the initial landings on the beachhead, was followed by some general

observations; these are quoted below as they illustrate that although in most of the landings medical arrangements worked smoothly, there were, as was inevitable in such a vast undertaking, occurrences which it was impossible to foresee and which had to be dealt with as they arose by individuals on the spot.

*'General observations:*

1. The expected medical organisation on the beach was not present because of heavy U.S. casualties (assault forces and medical officers) earlier in the day. No information was obtainable about casualty clearing posts.

2. Our own casualties were much higher than expected (25 per cent. approximately) and added to these were the American soldiers left on the beach from the early morning assault.

3. Available medical supplies were soon exhausted (25 tubunic ampoules were followed by morphine tartrate tablets used sub-lingually). Shortage of stretchers and bearers was felt acutely.

4. First aid was carried out remarkably well by individuals. The unit padre did a medical officer's work under very difficult conditions. Without the aid of these people the mortality rate would have been considerably higher.

5. The absence of an ambulance was probably the most severe setback. The type of vehicle in a unit of this kind (No. 21 Beach Defence Sector) is not readily converted into a stretcher carrier.

6. The transfusion outfit carried was unable to be used owing to pressure of work and lack of assistance.

7. The most remarkable clinical fact was the number of patients surviving after severe wounds, long periods in the open under very noisy and terrifying conditions, and with only elementary first aid and anti-shock measures. This, I think, is strong evidence that the human system benefits from rest rather than being subjected to too energetic 'resuscitation' methods.

8. The American personal first-aid pack was very useful and much superior to the English counterpart. Local sulphonamide and general therapy were possible in each wounded American.

9. Haemorrhage in the majority of cases was adequately controlled by a tight dressing.'

The medical officer concluded his report by paying tribute to the excellent work done by the sole R.A.F. medical orderly, of whom he said 'his assistance given throughout the twenty-four hours cannot be rated too highly'.

GENERAL MEDICAL POLICY RELATING TO MEDICAL  
UNITS IN THE FIELD

In the field the most valuable medical units were the mobile field hospitals. These, although showing certain individuality, conformed

to a general pattern with regard to organisation and equipment and their function was to act as small but complete hospitals offering all but the most complicated of treatment; they were also capable of 'splitting off' smaller units such as an advanced surgical team or a unit to assist in the evacuation of casualties, the need for such adaptability having been learned in the various campaigns earlier in the war; the work of the M.F.H. as a whole benefited by the experience gained through such extraneous duties.

The mobile field hospitals were attached to Groups in which it was felt they would be of the greatest value, but it was clearly laid down that they were mobile units and could be moved at very short notice to areas where their presence was urgently needed, even if such areas were outside the area of control of their initial Group. Brief notes on each of the M.F.Hs. are given below, but they are described more fully, with an account of their work, later in this narrative:

*No. 50 M.F.H.* formed in February 1943 in Fighter Command as a section of R.A.F. General Hospital, Wroughton. Later, it came under No. 83 Group. The M.F.H., less the Advanced Surgical Unit which preceded it by a week, landed in France on June 14, 1944. On October 1, 1945 the title was changed to R.A.F. Hospital, Schleswig. The unit was disbanded on April 15, 1946.

*No. 52 (R.C.A.F.) M.F.H.* formed on August 23, 1943 at Detling in No. 83 Group. 'A' Echelon (Advanced Surgical Team) landed in France on June 8 and 'B' Echelon ten days later. The unit was disbanded on August 11, 1945 at Dunsfold.

*No. 53 M.F.H.* formed on September 8, 1943 at Sawbridgeworth in No. 84 Group. The reconnaissance party landed in France on August 17, 1944 and the rest of the unit on the 18th. The unit became R.A.F. Hospital, Hamburg on September 1, 1945.

*No. 54 M.F.H.* formed on September 8, 1943 at Sawbridgeworth in No. 84 Group. The first part of the unit landed in France on August 21, 1944, the second and final part on the 23rd. The name of the unit was changed to R.A.F. Hospital, Celle, on September 1, 1945. Disbanded at Celle on December 15, 1947.

*No. 55 M.F.H.* formed on January 18, 1944 at Fontwell in No. 2 Group. The first party landed in France on August 23, 1944 and the remainder on the 28th. The name of the unit was changed to R.A.F. Hospital, Gütersloh, on September 1, 1945. Disbanded at Gütersloh on May 31, 1946.

The function of these M.F.Hs. as officially defined was to supply medical and surgical aid to members of the R.A.F. and either return them to their units after treatment or evacuate them to the base hospital or to England. In practice the duties were more varied and were, as in any campaign they must be, on an *ad hoc* basis according to the

immediate need; this is apparent from the location of the hospitals, which was usually an area of maximum R.A.F. operations and as far forward as the operational situation warranted.

As far as the supply of medical equipment and other necessities was concerned, most M.F.Hs. were acting as parent unit to something in the region of fifty R.A.F. formations such as squadrons, each of which had a medical officer, and smaller units, where a nursing orderly might be the only medical staff. This point was not fully appreciated in the initial planning and difficulty was experienced in the storage and issue of supplies; storage in particular was complicated by the fact that M.F.Hs. had at all times to be instantly mobile. The situation was considerably eased in August 1944 when a medical quartermaster was posted to each M.F.H.

#### MEDICAL EQUIPMENT AND SUPPLIES

With regard to the actual supply of medical requirements certain adverse comments were made by the medical officers of some of the smaller units. Their complaints centred around the difficulty in obtaining replenishments and in particular the uncertainty as to the correct authority responsible for their supply. Some of the complaints were justified, but in most instances the fault lay with the medical officer concerned, who had submitted his demands incorrectly and to the wrong formation; in any event, in an operational area sudden moves were to be expected and a certain amount of self-reliance in these matters was essential. Many examples were recorded of mutual assistance given by Allied medical formations and the American equipment which was acquired received high praise.

Squadrons and smaller formations based their medical equipment on the Z.1 scale (*see* R.A.F. Volume I, page 432) and this was in the main found to be most satisfactory, although possibly more suited to surgical than medical needs—this being particularly noticeable because of the predominance of medical patients throughout the campaign. Certain deficiencies were recorded, notably the lack of unguents and lotions, which were in great demand to treat the large number of infected abrasions and insect bites. It was also noted that no medicament was included for the treatment of scabies and it was fortunate that, surprisingly enough, few cases of this disease occurred.

There was one serious defect in the stores of all the medical services—a lack of sulphaguanidine. During the outbreak of enteritis in early July this drug was found to be most effective if given in fairly large doses and all supplies were soon exhausted, so that several units were without the drug for some time. (*See* Principal Diseases, page 507.)

Little criticism was directed against the instruments issued in the Z.1 pack, with one exception: in the hot dusty conditions of the

beachhead mild infections of the external aural canal were common and required inspection with an auroscope; it was found that the instrument issued had a very small battery which was soon exhausted and replenishments were almost unobtainable.

Apart from such justifiable criticism, the majority of complaints were either ill-founded or concerned isolated instances and with the exception of the lack of sulphaguanidine the medical supplies in the beachhead were satisfactory; after the breakout few complaints were received throughout the remainder of the campaign.

#### MEDICAL POLICY RELATING TO PATIENTS IN M.F.Hs.

The tendency has always been for medical personnel unfamiliar with the R.A.F. to look upon mobile field hospitals as units resembling small Army field hospitals which normally, after attending to their patients' immediate needs, evacuate them to base. This policy is no doubt admirably suited to Army requirements in the field, but was far from acceptable to the R.A.F. and the function of a M.F.H. was entirely different from that of an Army field hospital.\* The much smaller size of the R.A.F. and the highly specialised nature of much of its work meant that if a member of a unit was absent his immediate subordinate could not always take over his duties at once, because of his lack of technical knowledge. Hence, if a member of a squadron, for example, the radar engineer N.C.O., was admitted to an Army hospital he would in the ordinary course of events arrive eventually in an Army base hospital. If the patient was seriously ill, such a course presented no disadvantage, but if, on the other hand, he was only admitted for a minor complaint this chain of evacuation involved a period of time disproportionate to his illness before he rejoined his squadron; the operational efficiency of the latter would obviously be greatly impaired in the meantime and in some instances aircraft, vital to the immediate operational need, would remain unserviceable until a replacement technician could be found—not a very easy task in the middle of a campaign.

With the object of preventing such a situation it was agreed in the general medical planning between the Services that R.A.F. personnel should as far as possible be admitted to R.A.F. medical units only and that those who were, perforce, admitted to Army medical units should, if it could be arranged, be transferred to R.A.F. medical care as soon as possible. It was agreed that M.F.Hs. could, if the operational position allowed, retain R.A.F. personnel for up to 28 days if there was a reasonable hope that at the end of this time they would be fit to return to their own unit; this period was later increased to 42 days, when it was seen that the efficient working of the M.F.Hs. would not

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\* See R.A.F. Volume I, Chapter 5, page 265, Mobile Field Hospitals.



be impaired thereby. This scheme paid excellent dividends in preventing the separation of men from their units for an unnecessarily long time; this, indeed, had already been proved in the Desert campaign, but at that time the principle, although obvious to those in the operational area, was not altogether understood by the rearward formations.

#### WORK OF THE M.F.Hs.

As has already been seen in the introductory narrative, the mobile field hospitals were very early in the field, and, by using their mobile surgical teams as advanced parties, maintained close contact with R.A.F. units in the forward airfield areas. At no time, however, apart from very short periods when they were acting in support of casualty air evacuation units did they operate to their full bed capacity; the reason for this was that R.A.F. casualties did not occur in the numbers which had been predicted, nor in fact were the casualty rates in the other Services as high as had been thought likely—for it was always understood that the M.F.Hs. would in emergency admit any casualties irrespective of their Service.

After the initial breakout from the beachhead area and the advance into Germany the M.F.Hs. were able to offer a considerable amount of aid to civilians, either by treatment or in the supply of drugs and essential medical equipment; it should be remembered that during the German occupation medical supplies were very scarce and the civilian population had for a number of years been grievously neglected compared with English standards.\* The French in their turn gave all possible assistance to our medical units and matters such as laundry, a major item in any hospital, were arranged with ease through local authorities in return for payment in kind. It should be recorded that the help given to the French civilians did not pass unrecognised by the French authorities, as was evidenced by the award of two French decorations to R.A.F. medical personnel in direct recognition of their services. (*See Plate LII.*)

Finally, the presence of R.A.F. hospitals in the immediate operational area was of very great value to morale, for all personnel realised that medical attention by their own Service was always easily available and that their particular needs would be dealt with by medical staffs who were conversant with the problems of aviation as they affected the patient's condition.

#### MEDICAL PERSONNEL ON SMALL UNITS

Although it was realised that wherever possible it was desirable for R.A.F. personnel to be dealt with by R.A.F. medical officers, this fact had to be correlated with the medical man-power available and it was sometimes necessary for R.A.F. units to be placed under the medical

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\* *See also section entitled 'Observations on a Visit to the Continent', page 565.*

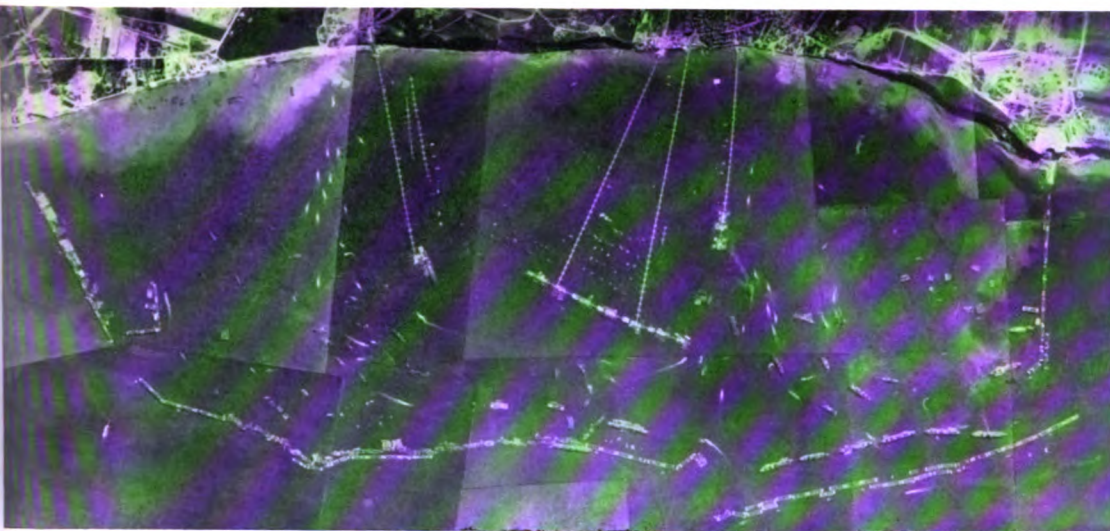


PLATE XLIX (a) : Aerial view of the landing area showing Mulberry harbour installations



PLATE XLIX (b) : Oblique view of part of the Mulberry harbour shown in the photograph above



PLATE L: A section of the vast armada of gliders and 'tugs' assembled ready for take-off immediately before D-day



PLATE LI: British and Allied aircraft burning on an airfield near Brussels after the German New Year's Day raid





PLATE LII: Alfresco dentistry. Note portable foot drill, chair unit, and mobile dental caravan



PLATE LIII: Typical squadron M.I. room in a requisitioned schoolroom in Normandy. Z.I. pack-up in protective panniers can be seen, and to the right is a resuscitation box (oxygen)



care of another Service; this was a reciprocal arrangement, for each of the Services had fewer medical officers than was desirable.\* Ideally, each operational squadron would have had its own medical officer, for only such relatively small numbers made it possible for the medical officer to establish that personal contact with pilots and other aircrew members which was so essential in dealing with the problems peculiar to flying personnel. It was found impossible, however, always to provide sufficient medical officers for this service because of the overall shortage, and a compromise was reached whereby medical officers were established on a wing basis of one squadron leader and three flight lieutenants to a fighter wing and one squadron leader and two flight lieutenants to light bomber and reconnaissance wings. Although by this method something of the personal touch was lost, it was found to provide a practical and realistic distribution of the available medical man-power.

On certain small units where it was not possible to provide a medical officer, a medical N.C.O. or nursing orderly was attached, general supervision being exercised by the medical officer of a nearby unit. In every instance these orderlies acquitted themselves in an exemplary manner—particularly those who were attached to units of the R.A.F. Regiment, whose medical and hygienic arrangements were of a high order and received praise in all reports.

#### IMMEDIATE PRELIMINARIES TO THE INVASION

To those not intimately associated with Operation 'Overlord' it is perhaps easy to take the detailed organisation involved as a matter of course. Historically, however, the success or failure of the operation largely depended on the initial organisation by which personnel were collected into orderly groups and conveyed across the Channel to the beachhead, and for complexity and perfect timing this organisation surely has no parallel in the annals of warfare. It is the purpose in the following paragraphs to outline briefly the plan as it affected R.A.F. medical units, showing how the latter were an integral part of this vast scheme.

#### THE CONCENTRATION AREA

It was decided that R.A.F. Station, Old Sarum, in Wiltshire, should be used as the main transit centre for all personnel of the Second Tactical Air Force. The two main reasons for choosing this station were (a) its position 3 miles from Salisbury on the southern part of Salisbury Plain was geographically most suitable; (b) it possessed all

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\* See R.A.F. Volume I, Chapter 1, 'Medical Manning: Officers', page 51.

PLATE LIV (*opposite*): Aerial view of a typical uncamouflaged M.F.H. Note proximity to airfield allowing speedy evacuation of casualties by air, and prominently displayed Geneva Cross.

the advantages of a peace-time station, which guaranteed certain basic amenities such as brick buildings and permanent sanitation.

The target date for readiness was April 1, 1944, by which time the station would have to be prepared to carry out its full commitment. The following requirements were stipulated:

- (a) Accommodation for 8,500 personnel and hard standing for 1,650 vehicles of all descriptions would be needed at peak periods.
- (b) Seven tented sites were to be used, each able to accommodate 80 officers, 90 senior N.C.Os. and 900 other ranks. It was emphasised that each site would have to be self-supporting. All sites were within one mile of the parent station which was staffed by 4 officers and 130 airmen.
- (c) Tented accommodation was to be provided on the following scale:
- |                            |               |
|----------------------------|---------------|
| Squadron Leaders and above | . 1 per tent. |
| Junior Officers            | . . . 2 " "   |
| Warrant Officers           | . . . 4 " "   |
| Senior N.C.Os.             | . . . 6 " "   |
| Other ranks                | . . . 8 " "   |
- (d) Water Consumption. This was to be limited to 10 gallons per head per day for all purposes. The possibility of increasing the water supply was investigated but no assistance could be obtained from the Ministry of Health. It was stated by the Air Ministry works engineer of No. 14 Works Area that the twin Air Ministry boreholes would have a maximum capacity of 5,000 gallons per hour and that this should prove just adequate if the proposed 10 gallons per man per day was not exceeded.
- (e) Sewage. Originally it had been decided that the existing sewerage works at Old Sarum would be able to cope with the increased flow, particularly as the peak periods would only be of short duration. This decision was later revised—fortunately as it turned out—and a number of bucket latrines and sullage vehicles were provided. Waste products were to be disposed of by digging slit trenches at 'High Post'  $2\frac{1}{2}$  miles from the main site.
- (f) Cookhouse water. This effluent was to pass through adequate grease traps into a 'septic tank' and finally into irrigation channels.
- (g) Ablution Water. The disposal of the considerable quantities of soiled water created something of a problem. It was planned that the water should be run off into large semi-soakaway sumps, but as the ground was chalky the drainage was poor and when any quantity of water was being directed into the sumps it was found necessary to supplement the slow soakage by the use of sullage waggons.
- (h) Sick quarters accommodation. It was agreed that beds should be available at the rate of 1 per cent. of the peak population. This was considered to be adequate to cater for the needs of men who were at the peak of physical fitness after months of field training.

Apart from the above arrangements which were of a general nature and concerned the overall organisation of the station, some medical

facilities were provided on the sites, and certain medical officers were made responsible for one or more of the latter. On each site two ridge and two E.P.I.P. tents were to be pitched and staffed by two medical airmen, one of these being a corporal. Medical equipment was to be issued to each site on the scale of one Z.1 pack to each site.

Although there was a small permanent sick quarters on the station this was not used in the scheme but was reserved for the use of the permanent staff already mentioned. It was therefore necessary to find alternative sick quarters to provide beds for personnel in transit, on the 1 per cent. basis specified. After some searching, suitable accommodation was discovered at Bossington House, approximately 15 miles from Old Sarum; this was accepted, even though it was rather farther away than was desirable, as accommodation in the area was at a premium. In this house it was possible to make available 80 beds for both surgical and medical cases. The staff consisted of:

- 4 Medical Officers
- 2 P.M.R.A.F.N.S. Sisters
- 29 Airmen and Airwomen

It was possible for Bossington House to function as a small cottage hospital and to cater for all but the most complicated types of injury. The unit admitted over 330 patients between April and September 1944 and had an average of 30 beds occupied over the period.

#### COMMENTS AND CRITICISMS ON THE WORKING OF THE CONCENTRATION AREA

It had been expected that the periods of peak population would be very brief, two or three days at the most, but shortly after D-day numbers remained at a high level for 10 days and consequently the irrigation channels, sumps and septic tanks became overloaded; fortunately, this caused little difficulty and no ill-health resulted. Latrines and urinals proved adequate, but it was fortunate that the additional bucket latrines had been installed as the original arrangements would have broken down over the prolonged peak period.

The general health of the transit personnel was excellent and the percentage of those reporting sick was 1.08, of which 0.08 per cent. were admitted to Bossington House or other hospitals. The very low rates were probably due to the fact that the men were highly trained, very fit and eager to play their part in the invasion—factors which combined to produce a very high morale.

The medical authorities had always borne in mind the possibility of epidemic diseases, particularly those liable to arise in the field and resulting from faulty hygiene or poor cookhouse conditions, and it is to the credit of all concerned that no such epidemic occurred.



The transit centre at Old Sarum continued as an active unit until December 1944 when the increased facilities for Channel crossing and the improved organisation for the reception of personnel in Brittany made the station redundant and it was accordingly closed down as a transit centre.

#### MEDICAL REINFORCEMENT ARRANGEMENTS

The question of reinforcements to replace medical personnel who fell sick or became battle casualties had formed an integral part of the initial planning for the invasion. The broad principle had been that replacements of essential personnel must be readily available in a pool for thirty days after the actual date of invasion; from then onwards it was hoped that replacements would be supplied through the usual channels.

It was considered that special medical pools would be unnecessary and that senior medical officers of groups would be able to provide replacements from sources available to them; in the event of casualties becoming very heavy the senior medical officers would seek help from the Principal Medical Officer of the Second Tactical Air Force, who in turn could apply to the Principal Medical Officer, Allied Expeditionary Air Force. The only other provision deemed necessary was that suitable individuals should be nominated in advance.

The matter was also of interest to other branches of the Force and they were required to provide estimates of casualties and replacements necessary during the period of the invasion, that is, during the landings and for the first three months of the campaign. It was then considered that four pools would be necessary:

- The main replacement pool
- One pool at Old Sarum
- One pool at Titchfield
- One pool in the Thames area.

This in effect meant that there was one main pool, one at the concentration area and one in each marshalling area. The original replacement rate suggested was 5 per cent. of personnel passing through the areas in two days.

The figures were then calculated taking into account the risks involved and the possible sickness rate; it was reckoned that of the total medical officer strength of 153 in the Second Tactical Air Force, allowance must be made for 13 battle casualties in the first month, 2 in the second and 3 in the third, equivalent figures for medical airmen being 28, 14 and 12. Sickness figures based on a daily incidence of 17 per cent. gave 6 officers non-effective in the three months and 25 airmen.

As far as the replacement pools were concerned 13 officers were available and these were allocated 4 to the main pool, 4 to Old Sarum,

4 to Titchfield and one to the Thames area pool. Nearly half of the 63 airmen were allotted to the main pool, 5 were sent to Old Sarum, 12 to Titchfield, 7 to Thames area pool and 14 to stations in A.D.G.B.

Separate arrangements were made in respect of certain medical officers in view of their special medical qualifications. It was decided that a supply of surgeons and anaesthetists in particular must be readily available and lists were prepared of suitable officers, who were warned that they might have to move instantly if called forward; these personnel were mainly earmarked for the surgical teams of the M.F.Hs. A similar arrangement was necessary for certain specialist airmen.

#### WORKING OF THE SCHEME

The scheme was reviewed in early August 1944 in the light of experience and it was realised that the actual casualty rate was surprisingly low for all personnel and especially in the medical branch. It was noted that of the 1,461 casualties sustained from D-day to July 23 approximately 800 were cases of sickness and that the liability to battle injury as far as the R.A.F. was concerned had been over-estimated.

Following this review it was considered that, to conserve medical man-power, the pools should be disbanded. This, however, presented certain difficulties, as careful selection had been necessary to have ready sufficient personnel, both officers and airmen, of the necessary technical groups. The dispersal of the medical officers was relatively simple, but the airmen's postings were more of a problem and it was finally agreed that they should be dispersed on to stations in A.D.G.B., the postings being allotted by the Commandant, Medical Training Establishment and Depot (*see* R.A.F. Volume I, page 94), who would thus be in a position to post airmen as replacements almost instantly.

The initial casualties among medical officers were very low: the S.M.O. of No. 125 Wing was killed coming ashore on D-day, two medical officers of No. 127 Wing were torpedoed and returned to the United Kingdom suffering from concussion and shock and one medical officer of No. 483 Group Control Centre was involved in a motor cycle accident while going to the concentration area.

#### CONCENTRATION AREA TO DISEMBARKATION

The problems of organisation in the concentration area were small in comparison with those of the next stages, which may be summarised as Concentration Area to Marshalling Area—Marshalling Area to Embarkation—Sea Crossing—Disembarkation—Dispersal in Bridge-head Area.

The overall plans for the movement of vast numbers of personnel, equipment and vehicles of all descriptions were ready many months before D-day and perhaps the first indications to the general public of

the forthcoming operation were gangs of men widening roads and constructing parking bays in Southern England and innumerable mysterious white lines painted on roads. As D-day drew near the reason for these preparations became apparent as convoy after convoy arrived and parked in the appropriate area as delineated by the white lines. It is not easy to give an idea of the vast concentration that took place, but as an instance it was observed that a line of D.U.K.Ws. (amphibious vehicles) stretched 'beak to tail' from Bursledon, near Netley, to the outskirts of Southampton (a distance of 5 miles). R.A.F. formations were obviously in a minority but the methods of assembly were basically the same for all Services.

In spite of the vastness of this undertaking the arrangements went smoothly and all personnel were embarked with the minimum of delay.

There were about 200 vehicles to each convoy, but it was considered that this number was unwieldy and led to congestion, with the rear vehicles often stationary or moving very slowly. When passing through small towns or villages hold-ups invariably occurred and the whole pace of the operation did not appear to have the urgency that was expected and in fact must have existed; the effect of this was, on the whole, unduly boring and tiring and most of the men lost their initial enthusiasm. The unwieldy size of the convoys was again demonstrated when the actual marshalling area was entered and the Marshalling and Movement control units were obviously finding it difficult to deal with the convoys at the speed necessary to prevent a hold-up, which would have been transmitted through many convoys.

Another factor which affected morale to some extent was the spate of rumour circulating among all ranks. For instance, it was confidently stated and believed by many that Field Marshal Montgomery had been killed and that a convoy of 557 craft carrying personnel of the R.A.F. had, two nights previously, been annihilated. These and other such rumours found ready acceptance among the relatively inactive troops, and were magnified so that they created quite the wrong atmosphere for men who in a few hours would be engaged in some of the bitterest fighting of the war. It was realised that the dictates of security had to be obeyed, but, in view of the adverse effect on morale which such rumours had, it seemed a pity that apparently no effort was made by those in authority to deny them.

All men were provided with a hot meal at the Marshalling Area before embarkation. This in itself was a considerable feat of organisation considering the numbers which had to be dealt with, but unfortunately the menu planned was not the most suitable for persons about to undertake a Channel crossing (and not a very smooth one at that) in small craft, and about to fight for their lives on landing. The food provided was very greasy and undoubtedly tipped the scale in favour of

seasickness in those susceptible. This fact is of interest when it is remembered that the medical authorities went to considerable trouble to evolve an anti-seasickness tablet. The effect of this slip in planning was all too evident during the crossing and if the weather had been heavier than it was even more troops might have been incapacitated.

With regard to food, further difficulty occurred. It had been decided that all personnel in the bridgehead should, after using their personal rations, subsist at least initially on 'compo' rations; these, however, were only loaded on to some of the vehicles and when a number of these were destroyed or the L.C.T. transporting them was delayed a general shortage of rations occurred. This shortage was marked during the first three days in the bridgehead. For similar reasons tentage was delayed and it was necessary for men to 'double up' or in some instances to 'sleep rough' in the most improvised of shelters.

In retrospect the mistakes are only too apparent, but at the time the obvious remedies might have taxed the organisation unduly; nevertheless, it was unfortunate that after these early lessons had been learned it was not possible to give a short talk to personnel still in the Concentration Area, for with the time available it would have been possible for most of them to have organised some degree of self-help.

#### INCIDENTAL CONDITIONS ENCOUNTERED IN THE BRIDGEHEAD

Weather prediction had made great strides during the war years and came into prominence during the final stages of preparing for 'Overlord'. Those planning the actual operation were able to state clearly the conditions most favourable, and the weather experts were able to indicate with a great degree of accuracy when circumstances suggested that the required weather was likely to occur.

The requirements may be briefly summarised as follows:

- (a) Calm sea for assault forces and their supplies.
- (b) Good visibility for air support, if possible no cloud below 20,000 feet.
- (c) Clear weather over bases for supporting aircraft.
- (d) Suitable weather over the dropping zones for both paratroops and gliders. In this instance the weather over the take off bases was not so important as long as it was safe for flying.
- (e) A good forecast for at least four days was important to allow replenishment of supplies for the initially landed troops.

#### SEA CONDITIONS

Because of weather conditions the start of the operation was postponed for 24 hours from June 5 to June 6, 1944, when the weather forecast approximated reasonably to the requirements, although not as closely as had been hoped. There was a certain amount of sea running in the Channel and many in the small boats suffered severely from

seasickness, while on D-day + 5 a stiff off-shore breeze in the beach-head area rendered the landing of supplies difficult, if not hazardous; these conditions recurred several times in the next four weeks.

One critical period is worthy of special mention. On June 19 and 20 a wind of nearly gale force caused considerable disruption to the Mulberry Harbour installations, one of which was so severely damaged as to be virtually put out of action, and several lives were lost through vehicles falling from the Harbour into the sea; fortunately the air/sea rescue launches which were purposely located in the area were able to pick up many survivors.

#### AIR CONDITIONS

Although the sea conditions affected the landing forces of the R.A.F. it was the flying conditions which were of the greatest interest to the vast numbers of R.A.F. and Allied fighter, bomber and supply aircraft responsible for the safety of and supply to the troops in the bridgehead.

Without doubt, air conditions were bad. Day after day low cloud hung over the home bases and the bridgehead; the cloud base was rarely above 5,000 ft. and this particularly hampered the heavy and light bomber aircraft, whose vital job it was to disrupt enemy communications behind the bridgehead so that reinforcements and supplies could not be brought up to the enemy troops in action.

These conditions were responsible for many of the inaccuracies that occurred in the dropping of paratroops and supplies and in the inability to find targets specified by the ground troops for the attention of our strafing aircraft. It should be understood that limitations were placed on the use of, for example, fighter/bombers and rocket-firing Typhoon aircraft, which are best operated in clear skies at a minimum of 6,000 ft. to allow them a reasonable opportunity to keep away from flak and with no clouds above to shield enemy fighters who could otherwise make effective and undetected approaches. As a matter of interest these aircraft were capable, when fully loaded, of travelling at 350 miles per hour in straight and level flight and over 420 miles per hour in a dive, which was the normal way of attacking.

It will be seen, therefore, that the Allies were unable to exercise their air superiority to the full, but, although the cloud formations tended to favour the enemy fighters, the latter rather surprisingly did not take full advantage of this fact. During the initial weeks of the assault, our aircraft were totally grounded for approximately 1 day in 10 and on many other days for a considerable number of hours. On those occasions when the weather was suitable for flying, it was used to the greatest effect, as for example at Caen, which Bomber Command attacked most heavily. Many personnel in Normandy tended to be critical and wondered why our aircraft were not more in evidence,

but they often judged by the immediate weather conditions in Normandy, forgetting that the bases in England might be experiencing a complete weather 'clamp'.\*

#### RAINFALL

The rainfall during the invasion period was abnormally low for the time of year and was in fact 75 per cent. below normal in Southern England and over most of the battle area in Normandy. This was in many ways fortunate, but there were also disadvantages, as will be shown in the next section.

In the beachhead there was no rain until August 15, when rain fell heavily for a short period during a violent thunderstorm. This storm, indeed, produced a spectacular display, for 12 of the static balloons, flown to guard the immediate beachhead area, were struck by lightning, and when their hydrogen content ignited provided a show equal to any set-piece shown at the Crystal Palace in pre-war days.

One of the main essentials in the beachhead area was the availability of slit trenches and the dry weather rendered these relatively easy to dig in the friable soil of Normandy. For the first six weeks in the beachhead slit trenches were used frequently, when raiding aircraft, particularly during the night, were dropping small anti-personnel bombs; when men were below ground level these bombs did hardly any damage and had little more than nuisance value. All sick quarters tents were dug into the ground and this fact gave great comfort to the patients.

A further advantage of the dry conditions was the ease with which pits could be dug for the disposal of rubbish and excreta; furthermore, the surface water was well below the level of the pits, and the latter thus remained dry.

#### DUST

As already stated, the dry weather was not altogether an advantage, and one of the drawbacks was the production of clouds of dust which shrouded the beachhead area. This dust derived from the friable nature of the subsoil, over which pounded continually, day and night, a vast variety of vehicles and which, owing to its relative lightness, was slow to settle. The dust was obviously worst on the small roads whose surface rapidly broke up under the load of tracked vehicles and other heavy machinery. The dust lay inches thick on roads, and was blown by the wind on to sites in fields, so that it was virtually impossible to keep it out of domestic tents and food stores.

The effect of the dust was twofold: it was responsible for undue wear and tear on aircraft operating from unsurfaced airfields, Typhoon

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\* Clamp: expression used to denote weather totally unsuitable for flying.

aircraft in particular suffering, until special air filters were installed, and in personnel it produced a continual feeling of general discomfort and dirtiness with a dry throat and soreness of the eyes.\* Though it was impossible for the authorities to organise an overall scheme to control or minimise the dust nuisance, much was done on a local basis at unit level. In and around the casualty air evacuation reception point at B.14 (*see* Map 4), for instance, the dust was treated with an emulsion of used engine-oil and water which was sprinkled from a water cart; this method proved very successful and was adopted on several other R.A.F. units. Used engine-oil was obtainable at most air strips and was carefully conserved for the above purpose.

### GENERAL LIVING CONDITIONS

#### SANITATION AND HYGIENE

In Volume II, Chapter 10 (Second Tactical Air Force) are described the training methods adopted to make all personnel aware of the importance of following certain basic principles of hygiene in the field. The value of this training was seen when it was put into practice in the beachhead, but the Air Officer in charge of Administration, Second Tactical Air Force, considered that the question was such a vital one that a reminder on the general principles should be given to all unit commanders; accordingly, on June 16 a general directive was issued outlining the simple precautions to be taken, as summarised below:

- (a) Protection of food against flies and dirt.
- (b) Cleanliness of all food-handlers.
- (c) Leaving camp sites in a clean condition for subsequent occupation by other units.
- (d) Personal inspection by unit commanders of cookhouses and latrines once a week.
- (e) Inspection of hands of all cooks and food-handlers by orderly officer, as part of his duties.

It should be noted that although phrased as a reminder this directive was circulated at the request of the medical authorities, who had observed many breaches of elementary hygiene rules and, in view of the crowded conditions in the beachhead, were not unnaturally apprehensive of outbreaks of communicable disease, for which conditions were in many ways ideal.

*Initial Arrangements in the Beachhead Area.* During the early days many units failed to make use of their previous training and their field hygiene was of a very low, even dangerous, standard. All personnel

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\* It is interesting to note that the dust did not have such serious effects as were noticed in the Middle East and North West Frontier of India where conditions were somewhat similar at certain seasons. In India especially a very heavy morbidity rate due to pharyngeal inflammations and chest conditions was always recorded but in the beachhead area no such morbidity occurred.

were so eager to maintain a 100 per cent. operational efficiency that they were liable to relegate such matters as sanitation to the background as of little importance—forgetting the part hygiene itself played in keeping the men efficient. The general attitude in such units was 'we are very busy and are likely to move any moment, so what is the use in digging holes and constructing appliances which we may never use?' Although this feeling is understandable, it was a dangerous one and most units in which such an attitude prevailed paid the penalty during the outbreak of enteritis which occurred. (*See Principal Diseases, page 507.*)

It was difficult to ensure that when units moved they left the site in a clean condition and often such elementary precautions as the burying or burning of rubbish were omitted or latrines and soiled areas left unmarked or not properly filled in. In the early days of the campaign there was indiscriminate defaecation and coverage was inadequate so that, with the numbers involved, large areas of the beachhead rapidly became fouled, as well as being strewn with rubbish. It was not surprising that in such conditions numerous flies soon made their appearance. The fly problem was aggravated by the presence of rotting animal matter, for in the early days corpses might remain unburied for some time owing to the difficulty of recovering them under enemy fire or because they were hidden by standing crops. Animals, too, particularly cows, were killed in large numbers as they grazed in the fields and a trail of unburied animal corpses lay behind the advancing battle front. These large rotting corpses were difficult to dispose of, as incineration was not always effective and burial was a laborious and time-consuming task, so that in general the presence of unburied animal corpses had to be accepted in the early stages when labour was scarce. After the initial period the condition of the beachhead was greatly improved, largely as a result of the efforts of the medical personnel—particularly the Group sanitary assistants—to whom the highest praise must be accorded. Communal deep trench latrines were soon organised, or where this was impossible bucket latrines were installed, the contents of the latter being either buried or disposed of into Otway pits, except where a high subsoil water level existed, when incineration was the method of choice.

*Later Stages of the Campaign.* Following the break-out from the bridgehead conditions steadily improved. The reason for this was perhaps twofold: firstly, airmen were becoming more accustomed to field conditions and realised the importance of maintaining a high state of general hygiene; secondly, R.A.F. units were relatively static, compared with those of the Army, and occupied sites for much longer periods, so that it was possible to organise more effective sanitary appliances.

Bucket latrines were used on most sites, disposal normally being by Otway pits or deep burial. Water was obtained from Army 'safe' water



points and transported in R.A.F. water carts. In areas where there were undamaged buildings it was often possible to use local conservancy arrangements, but in Belgium and Holland when this was done cesspits often overflowed through overloading and it was necessary to establish two sullage carts in each Group, as the retreating Germans had taken with them 60 per cent. of the civilian sullage carts.

The disposal of sullage water was on normal lines, grease traps and soakage pits being constructed. In Belgium and Holland, where high levels of subsoil water were encountered, recourse was made to preliminary filtration through 40-gallon drums filled with gravel and sand with a 9-in. layer of straw on top, the effluent then being jettisoned into convenient dykes or ditches.

Swill was never a problem. The local farmers, whose stock had, during the occupation, been existing on a poor diet, were only too eager to acquire as much of this high protein swill as possible. The only difficulty was that of transport, as civilian vehicles had either been removed by the retreating Germans or were so old and unserviceable as to be quite unreliable; however, the Services were usually able to remedy this deficiency.

*Sanitary Apparatus.* From reports submitted by a considerable number of medical officers taking part in the various campaigns, it is obvious that good sanitation depended on the individual drive encountered in units rather than on the issuing of long and complicated instructions and directives and that, as stated many times in this History, improvisation was the key to success.

In most small units in the field the 'drive' behind the construction of field appliances came from the medical officer, the adjutant and the senior N.C.O. who usually not only made the suggestions but ensured that the necessary materials were forthcoming and that men with some degree of skill or aptitude co-operated in the construction of equipment, such as grease traps and ablution benches. This self-help principle, however, although admirable in many ways, was not altogether as economical and as efficient as it may appear at first sight. Such key personnel as engineer officers might be diverted from their normal duties to construct sanitary appliances from misappropriated Service materials, and although serving their purpose well enough the finished products would often be poor in relation to the time spent and effort expended. Furthermore, apparatus so constructed was rarely portable and the whole process had to be repeated after each move, so that it was not uncommon to find a progressive waning of enthusiasm.

It was suggested in many reports that a range of portable, light, sanitary equipment would have been of the greatest value; manufactured to a standard approved pattern and carried with the unit's other equipment it would have been ready for immediate use and in no way

dependent on availability of materials or the presence of personnel skilled in their erection. Such articles as ablution benches and portable showers would have been of the greatest value in all theatres. The issue of this type of equipment would have eliminated the excuse, true or otherwise, that apparatus could not be built and would have undoubtedly led to a higher and more uniform standard of hygiene, on which success in the field was so dependent.

All medical officers on entering the Air Force were given a course in sanitation and hygiene, during which they were shown an exhibition of field sanitary appliances of all descriptions, but these had been constructed by skilled carpenters, who had both the time and the materials available to provide articles of considerable technical efficiency. The position was very different in the field, where the medical officer might be allotted two airmen who possessed no skill in carpentry and in all probability no tools would be available, while materials would be only those which could be immediately 'procured'. With these resources it was impossible to produce sanitary apparatus in any way comparable to that exhibited on the course and it is not surprising that much of it was of a poor standard; latrine seats made from packing case wood, for instance, would remain fly-proof for only a very short time before they were broken or became hopelessly warped.

Such is the balance which must be struck on the principle of self help and improvisation; that troops should be self-reliant is a *sine qua non*, but, as shown above, this principle can be carried too far. Where matters of health are concerned, financial considerations should be secondary, and in any event the cost of such measures as are advocated here, which might be termed preventive medicine, would in the long run be less than that of providing medical care and attention after the damage has been done.

#### WATER

In the beachhead the supply of safe water was an Army responsibility and one which they discharged with the greatest of efficiency. Clearly marked Army water points were set up in specified areas and safe water was provided from these points; in the rare instances where it was not possible to provide the water already chlorinated, this fact was plainly stated and instructions were given on the amount of water-sterilising powder that should be added. Furthermore, the rate of supply was very speedy, which was an important point as any undue hold-up would have resulted in long queues of water carts waiting to be filled.

R.A.F. units collected their water in R.A.F. 350-gallon water carts which were provided on a scale of 1 to 350 men. This proportion proved adequate, but if the Army water points had not been able to

fill the main tanks direct, the time taken by the relatively slow hand-driven semi-rotary pumps might well have caused embarrassment. It is recorded that these water vehicles stood up well to the rough usage, a point which is of particular interest as in other campaigns all types of R.A.F. water carts received little praise.

To supply smaller units 200-gallon water trailers were used. This proved a useful size, as the trailers could be towed behind jeeps; but hilly areas had to be avoided as far as possible, as the hand brakes on the jeeps were not equal to the extra strain. These small water trailers were of particular use when a formation split into small sections, such as signals units, when it was wasteful to allot a 350-gallon trailer; certain medical officers expressed the view that an even smaller trailer of about 100 gallons would have been of great value for supplying small isolated units, who were more often than not without a separate water supply, but to whom the issue of a 200-gallon trailer was uneconomical.

Following the break-out from the beachhead area it was usually possible to make use of public water hydrants, sterilising powder being added until water testing had been carried out and thereafter as necessary. The rapidity of their retreat fortunately did not allow the Germans much opportunity to interfere with urban water supplies; nevertheless, strict economy had to be practised by the Services in many areas.

A review of the sickness rates for the entire R.A.F. contingent gives little or no indication at any stage that the water arrangements were inadequate or that any outbreak of disease was directly attributable to this cause; this in itself speaks highly for those responsible for the water supplies.

#### RATIONS

As has already been mentioned, in the early days in the beachhead reliance was placed on 'compo' rations; these were packed in 'units', each containing the complete ingredients for meals for 10 men for one day. This system of messing had many advantages, the most important being the portability and the ease with which rations could be distributed; the main disadvantage was the cost, for most of the contents were individually tinned and the whole packed in wooden boxes. There were, incidentally, complaints that these wooden cases were too flimsy.

It was realised that for the first few days of the invasion period organised communal feeding would be difficult and in certain circumstances impossible; to cater for this need personal pack-ups, each sufficient for one man for one day, were issued, three to each man. This system was found to work well and was a great boon where enemy activity precluded the setting up of field cooking appliances for any number.

The main 'compo' pack-ups were popular at first, but after a fortnight the monotonous diet tended to pall and their popularity waned; unit cooks were often blamed for this lack of variety, but it was beyond their control and even when fresh vegetables became available it was no easy matter to prepare the large amounts required without the normal labour-saving gadgets of a permanent station. The peeling of potatoes was the greatest problem, for although this task has become associated with music hall jokes it is an essential one and it was always difficult to obtain sufficient men who could be spared for this duty.

As always under active service conditions, it was difficult to provide sufficient fresh fruit and green vegetables, and their absence from the diet for any length of time soon gave rise to complaints from the air-men and to fears in the minds of medical officers of inadequate vitamin C intake. One unit, in fact, did submit a demand for vitamin C tablets, but these were not issued as it was considered that there was insufficient justification on physiological grounds.

With regard to the 'compo' packs, the two main complaints concerned the biscuits, provided in lieu of bread, and the tea. The latter consisted of compressed tablets of tea, milk and sugar combined—the whole producing a brew foreign to the average English palate; the biscuits, although wholesome, were undoubtedly not of a high quality and as a substitute for bread they were not a success. Opinion of them was well summed up by one medical officer who said: 'If I have another b—— biscuit, I'll bark'.

Both these complaints were, in a sense, justified, but any radical change would have added to the complexity of the ration organisation and also increased the cost of the 'compo' pack-up, which was already considerable. It was suggested, however, that a variety of biscuits could have been used—this should not have been difficult to arrange and would have relieved the monotony to some extent without increasing cost. It should be noted that the Army bakeries were in action in the bridgehead well before their scheduled date, but the distribution of the bread was not easy and many R.A.F. units did not receive adequate supplies for a considerable time.

Once the bridgehead was firmly established, however, the ration position continually improved and when sufficient aircraft were available it was possible to fly-in quantities of fresh meat, vegetables and liquid milk. As has been seen in the preliminary account, units moved frequently, and at such times it was necessary to revert to 'compo' rations until arrangements had been made at the new sites for the supply of field rations from the R.A.S.C. Detail Issue Depot.

During September and October quantities of German rations, which had fallen into Allied hands during the German retreat, were issued to units. These rations were criticised by all and were far from popular,

complaints being made about the poor quality of the meat, black puddings, sausages, rye flour and cooking fats. It was noticed that after the issue of these German commodities there were fewer complaints over the British rations! One side effect of the German rations which was interesting and of some importance was that certain aircrew found the change of diet made for a queasy stomach and definitely affected their flying. It should be remembered that gas-forming foods were particularly unsuitable for aircrew as these led to unpleasant distension of the gut at any altitude above 5,000 ft.; indeed,\* all food for aircrew should always be presented in the most palatable form possible, and in this respect neither the 'compo' packs nor the field service rations were entirely satisfactory, although this food did not produce the discomfort caused by the German rations.

The calorie value of the 'compo' packs was of considerable interest as it was surprisingly high, as a result of careful selection and balancing of items; the calories they contained were as follows:

24 hour personal pack . . .	3,900 Calories per person
10 man pack . . . . .	4,200 Calories per person

It will be seen that this intake was completely adequate for even the most strenuous work, but if any items, for example the biscuits, were not eaten the calorie value was greatly reduced. As a comparison the calorie value of the food issued for workers in Belgium in March 1945 is given below:

Normal workers . . . . .	2,075 Calories
Heavy workers . . . . .	2,418 "
Very heavy workers . . . . .	2,763 "
Miners . . . . .	3,991 "

Despite the apparent adequacy of the calorie intake some disquiet was felt with regard to aircrew living strictly on the rations, and to allay any fears a nutritional team consisting of two medical officers skilled in dietetics, visited the Second Tactical Air Force in September and October of 1944. They carried out very thorough investigations into the adequacy and suitability of the diet in thirteen units, clinical investigations being undertaken by the laboratories of Nos. 50 and 53 Mobile Field Hospitals. Neither clinical nor chemical investigations revealed any gross signs of malnutrition and in fact the only positive finding was that one wing, which had suffered a deficiency of fruit and green vegetables for a short period, showed signs of deterioration in the speed of adaptation to night vision.

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\* As was pointed out by one pilot, 'steak and kidney pud.' for which English cooking is justly famed, was not the kind of food likely to leave a pilot, who might be in the air within a very short time after a meal, in an alert frame of mind to combat enemy attacks.

The whole rationing position can be summed up by saying that, considering a major military assault was taking place, food was good and no serious breakdowns occurred. Certain of the criticisms made were justified and could have been avoided by a number of simple measures which, as they may assist future planners, are listed below in the form of recommendations:

1. Packs of the 'compo' type could be improved by:
  - (a) Packing tea, sugar and milk (preferably the concentrated liquid) in separate containers.
  - (b) Introducing cereals and extra milk to improve breakfasts.
  - (c) Incorporating more than one type of biscuit to allay monotony.
  - (d) Selecting less fatty cuts for tinned bacon (this applies to the Field Rations).
2. Special priority should be given to the establishment of field bakeries and an adequate distribution scheme.
3. When 'compo' packs are issued a special supplementary pack should be available for aircrew, containing fruit juice, tinned milk and tinned fruit, these being required in the interests of nutrition and palatability.
4. In view of the lack of adequate storage facilities all mobile units should be provided with a food tender, preferably with a refrigerator compartment. Such provision is considered essential if a high standard of cleanliness is to be maintained.

#### WASHING UP

This normally prosaic task assumed considerable importance in the bridgehead period in view of its implications with regard to hygiene. It should be remembered that a very large number of men were enclosed in the compass of the bridgehead, and that if dirty washing up water was indiscriminately voided the area would soon become fouled, creating an entirely unnecessary danger of general infection.

To minimise this risk, which was a very real one in view of the hot dusty weather, medical officers and hygiene personnel kept a very strict watch on the methods of washing up used. The most popular and effective was the 'three-container system' and all units were encouraged to adopt this method.

In this system three longitudinal halves of 50-gallon fuel drums were set up with sufficient room below to allow a fire to be built. The first contained a strong solution of soda in hot or boiling water to remove grease after 'scraps' had been emptied into an adjacent swill bin, the second contained a strong solution of bleach and the third plain boiling water.

Individuals rinsed their own utensils in the three troughs and retained them in their own possession, for the next meal might be taken in a very different location. It was found that this method worked

well and that the minimum of supervision was necessary. The water, when dirty, was disposed of into soakaways which were clearly marked with stones to give warning to any other unit which might use the site subsequently. A certain amount of 'spill' occurred and as a further precaution the surrounding area was limed.

A word of warning on the use of fuel drums for sanitary appliances will not be out of place here. On one occasion an airman was using an oxy-acetylene flame to cut off the top of a drum, not realising that even small quantities of residual fuel would be dangerous in these circumstances; the heat of the flame unfortunately created an explosive mixture and the top portion of the drum flew off, fatally injuring the airman. Following this incident the use of cutting flames for this purpose was forbidden and the lengthier but safer method of hacksawing insisted upon.

#### ACCOMMODATION

*Tentage.* It was obvious that the accommodation possible in the beachhead area would depend largely on the operational situation, while later in the campaign more generous accommodation could be expected, either in the form of larger tents or in requisitioned civilian buildings.

Apart from certain specialised tents reliance was placed mainly on the 160-lb. ridge tent for sleeping and office use and the larger type of store tent for dining and recreation halls and for other uses of a semi-permanent nature, bearing in mind that the larger tent was more difficult to erect and to camouflage.

In the beachhead and in the initial advance the 160-lb. tent was used a great deal, for it had the advantage that it could be rapidly erected by two people and easily camouflaged. It was, however, not popular for medical use, for example in the airfield sick quarters where nursing was involved, as the height of the sides was only 18 in.; the tent was 7 ft. high in the centre and the total floor space was approximately 14 sq. ft. Nevertheless, it was extremely portable, for canvas, pegs, poles, ropes and mallets were easily stowed in a jeep.

In the bridgehead it was customary to use a fly sheet as it was found that flak usually penetrated one layer of canvas but not the second. As a further precaution it was wise to 'dig in' so that the recumbent patient, on a portable bed, was well below ground level; in addition, the patient's body was often covered with a folding table.

When conditions allowed use was made of the larger tent marquee which was a most convenient size (45 × 20 ft.) and seated 70 persons; a large number of beds could be set up in these marquees, and the walls were sufficiently high to allow comfortable nursing of patients. Apart from being easy to erect and not unduly bulky, the tents were

cool in summer as it was easy to remove one side completely; there was one drawback, however, in that they could not be dug in, as the area involved was too great for the labour available.

Using the two types of tentage described it was possible to provide adequate and portable accommodation to suit the particular circumstances prevailing and by and large all personnel were as comfortably housed, both generally and medically, as could be expected in the circumstances.

By the autumn of 1944 the operational situation was so favourable that all units were encouraged to seek and prepare more permanent accommodation in which to pass the winter months. By January it was estimated that only 0.9 per cent. of the whole force remained under canvas and these few were doing so by choice or for urgent operational reasons. It is interesting to note that records suggest that the time spent under canvas was not responsible for any undue increase in sickness rates; in fact it may even have had the reverse effect of generally improving health and resistance to minor infection.

*Requisitioned Buildings.* From the winter of 1944 onwards, as far as medical units were concerned, tentage was not greatly used except in small units, such as C.A.E.U.s., which were continually on the move. The mobile field hospitals in particular were most fortunate in finding suitable accommodation and by the first winter all but No. 54 were housed in buildings which had been previously used by civilian authorities as hospitals; No. 54 Mobile Field Hospital took over a modern technical school which lent itself to easy adaptation to hospital accommodation.

Other units made use of a variety of buildings, luxury hotels and villas being particularly popular, although in some instances disused cattle sheds and other farm buildings had to be used, one enterprising but foolhardy unit even taking over a tannery—though this occupation was, needless to say, short-lived. By the winter all R.A.F. units had found accommodation which was reasonably suitable to the inclement weather conditions, even the poorest buildings being preferable to tentage.

In taking over such buildings considerable care had to be taken to ensure that all booby traps had been removed, this type of sabotage being particularly common when German troops had the necessary time prior to retreating. All personnel were briefed on the dangers, but in spite of this a considerable number of casualties occurred as a result of combined carelessness and curiosity.

Most units were able to remain in these relatively comfortable billets until late March 1945, when the move across the Rhine began, bringing with it a return to mobility and field service conditions. Even in these circumstances, however, the R.A.F., as a more static force than the



Army, usually remained in each place sufficiently long to take over permanent buildings between each move.

#### FUEL AND HEATING

In the beachhead area most cooking was done on Hydra burners, which ran on petrol supplied under pressure, producing a flame very similar to that of the common blow lamp. They were found to be most efficient if normal maintenance was carried out, particular care being required to keep the needle jet clean, for this regulated the size of flame; although this should have been a simple task, even for a non-mechanically minded person, many burners were rendered unserviceable through lack of such attention. A further difficulty was encountered over the supply of leadless petrol, which although difficult to obtain was essential if the burners were not to become corroded with deposits of lead sulphide; when it was discovered that food cooked on these stoves was becoming contaminated with lead the use of leaded petrol was forbidden, but as there was no other petrol available, these instructions were often ignored.

Although the Hydra burner was the one most generally employed in the field use was often made of the oil and water flash principle. This consisted of two tanks, one containing crude engine oil and the other water, which were so arranged that feed pipes from each led to a metal plate where drips of the two fluids were ignited, this producing a good flame suitable for all forms of cooking and heating. These stoves, which could be constructed in the field with the minimum of ingenuity, were little used, even when the fuel shortage was most acute, which was surprising in view of the fact that explanations of their construction and function had been included in the exercises prior to D-day.

When, in the winter months of 1944, personnel were for the most part housed in permanent or semi-permanent accommodation, many of the kitchens were fired by solid-fuel stoves, which were satisfactory until the shortage of solid fuel became acute in January 1945; it was then necessary to practise the most rigid economy and it was officially laid down that solid fuel was to be used only for cooking, and not for general heating.

The explanations given for this shortage of solid fuel were many and the true reason was probably a combination of all the factors, the main ones being outlined below:

- (a) Shortage of pit props. The enemy in their drive through the Ardennes had captured and destroyed the main dump of these props, which were essential to the safe mining of Belgian coal.
- (b) Difficulties in transport. This was a very real problem for, as mentioned elsewhere in this narrative, the roads were in such a

state that certain sections were impassable to heavy vehicles. In addition canal traffic had ceased owing to the damage caused to lock systems by the retreating enemy and by the general freeze-up.

- (c) A strike among the Belgian miners over a reduction in rations. This was particularly unfortunate as the reduction was unavoidable in the operational situation prevailing, and their lack of co-operation did little to forward the Allied cause—or incidentally, their own.
- (d) A pilfering rate stated to be at least 10 per cent. This estimate may well be correct, for it must be remembered that in the occupied countries pilfering had been encouraged by the Resistance groups as a means of hindering the enemy, and it is understandable that in the confusion of the fighting pilfering still went on.

The solution to the fuel problem as far as the Second Tactical Air Force was concerned was not easy; local aid and ingenuity played a big part but the most practical solution was to use the Force's own transport to collect solid fuel from the pit-heads and dumps. Once the severe winter weather had broken there was no further serious shortage, although, as already recorded, many of the buildings used by mobile field hospitals were rendered extremely cold when the glazing was damaged by near misses of enemy missiles.

#### LAUNDRY

In the beachhead area personnel did their own laundering, an increased issue of soap being allowed for the purpose and a generous ration of water made available through the efficiency of the Army water points. The men were encouraged to wash clothes as frequently as possible, but garments dried in the dust laden atmosphere often appeared no cleaner after washing than before. When the break-out occurred laundry difficulties vanished, for the local village population were only too anxious to undertake such tasks in return for payment in kind (not currency). In the instance of the mobile field hospitals, arrangements could usually be made for the local authorities to undertake bulk laundering, which resulted in a considerable saving of manpower, for the wash from any busy hospital assumes startlingly large proportions and as obviously no very great store of linen could be carried, the turnover had to be rapid if the efficiency of the hospital was not to suffer.

Disinfection of blankets was a considerable problem and until the units became relatively static little could be done apart from washing. Disinfectors were carried by many units but they were bulky items and as the campaign progressed they tended to 'disappear' from the equipment—a reprehensible but at least understandable occurrence. The Army were established with special units to undertake disinfestation and whenever their commitments allowed offered these facilities to the R.A.F. It was perhaps fortunate that, as far as the R.A.F. was

concerned, lice were not a problem in this campaign, for if they had been found in any numbers a special organisation to deal with the matter would have had to be set up.

With regard to organised bathing the position of the R.A.F. was relatively favourable, again due to the few sudden moves in comparison with the Army. For units situated in town areas it was usually possible to come to some arrangement with the local authorities to use public bath houses; in the more outlying districts most personnel showed considerable ingenuity in the production of home made baths and showers. One of the more amusing of such gadgets was a flash-fired 'lazy man's boiler', which had an electric pump connected to a well as the inlet supply, so that all that had to be done to get hot water was to turn a switch.

Safety of water supplies, even for washing and bathing, was a factor which could not be neglected and whenever it was thought possible that contamination might have occurred tests were carried out. Although the enemy destroyed water installations when their retreat was sufficiently orderly to allow time for this, no instance of deliberate poisoning of water supplies was recorded by the R.A.F. authorities, but all medical officers were warned of this possibility and prepared for its detection.

#### CASUALTY AIR EVACUATION

##### GENERAL ACCOUNT

The subject of evacuation of casualties by air, including that during Operation 'Overlord', has been dealt with in considerable detail in Volume I of this History, but some of the initial evacuation by air in the early days of the beachhead is worthy of further consideration in so far as it demonstrates the impromptu work carried out by the R.A.M.C. and R.A.F. medical units concerned.

In the initial planning it had been estimated that no large scale air evacuation of casualties would be possible from the beachhead area until at least D-day + 28 and accordingly the Army was relying mainly on sea evacuation up to that date.

It had been arranged that the ground personnel to operate the forward airfields should be flown to the Continent in Dakota aircraft between D-day + 7 and D-day + 28, the number of aircraft involved varying from 9 to 13. The air parties were known as 'A' Echelon and it was planned that they should arrive before the main body of 'B' Echelon, which would include the medical personnel and travel by sea. When the time came, 'B' Echelon arrived before 'A', and it was realised that the aircraft bringing the latter and returning empty to the United Kingdom offered an excellent opportunity for the evacuation of casualties. It was, therefore, arranged through D.D.M.S. Second

Army that these aircraft, together with certain other Dakotas that were ferrying bombs, should carry stretcher and walking wounded on their return to the United Kingdom. It was estimated that 180-250 stretcher cases alone could be moved in this way, and the potential saving to the over-taxed land/sea route of evacuation was considerable.

To run this *ad hoc* air lift medical officers and other personnel were obtained from No. 50 M.F.H. and No. 127 Wing, the numbers being sufficient to man two temporary mobile evacuation units; a third unit was formed from No. 52 M.F.H., but remained static as it was most conveniently situated within two miles of both B.2 and B.3 airfields. (See Map 4.) D.D.M.S. Second Army made available No. 50 Army Field Dressing Station to augment the scratch C.A.E. units when necessary. This arrangement only lasted a few days but proved invaluable.

The aircraft normally carried between 100 and 400 casualties per day, depending on whether they were stretcher or sitting cases, while the mobile units had marquee accommodation for 50 to 70 persons. Wherever possible the C.A.E. units were established about 500 yards from the perimeter of the airfield, using any suitable camouflage; this distance meant that there was a minimum of dust from the airfield and also that the large numbers of ambulances did not assemble in too conspicuous a position.

Much co-operation was received from the R.A.F. Provost Branch who set up signposts to assist ambulance convoys and also supplied D.Rs. to direct the convoys at confusing road junctions. Ambulances were timed to arrive two hours before the E.T.A. of the aircraft, but this was not easy to achieve; frequently aircraft were held up by unfavourable weather for anything up to eight hours, while ambulance journeys which should have taken barely half-an-hour dragged on for over two hours because of congestion on the roads.

On arrival each patient was seen by a medical officer of the C.A.E.U. and ideally by a medical officer from the airfield, the more serious cases being immediately transferred to the marquees. If possible a nursing sister drawn from the mobile field hospitals was present all day and proved invaluable from both the nursing and morale point of view. The difference noticed in morale when a sister was present was quite dramatic.

The majority of the casualties had been wounded 10-15 hours previously and little beyond elementary first aid and continuation therapy was necessary. The unit kitchens provided constant hot tea and snacks and on several occasions had to provide midday meals for over 200. Fortunately food supplies were plentiful as also were cigarettes, chocolate and periodicals, most of which were flown over in the aircraft from the United Kingdom.

Immediately the transport aircraft arrived a 'Report Centre' was set up on the airfield, its position being indicated by a flagpole displaying the Geneva Cross, and here a medical N.C.O., assisted by a despatch rider, superintended the loading of patients. Ambulances were called forward by the D.R. and the driver handed in a chit stating the number of patients carried and their classification (i.e. sitting or stretcher) and gravity of injuries; this was a very important point and incidentally made certain that *all* cases had been examined. The N.C.O. at the centre then allocated the ambulance load to a suitable aircraft, thus ensuring even loading, for it was important that no aircraft should have, for example, a predominance of stretcher cases. Each of the available aircraft was allotted to a medical airman of the C.A.E.U. who was ready to receive the ambulance and supervise the safe and correct loading of the cases. Fortunately all C.A.E. work proved a strong attraction to casual onlookers and from such persons it was possible to recruit, on the spot, sufficient labour to handle stretchers and assist the walking wounded.

The above paragraphs indicate briefly the general plan on which the impromptu evacuation was carried out and underline the makeshift nature of the arrangements, under which, nevertheless, over 3,000 casualties were evacuated between D-day + 7 and D-day + 28; a very considerable feat which greatly relieved the pressure on the land/sea route and in certain instances proved a life-saving measure. It should be remembered that in the initial planning it was agreed by all Services that C.A.E. proper should not begin until D-day + 28 and that these efforts must be looked upon as an example of commonsense venture by personnel who were prepared to seize a good opportunity.

The scheme worked satisfactorily up to a point, but the strain on the M.F.Hs. was severe, and although the number of casualties evacuated reflects very great credit on these units many difficulties were encountered; these are summarised below:

#### GENERAL OBSERVATIONS ON DIFFICULTIES ENCOUNTERED

- (a) On many occasions accommodation was available for a total of 300-500 on the transport Dakotas, but as these aircraft landed at 3 or 4 airfields, all arriving at approximately the same time, and the scratch C.A.E. units were not able to make arrangements simultaneously at all the airfields, many aircraft unfortunately returned home empty.
- (b) Notification from the United Kingdom of intended aircraft arrivals was often very poor and perhaps only 3-4 hours' notice would be given. Sometimes aircraft arrived at an airfield other than the one stated or they arrived in fewer or greater numbers than advised.



PLATE LV: A. M. F. H., at work in the field

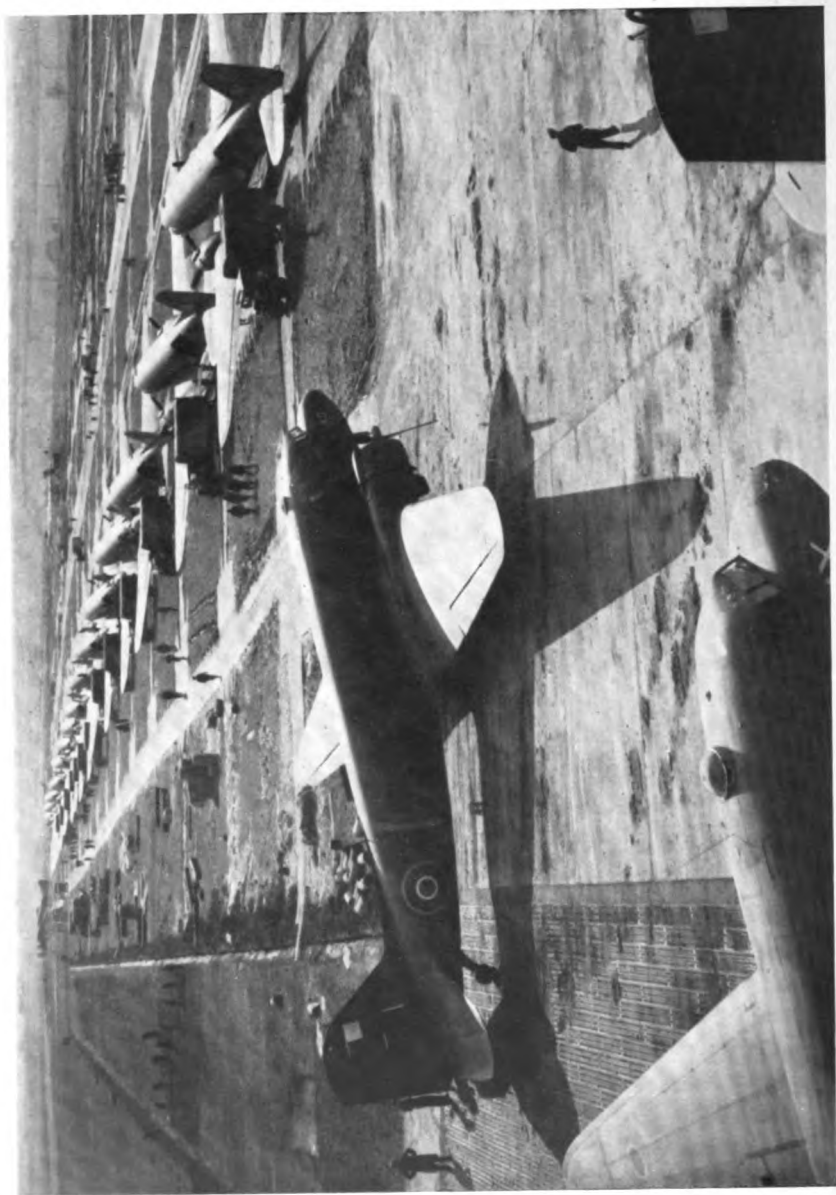


PLATE LVI : Casualty Air Evacuation. Loading Dakotas on a large airfield near Brussels. Note allocation of one ambulance to each aircraft to allow simultaneous loading of a considerable number of patients. Also hardstanding for aircraft and vehicles

- (c) Postponements from the United Kingdom due to bad weather were unavoidable, but frequently an 'indefinite postponement' was received, only to be followed within a couple of hours by the arrival of the Dakotas overhead, unavoidable perhaps, but most frustrating to medical personnel who had badly injured patients in need of evacuation.
- (d) Communications being bad and traffic jams the rule, it often took three hours to cover three miles and it was thus impossible to get patients to the airfields in time for air lift when only short notice was given. Furthermore, hospitals could not produce very many patients at a moment's notice when, in addition to a minimum of one hour for the journey, it took something like two hours to get the patients ready. One reason why this preparation took so long was that a special form—Form 2074—had to be written out in triplicate for each patient being evacuated by air—a laborious task when perhaps over 200 cases were involved. When a patient had been documented on Army Form 3210 for sea travel, and then an air lift became available, the Form 3210 had to be scrapped and a Form 2074 prepared; this in particular was most irksome for a busy hospital in a forward battle area.
- (e) With delays due to weather inevitable, it was common for casualties to be waiting at the airfield units for 6–8 hours and as it was impossible to provide tented accommodation for more than 50–70 patients, the remainder had to wait in their ambulances placed in whatever shade was available. Not only was this very trying for the wounded in the hot weather but it meant that a large number of ambulances, which the Army could ill afford, were tied up for long periods at a stretch.
- (f) With the limited accommodation available at the improvised C.A.E.U.s. it was necessary to decide, on doubtful flying days, whether to hold the casualties at the C.A.E.U.s. in the hope that aircraft would arrive, and thus risk missing sea evacuation for the day, or whether to send them down to the Casualty Evacuation Posts (C.E.P.) on the beaches. If sea evacuation was missed it would be necessary to return possibly 200 casualties or more to the hospitals, which in all probability would have filled up in the meantime. Fortunately it was never necessary to return casualties in large numbers and this difficult situation did not arise, although on certain occasions it seemed unavoidable.
- (g) Despite most explicit instructions from D.D.M.S. Second Army and personal visits by R.A.F. medical officers, cases totally unsuitable for air evacuation\* often arrived, illustrating the importance of

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\* See 'Clinical Considerations', R.A.F. Volume I, Chapter 10, page 529.



all cases being seen by a R.A.F. medical officer before emplaning. Such cases included:

- (i) Abdominal section within 10 days of operation.
- (ii) Perforating chest wounds with dyspnoea.
- (iii) Psychotics and Battle Exhaustion cases.
- (iv) Casualties in a state of shock.

When such cases were received the medical officer in charge was in a difficult position. He had to weigh up the risks involved in air travel against those of the patients being returned to hospital, a rough journey rarely under three hours, and then being evacuated by the sea route. Considerable clinical acumen was necessary to make this decision and there was the certain knowledge that errors of judgment would be inevitable in some border-line cases.

- (h) Owing to the risks involved in the uncertainty of air travel, hospitals often chose the sea route when air evacuation was certainly, apart from possible delay, best for the patient.
- (i) It was obvious from experience during the impromptu air evacuation that when the main airlift began it would be essential to have surgical and anti-shock treatment available at the C.A.E.U.s.
- (j) Throughout the impromptu airlift the principle adopted was that the casualties must wait for the aircraft and not the aircraft for the casualties. It was not always realised that aircraft in operational areas were 'sitting targets' as long as they were on the ground and that as rapid a turn round as possible was desirable; aircrews were understandably loath to wait any length of time even for casualties and therefore, for air evacuation to be really effective, it was essential that patients should be ready on the airfield when the aircraft arrived and an organisation which ensured rapid loading was fully justified.

## The Health of the R.A.F.

### PRINCIPAL DISEASES

In any large scale military operation disease may play an important part—indeed, historians have recorded how in many campaigns armies were decimated and battles decided by the appalling ravages of sickness occurring among formations in the field. Even in this Second World War the toll taken by disease was very considerable and it is, therefore, not surprising that in the preliminary schemes for the invasion of Europe the medical hazard was never forgotten, precautionary measures being worked out in detail before the assault began. Having provided as far as possible for every contingency, the medical

authorities were constantly on the alert for the first signs of disease, in order that it could be quelled before assuming epidemic proportions.

In general, health throughout the campaign remained at a very high level and disease in true epidemic proportions was never encountered. That major outbreaks could have occurred is unquestionable but it is to the credit of all concerned that the conditions which would have led to wholesale infection were never allowed to develop. Brief mention will be made in the following paragraphs of the main diseases of importance which were encountered and any details considered pertinent will be discussed, particularly with regard to their bearing on the preventive aspect. Owing to its importance, venereal disease and its incidence during the campaign is dealt with in considerable detail.

#### ENTERITIS

Early in July 1944 scattered cases of enteritis were recorded among personnel of the R.A.F. in the bridgehead, the numbers assuming progressively larger proportions until, towards the end of the month (July 27), the incidence was giving rise to some concern. It was noticed that the number of cases increased markedly when 'compo' rations ceased to be issued in the latter days of July, and messing went on to a basis of field rations. It was further observed that recent arrivals were more susceptible than those who had been in the area for some time.

The total number affected is not easy to discover as many personnel suffering a mild attack continued to carry out their duties while undergoing out-patient treatment. It is known that during July there were 69 cases of such severity that they had to be admitted either to hospital or to sick quarters. By August the number had risen appreciably but in September there was a dramatic decrease and the figures continued to fall until they became negligible. This sudden drop was no doubt mainly due to the breakout from the bridgehead area into 'clean' country and the onset of colder weather. Fig. 3 depicts the course of the outbreak as described above.

The average weekly incidences per thousand for the three months of the outbreak were as follows:

July	.	.	0.177
August	.	.	1.72
September	.	.	0.556

Most patients were only in hospital for 3-4 days, but this was still a serious loss to small units in full operational working. These figures, moreover, reflect only the numbers treated as in-patients and it is estimated that at the height of the outbreak something like 20 per cent. of the Force had symptoms which resulted in a definitely lowered output of work. The incidence was greater among Army formations but

this was only to be expected in view of the inevitably lower hygienic standards obtaining in the advanced fighting areas.

No immediate cause was ever discovered for the outbreak and it is in fact unlikely that any single factor was wholly responsible; it was considered that the following were among the main causative agents:

1. Prevalence of flies attracted by rotting apples, corpses, fouled ground and faulty or negligent disposal of faeces.
2. Dust coupled with heavy traffic keeping it continually stirred up.
3. Carriers among food-handlers.
4. Exceptionally large numbers of troops in a small area.
5. Changeover from 'compo' to field rations with poor storage facilities.
6. Susceptibility of newly landed personnel.

It is of some interest to note that attacks of enteritis were commonplace among visitors to Normandy in peace-time; this fact was considered by the German medical authorities to be of such importance that they had insisted on all their troops in this area being protected with a dysentery vaccine and daily medication. A translation of a captured German medical order relating to this matter is reproduced below and it is worthy of speculation why our own medical authorities were not aware of, or under-estimated, this particular hazard.

"Oberkommando der Wehrmacht                      Berlin, 11 April, 1944.  
Surgeon General

S.O.P. FOR DYSENTERY INOCULATION, 1944.

For dysentery, vaccine manufactured in 1943 or 1944 must be used. Both vaccines have the same content. Other vaccines are not to be used. Vaccines will be supplied in bottles of 50 and 100 c.cm.

The inoculation will be administered subcutaneously in doses of 0.5-1.0-1.0 c.cm. at intervals of 7 days into right and left chest. In addition, in August 1944 on order of higher medical headquarters 'dysentery tablets 1944' (Ruhrschutztabletten 1944) will be given to units where dysentery occurs frequently. The tablets will be taken three days consecutively. One tablet every morning on empty stomach. The effect of the parenteral dysentery inoculation will be reinforced by this oral administration. The inoculation must be entered on the soldier's service record. By 15th December 1944 experience reports must be submitted.

signed DR. HANDLOSER."

The disease ran a comparatively quiet clinical course, being characterised by diarrhoea, vomiting and malaise, lasting 12-36 hours. In most of the severe cases bacilli Flexner or Sonne were isolated. Treatment was straightforward and the routine use of sulphaguanidine greatly decreased the period of incapacity.

*Preventive Measures.* Both executive and medical authorities were immediately aware of the potential dangers of an outbreak of enteritis

among personnel who, in the relatively small area of the bridgehead, were inevitably in close contact with each other, and the following were among the measures taken to control the epidemic:

- (i) Camouflage orders were withdrawn and units instructed to site cookhouses in the open away from hedges and orchards.
- (ii) Extra sanitary assistants were attached to Group Headquarters.
- (iii) Medical officers were instructed to inspect all cookhouses daily and directions were issued on fly control, collection of rotting fruit and kitchen hygiene—including cooks' hand-washing and disinfecting.
- (iv) The Air Officer in charge of Administration instructed Group Commanders to demand an explanation from officers commanding units which received unsatisfactory hygiene reports.
- (v) Extra supplies of butter muslin, insecticide and fly traps were made available.
- (vi) A small quantity of D.D.T. Residual Spray arrived in September and was issued to the worst areas, although by this time the weather was getting colder and the flies decreasing.
- (vii) Command Routine Orders were issued forbidding the consumption of uncooked fresh fruit or vegetables and non-alcoholic beverages outside camp areas.
- (viii) All food-handlers suffering from diarrhoea were to be treated in hospital and a full course of sulphaguanidine was also to be given to unaffected food-handlers wherever a large number of cases occurred.
- (ix) All water supplies were to be tested for free chlorine daily irrespective of their origin.
- (x) Animal corpses were to be buried or burnt.

These measures must have had some effect, but it was considered, as stated earlier, that the major factors cutting short the outbreak were the colder weather, and the break-out into fresh, open country, away from the intensely congested, battle-fouled and apple-strewn bridgehead.

#### INFECTIVE HEPATITIS

Throughout the campaign this disease never assumed alarming proportions and the incidence was considerably less than that encountered in, for example, the Western Desert and Burma; nevertheless, a small but steady number of cases did occur, typically in small groups of 4 or 5, with one exception that will be discussed later.

Until February 1945, the general incidence for the Second Tactical Air Force was similar to that experienced during training in England in 1943, and 90 cases were recorded; this figure is probably fairly reliable as it is unlikely, in view of the characteristic malaise and jaundice of the disease, that any personnel suffering from it would have remained out of hospital or sick quarters.

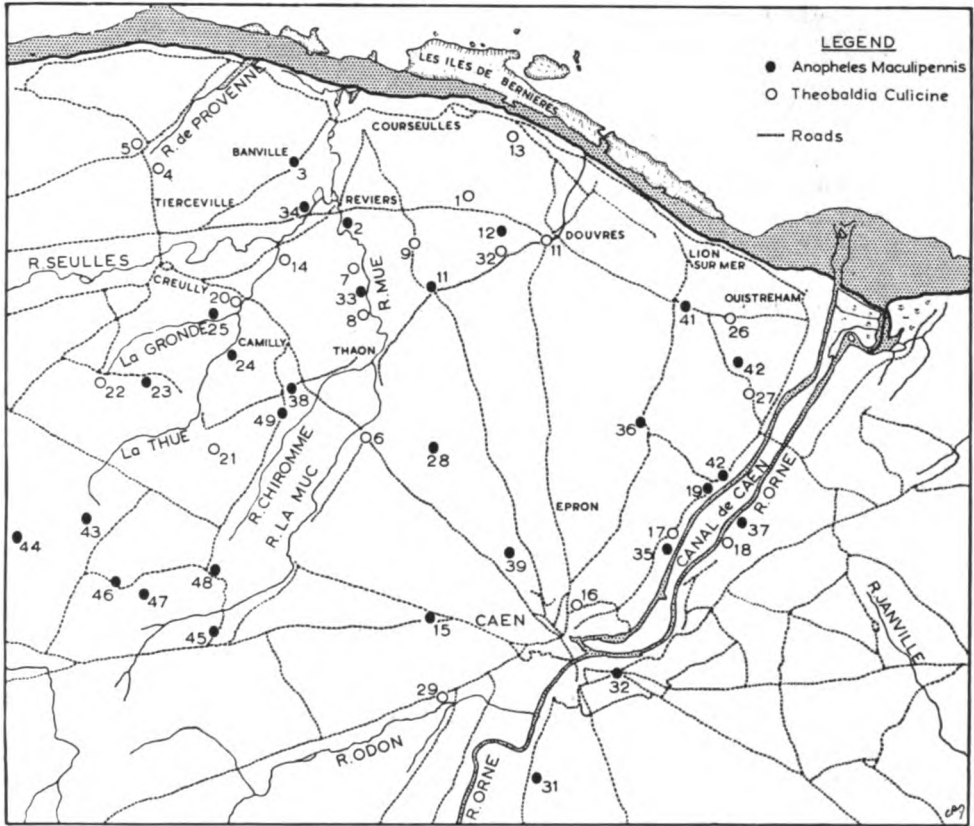
In January 1945, the number of cases recorded was 27 and this gave an indication of a possible upward trend, which was borne out in the two following months when the figures were 132 and 133 respectively. The number of cases in April was 37 and the rate then dropped to negligible proportions. Of the 302 cases recorded in February, March and April 106 occurred in the Norwegian Wing located at Schindjel (eight miles south-east of 'sHertogenbosch); the outbreak was confined to the airmen's mess, and, although this was used by approximately 50 per cent. Norwegian and 50 per cent. British personnel, 97 per cent. of the cases were among Norwegians.

Investigations on the subject of infective hepatitis have never been fruitful but the statistical difference in this instance appeared to have some significance and it was considered that the reason for the higher incidence among Norwegians than among British personnel might have been a lack of immunity among the former. This theory finds support in the statement by the Norwegian medical officer that before the war infective hepatitis was a rare disease in Norway. Another suggestion was made that the epidemic was connected with the drive in 1944 to render the inoculation state of the Norwegians 100 per cent. and that the disease had been spread through faulty inoculation technique. Although the causal factor was never proved immediate steps were taken to control spread of the disease; the most important precaution was to move the wing into tents to reduce the risk of droplet infection and whether as a direct result or not, the epidemic died out soon after this move had taken place. (*See also page 541.*)

#### MALARIA

In the initial days of the beachhead several cases of malaria were recorded in the Army and these patients were in fact among the first to be evacuated by air to England; all cases were relapses in men who had had previous attacks of malaria when serving abroad. The reason for the relapse was probably the rough conditions in which they had to live, many of them getting their clothing soaked on the initial landings and being unable to change into dry garments.

By October 1944, thirty-seven cases of malaria had been recorded in personnel (other than R.A.F.) who had not previously been exposed to infection, and almost without exception the disease was contracted in the Caen area. The possibility of malaria being indigenous to this area had not been realised either by our own medical authorities or by the Germans, as was evident from a captured order of the Wehrmacht Surgeon General which defined clearly the likely malarious areas in France but did not mention Normandy. A translation of this order follows:



MAP 3. Area over which the mosquito survey was carried out.

'Oberkommando der Wehrmacht.  
Surgeon General

Berlin, 15 February 1944.

#### PREVENTION AND TREATMENT OF MALARIA

1. Preventive treatment will be carried out without exception by all units which are stationed in the area described below.

The malarious area is defined as beginning in the west with the area of the Rhone Delta south of a line from Montpellier, through Nîmes, and Avignon, to Toulon. It then continues along the French Mediterranean coast to Mentone, thence along the foothills of the Italian Alps to Graz (in Austria). From Graz, the boundary is formed by the Rivers Mur, Drava and Danube, as far East as the Iron Gate, then follows the Southern and Eastern Carpathians to Cernauti, thence to Kiev and Kasan.

2. Preventive treatment starts on the 1st of April of each year and ends on the 31st of October of the same year. In general, north of this line preventive treatment is not necessary. In special cases the

Surgeon of the Army Group will make decision on the basis of the Army Surgeon's report.

3. The preventive treatment consists of: Daily, after meals, one tablet atebirin 0.06 grams with abundance of liquid. (One tablet daily.) Any change of this dosage is forbidden.

4. Terminal treatment will be uniform for the whole Army and will be carried out on the 1st of November each year, using atebirin and possibly plasmoquine. This treatment will follow immediately after the last day of atebirin preventive treatment. Atebrin 0.1 gram will be given three times daily after meals for seven days, followed by plasmoquine, 0.01 grams three times daily after meals for three days. Plenty of water should be taken.

5. Units which depart from this malaria-danger area, or men on furlough or being transferred, will be given the terminal treatment as per paragraph 4.

signed DR. HANDLOSER.'

Among R.A.F. personnel no case of true indigenous malaria was recorded throughout the campaign although several cases of relapse occurred in both ground and air crew. Nevertheless, it was considered a wise precaution for field studies to be instituted to discover the main types of mosquito indigenous to the beachhead area and to estimate the possible risks. Map 3 shows the results of the survey (which covered the majority of the likely breeding grounds in the area) and indicates the number of mosquitoes trapped. Although numerous specimens of *Anopheles maculipennis* were discovered it was felt that these did not constitute a serious menace, as this North European variety normally feeds on domestic animals in preference to man; nevertheless, a reversal of this habit is not unknown and with the diminishing numbers of animals in the beachhead the possibility of malaria occurring remained.

#### TYPHUS

The full medical implication of this disease was clearly understood by all medical officers of Second Tactical Air Force and very careful watch was kept for its possible occurrence. It was recognised that the disease was relatively common in Europe and that the conditions associated with the occupation were likely to produce outbreaks of epidemic proportions; hence medical officers were always on the alert for cases among the civilian population, particularly after our advance into Holland and Germany, where it was known that workers in the German Todt organisation (mainly Poles and Russian slave labourers) had suffered considerably from the disease.

Although, as had been expected, many reports were received of cases occurring among the German population and their slave labourers, the only occasion when R.A.F. personnel of Second Tactical Air Force

were in close contact with typhus was at Süchteln, where the advance guard of the Second Tactical Air Force Headquarters were camped in the grounds of a lunatic asylum while taking over the buildings. It was discovered that part of the asylum was being used by the Germans as a hospital, run by two doctors, and when medical officers of the Second Tactical Air Force visited the building they personally examined 80 typhus patients, in all stages of the disease, 5 of them Germans and the remainder Russians and Poles who had been working on fortifications in the neighbourhood.

It was observed that the hospital was well run and that the patients were looked after in a correct manner; the mortality rate was low, 5 patients out of 145 dying. Arrangements were made for the hospital to be sprayed by an Army field hygiene section, using A.L. 63, Mark III, as D.D.T. residual spray was unfortunately not available.

In view of the possibility of a serious epidemic the following signal was sent immediately to all Senior Medical Officers by Headquarters Second Tactical Air Force.

'From Principal Medical Officer

Second Tactical Air Force

For all Senior Medical Officers.

145 cases of Typhus notified among civil population in Venlo area. Conditions favour spread to all parts of Germany. Instruct medical officers to be on alert for mild cases resembling influenza. Inoculation state to be made 100 per cent. forthwith. Personnel to be warned to avoid contact with civilians in Germany. Laundry not to be washed by civilians in Germany and buildings not to be occupied until treated with D.D.T. Residual Spray. All ranks to be dusted weekly with A.L. 63. The following to be considered protected against typhus. Those who have received initial protection with three doses within three months. Those who have received second, repeat second, re-inforcing doses within six months.'

This signal was followed by more detailed instructions, summarised below:

- (i) All anti-lice measures were to be strictly adhered to.
- (ii) Every effort was to be made to reach and maintain a 100 per cent. state of immunity by inoculation. In areas where cases had been notified, unprotected personnel were not to leave camp on other than essential duties—this did not apply to personnel proceeding on leave outside the infected area.
- (iii) Civilians could now be employed for laundry work on the advice of S.M.O. Group, who had first to satisfy himself that there was no typhus in the area concerned.

It was noted that few of those who in the past 'did not believe in inoculation' retained the courage of their convictions and no trouble was



experienced by medical officers in obtaining a satisfactory state of protection.

#### ACCIDENTS

It has been seen that the bulk of the medical work in the initial phases of the invasion was provided by battle casualties or medical conditions, mainly enteritis. One further group of patients worthy of mention can conveniently be described as accident cases. These, of course, were equally common to the Army, or perhaps more common, as their conditions were more favourable to the occurrence of accidents than were those of the R.A.F., but casualties were naturally taken to the nearest medical aid and thus a cross-section of such cases in the bridge-head area would automatically be seen by medical officers of the R.A.F.

It is convenient to subdivide the accidents into four main types, the frequency of occurrence being roughly the order in which they are dealt with below:

- (a) *Mishandling of Firearms.* All personnel in the R.A.F. contingent of Second Tactical Air Force were given a course in the handling of firearms during their initial training. Despite the knowledge thus gained, men would 'fiddle' with arms, with the obvious result. This was particularly so in relation to captured German arms which the men persisted in hoarding as souvenirs—and very expensive ones they often turned out to be.
- (b) *Burns from Petrol Fires.* The ingrained habit among all troops of brewing a cup of tea on every possible occasion was responsible for some very unpleasant and sometimes fatal burns. As the tea-making was usually done on the spur of the moment and in some hurry the temptation to use petrol to get a fire going quickly was irresistible and petrol\* would be poured from jerry-cans on to smouldering embers; such stupidity resulted in an explosion which, if it did not kill the culprit, at least ensured his being in a plastic surgery unit for many months to come. Official instructions were widely issued pointing out the great dangers of this practice but the figures for burns injuries unfortunately show that these regulations had little effect on human nature.

One other very dangerous practice in relation to the use of petrol was that of emptying quantities into latrines in place of used engine oil; cases of very severe burns to the genitals, with fatal results, were recorded from such misguided attempts at hygiene.

- (c) *Motor Cycle Accidents to Dispatch Riders.* It was realised that the duties of dispatch riders involved a definite risk, for the very urgency of the messages carried demanded that vehicles should be ridden at considerable speeds. In exercises in England a very high rate of injury was recorded and it was, therefore, not surprising that the rate in Normandy was even higher.

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\* Ordinary M.T. petrol was sufficiently dangerous when used in this way, but the aviation fuel (100 octane) which was usually available was even more inflammable.

Most of the fatal accidents involved multiple injuries with a particularly high incidence of wrist and lower limb fractures. In non-fatal accidents it was observed on many occasions that the rider had been saved from severe cranial injury, or even death, by his 'crash hat'; it is interesting to note that the pattern of this hat was devised by a special panel during the war and that their efforts were so well rewarded.

Many of the accidents were undoubtedly due to the motor cyclist travelling too fast on roads which were congested with tanks and tracked vehicles and obscured by the pall of dust which hung over everything. It was felt that the youth of the D.Rs. was in many ways responsible for their lack of caution, but another factor brought out clearly in individual reports by medical officers was the doubtful wisdom of employing motor cyclists in weather which was unfavourable to two-wheeled transport. In the icy conditions encountered in the winter months of 1944 motor cycles were being used on roads which were so heavily coated with ice that spills were inevitable, and it was pointed out that four-wheeled transport would have been just as effective, safer, and, as far as the time factor was concerned, quicker. One report pointed out that whereas pilots of aircraft are entitled to question the advisability of flying in dangerous weather conditions, motor cyclists faced with an analogous hazard have no such rights.

(d) *Fractures in Personnel on Unloading Duty.* In the initial stages the rapid unloading of landing craft on the various beaches was a vital task and one which had to be accomplished regardless of weather conditions. Work had to continue even though the rough sea and wind made the landing craft anything but stable and it is not surprising that a considerable number of men were injured by falling into holds or by being crushed by runaway vehicles and heavy freight, most of the injuries being fractures of the limbs or ribs. Little could be done to obviate these risks, however, and they had to be accepted in view of the urgency of the situation.

#### VENEREAL DISEASE

If an armed force is to function efficiently it is axiomatic that the loss of man-hours, from whatever cause, must be reduced to a minimum, and to this end preventive medicine has an important part to play. In this connexion, it is of interest to note that, unlike most other causes of non-effectiveness, venereal disease is a disability for which the individual is entirely responsible and it is, therefore, only through the co-operation of the individual that the disease can be controlled. Furthermore, although it was possible to sympathise with a man who contracted, for example, dysentery, through an indiscretion in his eating habits while abroad, no such sympathy could be felt for the man who acquired venereal disease—even though both diseases resulted in a loss of man-hours and the employment of medical facilities which were needed for less mundane conditions.

On May 25, 1944, the Air Officer in charge of Administration (A.O.A.) wrote demi-officially to the Air Officers Commanding Groups, pointing out that there was known to be a very high incidence of venereal disease among prostitutes and in much of the population of the occupied countries and in Germany itself; it was also stated that the normally high pre-war incidence had increased greatly owing to a combination of poor conditions and a shortage of the drugs necessary to combat both syphilis and gonorrhoea.

The A.O.A. suggested that the Air Officers Commanding should send a personal letter to all unit commanders asking the latter to ensure that all personnel under their command were aware of the situation and of the dangers inherent in promiscuous intercourse. It was suggested that information could best be disseminated through lectures and that all personnel should be instructed in prophylactic measures.

In spite of these warnings, however, the anticipated high incidence of V.D. occurred and a further letter issued in October 1944, in which this fact was stated, stressed the good influence that unit commanders could exert by personal intervention and the results that could be achieved through the whole-hearted co-operation of all interested parties—namely, padres and welfare and medical officers.

#### *Venereal Disease and Its Course during the Campaign*

During June, July and August, when the bulk of our Forces were west of the River Seine, the incidence of all V.D. was insignificant, and of the 45 personnel requiring treatment in August 1944, only 2 had contracted the disease in Normandy. Later, when units were within easy reach of such towns as Lille, Amiens and Brussels, there was, not surprisingly, a sudden marked increase, and 162 cases were notified in Second Tactical Air Force in September. This represented an incidence per 1,000 per month of 1·84, as against 0·62 for August. It is of interest to note that geographical circumstances permitted comparatively few R.A.F. personnel to visit Paris and consequently little of the infection could be traced to that city.

The very circumstances in which our Forces were looked on by the local population as liberators were favourable to promiscuity and as the Allies were now approaching many more large towns, much anxiety was felt over this increasing incidence. It was accordingly decided to seek the advice of the senior R.A.F. Consultant in Venereology and that officer, therefore, visited Belgium and France to assess the exact position and to make necessary recommendations.

The Consultant found that medical arrangements for dealing with cases of V.D. had proved adequate; nearly all cases had been treated in either No. 52 Mobile Field Hospital in No. 83 Group or in No. 54 Mobile Field Hospital in No. 84 Group, the other mobile field

hospitals taking little part in the treatment of V.D. as they were, at this period, highly mobile. Supplies of drugs suitable for treatment were readily available, both sulpha drugs and penicillin being used; the latter was of particular value in the sulpha-resistant strains of neisserian infection and from September onwards both drugs were used in all fresh cases of both luetic and neisserian infection, with the specific object of discouraging sulpha-resistant strains which were beginning to be seen in some numbers.

*Recommendations by the Consultant in Venereology*

Although it was not possible for the Consultant to produce any immediately effective formula for lowering the V.D. rate, his presence and drive acted as a spur to all responsible officers, both executive and medical, and the problem was tackled with renewed energy. The Consultant's recommendations fell into two clear groups—social and medical.

On the social side it was emphasized that an intensive campaign of education in prophylactics was an immediate necessity, but that, as carelessness and drunkenness would render any prophylactic measures useless, a parallel scheme providing social and recreational activities was essential. The inauguration of Service social clubs would, it was felt, meet this need, although it was realised that to be of any real value the clubs would have to be equal to, or more attractive than, civilian places of entertainment. This was not easy in the 'official' atmosphere of a Service club, but when such clubs were opened voluntary workers of the Red Cross and other charitable organisations did much towards achieving a homely atmosphere.

It was also realised that at least for some considerable time the control of prostitutes and *maisons de tolerance* in the large cities would be a difficult, if not hopeless, task, especially as the professional prostitutes, if medically examined, were expert in masking their condition by self-disinfection and could also obtain medical certificates of the most dubious veracity.

The medical recommendations were more clear cut and definite and can be summarised as follows:

1. All cases of suspected or proven V.D. to be admitted to the nearest mobile field hospital or R.A.F. general hospital, or, if distance precluded this, to the nearest Army hospital, or recognised centre.
2. Neisserian and luetic infection to be treated with penicillin.
3. Patients in mobile field hospitals requiring more than 14 days' treatment to be transferred to the R.A.F. general hospital.
4. Facilities for W.R. and complete cerebro-spinal fluid examination to be available at mobile field hospitals and general hospitals.
5. Publicity to be given to the prevalence of disease in large towns, the Army policy of putting *maisons de tolerance* out of bounds to be supported actively by R.A.F. police.

6. Early treatment centres to be established where necessary and their location to be publicised.
7. Protective sheaths and E.T. packets to be easily available.
8. V.D. incidence to be published in Daily Routine Orders at the discretion of commanding officers.

In December and January, the campaign to decrease the V.D. rate was considerably helped by the Provost Marshal's branch, who had at last succeeded in getting active co-operation from the civil authorities; this had resulted in 158 women being examined and 75 of these being given treatment, although it is significant that only 50 per cent. were detained for treatment when it was more than likely that practically 100 per cent. were infected. The Belgian Public Health Department was also pressed to publish a decree relating to the control of venereal disease and to provide compulsory treatment of the infected, notification and information regarding the source of infection, the prohibition of the sale of anti-venereal drugs except to registered doctors, and the outlawing of advertisements for anti-venereal drugs, together with fines and imprisonment for those who indulged in intercourse when suffering from V.D. and also imprisonment for doctors and pharmacists who did not observe these civil laws relating to V.D.

In May 1945, the Consultant revisited Second Tactical Air Force and reported that the incidence of all types of venereal disease had dropped as soon as the force moved into Holland and Germany leaving the French and Belgian towns behind. He also pointed out that the incidence of non-specific urethritis was parallel to that of syphilis and gonorrhoea and suggested that this indicated a possibly venereal origin of the condition.

#### *Venereal Disease in Germany*

At the end of hostilities and with a very large number of Allied troops stationed in Germany it was realised by the medical authorities that V.D. would become an even greater problem for although, initially, a non-fraternising order had been issued to all personnel, it was obvious that this would gradually lapse until wholesale mixing with the German population occurred. The executive and medical authorities of all Allied Forces were, therefore, anxious that the policy with regard to prophylaxis should be established as soon as possible.

It was known that treatment of V.D. in Germany during the war had been, at best, most haphazard, owing to the progressive shortage of essential drugs and medical man-power and it was, therefore, expected that the incidence would be high among the German population and even worse among the many European displaced persons in the country. That such was indeed the position was shown by an official report issued in July 1945, by the P.M.O. of Headquarters No.

**85 Group after a survey of the situation in Hamburg by Allied medical officers and German health authorities :**

'In Germany today venereal diseases are rife to a degree never before experienced. I have recently caused an investigation to be made on the situation in the Hamburg area, the result of which gives much food for thought. It was disclosed that the control of prostitutes by both the police and the medical authorities in Germany completely broke down as long as two years ago and has remained non-existent ever since. As far as displaced persons are concerned, the Germans never had any sort of control over those suffering from venereal diseases. Furthermore, the Germans have never had the use of penicillin, with which the disease is best treated, and have recently exhausted their supplies of the sulphanilamide drugs which form the next best method of treatment.'

The following recommendations were made after consultation by the interested parties :

1. Anti-venereal propaganda to be continued as vigorously as in France and Belgium.
2. Condoms to be available (free), prophylactic centres to be set up and their location widely advertised.
3. The policy of tracing contacts to be pursued and Military Government to be pressed to have infected women detained and treated with antibiotics, supplies of which should be made available from Allied sources.
4. Medical officers in charge of special treatment centres to meet at three-monthly intervals, under the chairmanship of the Deputy Principal Medical Officer (Hygiene), to discuss problems, and an Army venereologist to be invited to attend.
5. A minimum of 150,000 units (international) of penicillin to be employed in the treatment of all cases of gonorrhoea.
6. All cases of syphilis under surveillance to be examined at each attendance for signs of muco-membranous relapse.

In this campaign as in others, therefore, every effort was made by both the executive and the medical branches to reduce the incidence of V.D., with its resultant loss of man-hours and heavy demand on the medical services. Most of the propaganda was designed to influence the attitude of the individual, without whose co-operation no preventive measures could be effective, but although much was undoubtedly achieved in this way and through improved methods of prophylaxis and treatment, the problem was never satisfactorily solved, nor was it felt that a complete solution could be found as long as men were willing, from whatever cause, to lay themselves open to the contraction of a disease which held such great risks to their health both in the present and in the future.

It was stated that the average time required for the initial treatment of the various forms of V.D. encountered was 10 days for syphilis, 2 days for gonorrhoea and 8 days for non-specific urethritis: if these figures are multiplied by the number of cases which occurred, it will be seen what a very large proportion of the non-effectiveness in the Force was caused by this disease.\*

#### AVIATION MEDICINE PROBLEMS

Problems connected with aviation medicine did not occur to any great extent in this phase of hostilities, largely because most major difficulties had been overcome prior to the Invasion. Nevertheless, the continued vigilance of Flying Personnel Medical Officers was essential and several of the matters which did arise and which required investigation are described in the following paragraphs.

#### CRASHES AND PROTECTIVE EQUIPMENT

A perusal of Forms 765(M), the Flying Accident Report, indicates that although there were fewer accidents throughout the Force than had been expected, casualties were still occurring which could have been avoided if greater attention had been paid to detail. One of the most frequent causes of such avoidable accidents was the incorrect positioning of the adjustable straps of the Sutton Harness and the poor padding of the gyro gun sights, resulting in numerous cases of injury to occupants of fighter aircraft, particularly when attempting belly landings.

The Sutton Harness was designed to hold the pilot firmly in his seat by means of straps which crossed over the chest. If, however, these straps were so arranged that they crossed too low on the chest, when sudden deceleration occurred the wearer's body would be precipitated through the V formed by the straps and the head would strike the gun sights, with usually fatal results.

A further, though less common, error in adjustment of the Sutton Harness was to have the straps crossing too high on the chest so that on sudden deceleration the body would be projected forward below the crossing of the harness straps. (See Fig. 4.) If not with fatal results the injuries were characteristically severe fractures of the lower limbs.

If correctly adjusted the Sutton Harness was extremely efficient and these accidents must, therefore, be considered largely avoidable and within the control of the individual. Efforts were made to see that all pilots were aware of the danger, for it was not possible to reposition the gun sights, and padding, sufficiently effective to prevent injury from these causes, would have rendered the gun sight inoperable in action.

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\* See also Section entitled 'Observations on a Visit to the Continent', page 562.

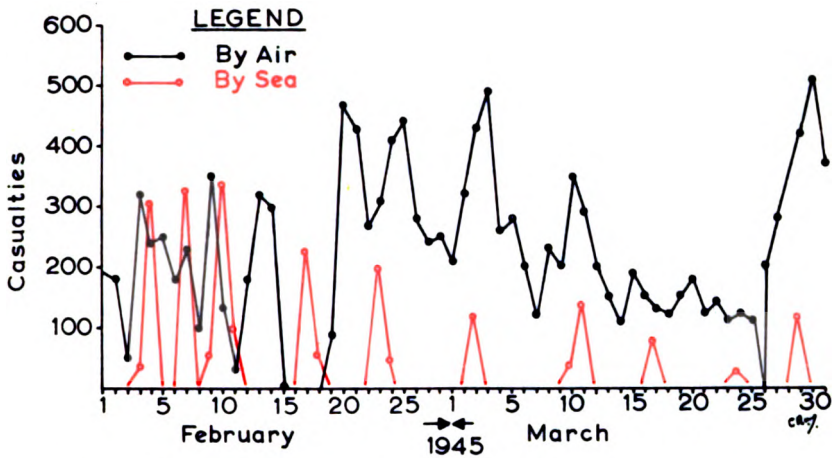


FIG. 1. Casualty Air Evacuation. Comparison of air and sea routes.

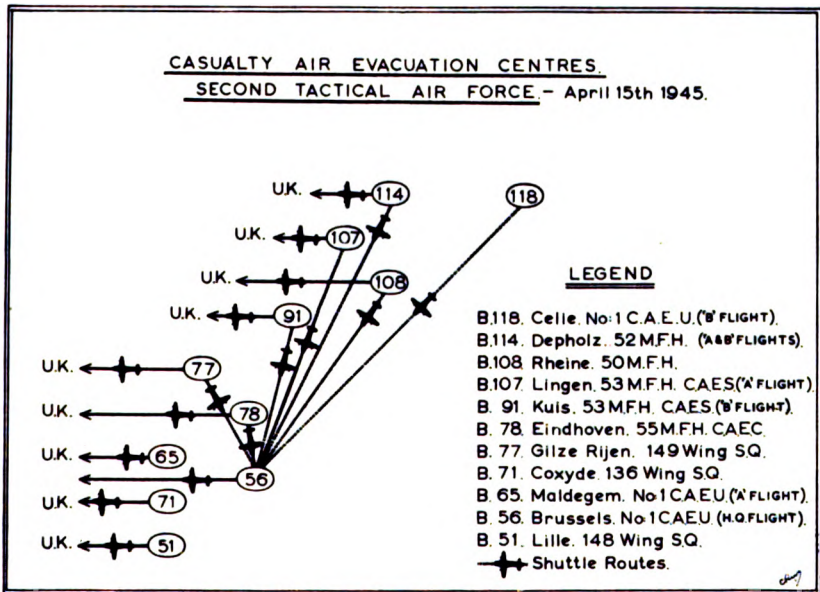


FIG. 2. Casualty Air Evacuation Centres. Second Tactical Air Force, April 15, 1945.



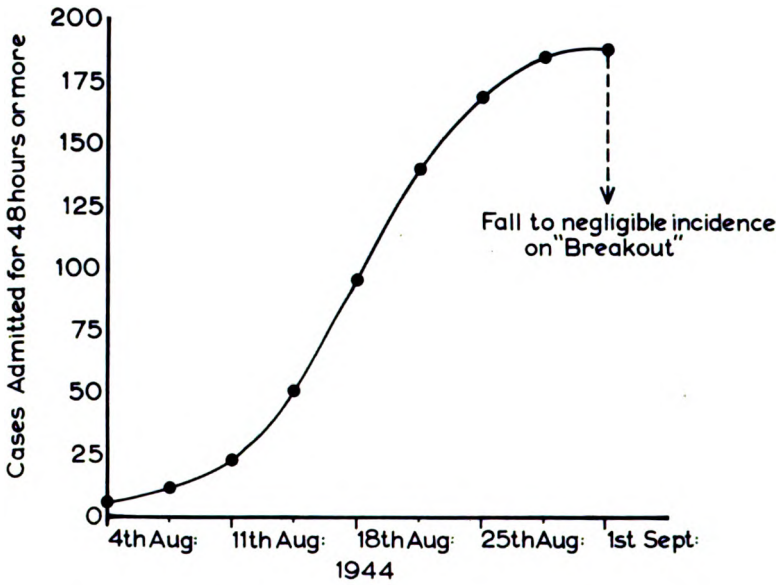


FIG. 3. Enteritis in the Beachhead. August-September 1944.

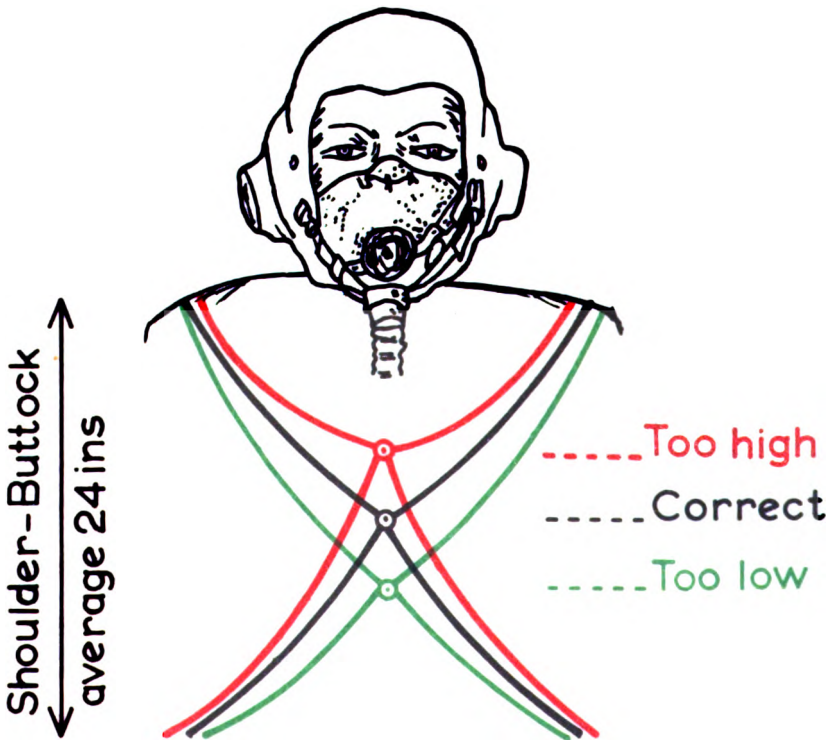


FIG. 4. Correct and incorrect positions for Sutton Harness.

The following incident, described in a medical officer's diary, illustrates the efficiency of the Sutton Harness:

'A Boston aircraft returning from a sortie on one engine crashed in a ploughed field on a hillside about 2 miles from an airfield. The aircraft was very badly smashed up and the two occupants of the rear compartment, although extracted alive, rapidly died from their wounds. The pilot and observer were both strapped in with Sutton Harness. The pilot, in whose cockpit very little damage was observed, escaped with very severe bruising of his lumbar region. On the other hand the observer's compartment was ripped away from the rest of the aircraft and all that remained of it was about 9 inches of one strand of Sutton Harness. It would appear that the observer's compartment in the front of the aircraft was completely detached from the main fuselage on impact and that the observer remained suspended from the front of the remaining fuselage by his Sutton Harness and later, as the aircraft careered across the field, the harness broke and the observer fell into the ploughed land. He suffered from very severe concussion and amnesia but there is no doubt that he would have been killed had it not been for his harness. The occupants in the rear compartment were also strapped in—they received severe injuries from the structural damage.'

Major injuries and deaths were also recorded from accidents in which Typhoon aircraft overturned while attempting belly-landings. In these cases, the pilot's head was particularly vulnerable as the aircraft possessed little in the way of protective overturn arch and no crash pylon. Little could be done to remedy this situation, as anything effective would have meant a major alteration in the construction of the aircraft frame.

A number of casualties resulted from crashes of Auster reconnaissance aircraft, for many of the latter had no form of harness to prevent the occupants from being flung forward on deceleration. This deficiency was later remedied and all these light aircraft were provided with protective harness.

#### VISION

A survey of the visual acuity of a considerable number of pilots revealed a very unsatisfactory position and one which was particularly surprising in view of the attention which had been paid to visual standards in the years immediately preceding the invasion.\* It was found that 2.5 per cent. of the pilots examined had a visual acuity of less than 6/6, 6/9 and that a small number were below 6/9, 6/12; wherever possible, corrected goggles were supplied to these pilots, but if

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\* The importance of correct standards had received much medical publicity from the work of the Night Vision School at Upper Heyford. (See Volume II, Chapter 1, 'Problems of Aviation Medicine: Night Vision', page 100.)

this was not feasible, personnel whose visual standard was considered to be below that necessary for safety were taken off flying. At the same time, all medical officers in charge of aircrew were warned of the dangers inherent in visual standards below those prescribed for flying personnel.

#### ANTI-G PROTECTION

As had been expected, complaints were received from fighter pilots engaged in dive-bombing that they were experiencing 'blacking-out' on pulling out of the bombing dive. The officer from the Royal Air Force Physiological Laboratory who visited the squadrons concerned to investigate the problem was able to take with him a prototype anti-G suit, operated by air inflation, which had been developed for use with a specially adapted Spitfire Mark IX. The suit had an outer skin into which air was forced proportionately to prevent the rush of blood away from the vital centres which occurred on pulling out from dives. The suit was tested in actual operational conditions where it proved to be a great advance on the Franks suit, which worked on similar principles, but was water inflated. (*See R.A.F. Volume II, page 626.*) It was considered that further development should take place, and this suit may, in fact, be looked upon as the prototype from which the present day pressure suit was evolved.

#### OXYGEN EQUIPMENT

It was a matter for satisfaction that few complaints were received from either fighter or bomber squadrons concerning oxygen equipment. The only serious criticism was made by No. 339 French Wing, flying Spitfire Marks VIII and IX aircraft, who stated that difficulty was being experienced with the 'G' mask (*see Volume II, Chapter 1—Problems of Aviation Medicine, page 94*), which froze at altitudes of 25,000 feet or more. The complaint was investigated immediately but in spite of meticulous examination of the equipment no reason for the freezing could be discovered. It is of interest to note that no difficulty had been experienced by other formations similarly equipped and the suggestion was put forward that the trouble might be due to the issue of 'wet oxygen'; however, samples flown to the Institute of Aviation Medicine, Farnborough, proved completely normal and no explanation could be given for the defect.

A complaint received from squadrons operating Mitchell bombers emanated from turret gunners, who found that, when the head was turned, the microphones of the 'G' type oxygen mask fouled the breech mechanism of the gun. After investigation had been made, the 'H' type mask was substituted and this was found to allow complete freedom of movement.

## MORALE

The success of any operation stands or falls on the general morale of the personnel in both the fighting and the support areas and in this respect the Allies had everything in their favour.

Our Forces had been training for a considerable time in preparation for Operation 'Overlord' and by D-day they were not only fully-trained and as physically fit as they could possibly be, but they were united in the common aim of driving the German forces from occupied Europe and defeating them in Germany itself; furthermore, they were fully confident of their ability to achieve this aim.

With regard to aircrew personnel, morale was extremely high. They were aware that the aircraft they flew equalled or surpassed those of the Luftwaffe and had proved this prior to D-day by repeated successful attacks on Germany and occupied France. In the initial stages of the landing it was obvious that our aircraft, despite the bad weather, had air supremacy, and they held this position in nearly all sectors of the fighting area. The main reverse to our Forces came on January 1, 1945, when the Luftwaffe made an all out final attack on our fighter airfields in support of the German counter-attack in the Ardennes. In this attack Allied losses were grievous (*see* Operational Narrative—January 1945, page 466), but the effect on aircrew was to boost their already high morale and fill them with a desire for revenge—quite the reverse of what the German High Command might have expected.

## FATIGUE IN AIRCREW

Throughout the war period medical officers were always on the alert for signs of undue fatigue in aircrew and did all in their power to minimise conditions which favoured its occurrence. In certain phases of the invasion of Europe definite cases of fatigue were recorded and there was no doubt about the causal factors. In Second Tactical Air Force orders were given that all aircrew were to remain at their duties from D-day—20 to D-day+20, and at the same time the 'tour' was increased from 30 sorties in the first tour to 50, and from 20 in the second tour to 35; each tour was to be completed in 9 months and aircrew were to be reviewed after every 5 sorties over 30. This was bound to have some adverse effects but the operational necessity for such measures was obvious and they were accepted by all aircrew as part of the normal hazard of their work. Those most affected by the change of policy were the more senior and experienced pilots of the various squadrons who, being the best fitted to operate in the poor weather conditions which prevailed, carried out a disproportionately large number of difficult sorties.

Some idea of the total number of sorties carried out by the Royal Air Force can be gained from the record of No. 2 Group in June 1944,

when 3,119 operational sorties were flown against targets in occupied France and Germany, with a loss of thirty-one aircraft (14 Mosquitoes, 14 Mitchells and 3 Bostons) and twenty-six crews. Although the 3,000-odd sorties flown during the month by the Group's twelve squadrons would not appear to demand an excessive amount of flying by any one individual, it must be remembered that the operational situation often necessitated far more activity by one squadron than another, so that the number of hours varied from crew to crew. In bad weather, furthermore, all sorties were undertaken by the more experienced flying personnel, who thus spent longer in the air than other aircrew. Over a period of time, the cumulative effects were obvious to squadron medical officers, but very often there was nothing that could be done to ease the situation.

A further important factor in respect of fatigue was noticed after the beachhead airfields began to operate—namely, the difference in conditions for aircrew based in England and for those in Normandy. The sorties from England lasted on an average just under two hours, but only about a quarter of this period was occupied in actual fighting, the remainder of the time being employed in flying to the operational area and returning to base. Aircrew based in Normandy, on the other hand, were in the operational area within 10 minutes of take-off and they might be engaged in fighting for practically the whole of the flying time allowed by their petrol supply. Furthermore, the proximity of the Normandy squadrons to the targets meant that Army support was most conveniently and effectively carried out by them and thus the demand on these squadrons was greater than that on United Kingdom based aircraft. The type of facilities available for rest and recreation when off duty also had an important bearing on the question of fatigue; sleeping conditions in particular were obviously far better for aircrew based in England than for those in Normandy, where uninterrupted sleep was almost impossible.

It will be seen then, that conditions in the early days of the campaign were quite sufficient to cause considerable fatigue among flying personnel. The fact that more cases did not occur may be attributed to two things; firstly, as perhaps always in aircrew, the stimulus of active operations, and secondly, the knowledge that the campaign was clearly going in our favour. These two factors combined to produce a morale among Second Tactical Air Force personnel which had never been higher and which offset to a great extent the insidious effects of fatigue which would otherwise have made themselves felt.

## Hospital Facilities

In providing the necessary medical care for Royal Air Force personnel engaged in operations on the Continent the cornerstone of all planning was the availability of medical attention and beds for personnel requiring hospital treatment for either long or short periods. It is perhaps most convenient to consider the facilities in four stages roughly correlated to the gravity of the patient's condition.

*Stage 1.* The provision of elementary treatment which could be given by unit medical officers with a small staff of nursing orderlies. This was directed mainly towards out-patient treatment or short stays in station or squadron sick quarters and corresponded very approximately to the work of a general practitioner in civil life. (See Plate LIII.)

*Stage 2.* The establishment of mobile field hospitals to deal with cases requiring facilities beyond those available in Stage 1 units. It was clearly understood that the mobile field hospitals should aim at returning patients to their units wherever possible, but they were so organised that they could be turned into small hospitals offering the facilities associated with a civil cottage hospital and they were to act as such whenever the situation allowed. Thus the M.F.H. was in fact endowed with a dual rôle: that of a highly mobile unit at which emergency surgery and medicine could be carried out and the patient evacuated to base at a suitable time, and the more static rôle of a relatively large hospital (100 beds approximately). A further duty devolved upon the M.F.Hs. in that they acted as parent units to small sections engaged in casualty air evacuation, these sections (officially known as flights) acting either completely independently or in conjunction with the parent unit.

*Stage 3.* It was decided that a R.A.F. general hospital would be necessary to meet the special medical and surgical commitments likely to be encountered among R.A.F. personnel, particularly those engaged on flying duties, and it was to this hospital that M.F.Hs. were encouraged to send their more difficult cases; at the same time it was realised that this one R.A.F. general hospital would not always be suitably located to accept patients from the widely scattered M.F.Hs. and that the latter would still need to use adjacent Army hospitals.

*Stage 4.* Evacuation to base hospitals in England. The principle of returning patients to home-based hospitals rapidly, safely and with the minimum of shock associated with transportation had never before been adopted with such effect. In the early days of the invasion men were often evacuated and operated on in England within a few hours of being wounded; this meant that they were afforded some of the best medical facilities in the world and that specific injuries could be dealt

with at the appropriate centres—for example, the Military Hospital for Head Injuries near Oxford.

The hospitals in England, therefore, formed an integral part of the medical facilities available for personnel in action in Normandy, France, Holland and Germany; the value of such an arrangement can be seen from a study of the accounts of Casualty Air Evacuation and of Wroughton Hospital in R.A.F. Volume I (pages 501 and 252 respectively).

The work of unit and station sick quarters has already been covered fully in this and other volumes and, as mentioned above, Stage 4 is dealt with in Volume I. This section, therefore, will be devoted to an account of the work and movements of the mobile field and general hospitals on the Continent.

#### MOBILE FIELD HOSPITALS

It was considered that the formation of five mobile field hospitals would be adequate to provide coverage for the force and that it would be possible to staff these units without denuding to a dangerous degree other medical units already functioning, mainly in the United Kingdom. Nevertheless, it was fully realised that certain staff sacrifices would have to be made, for the medical manning position was far from favourable in all medical services at this stage of the war.

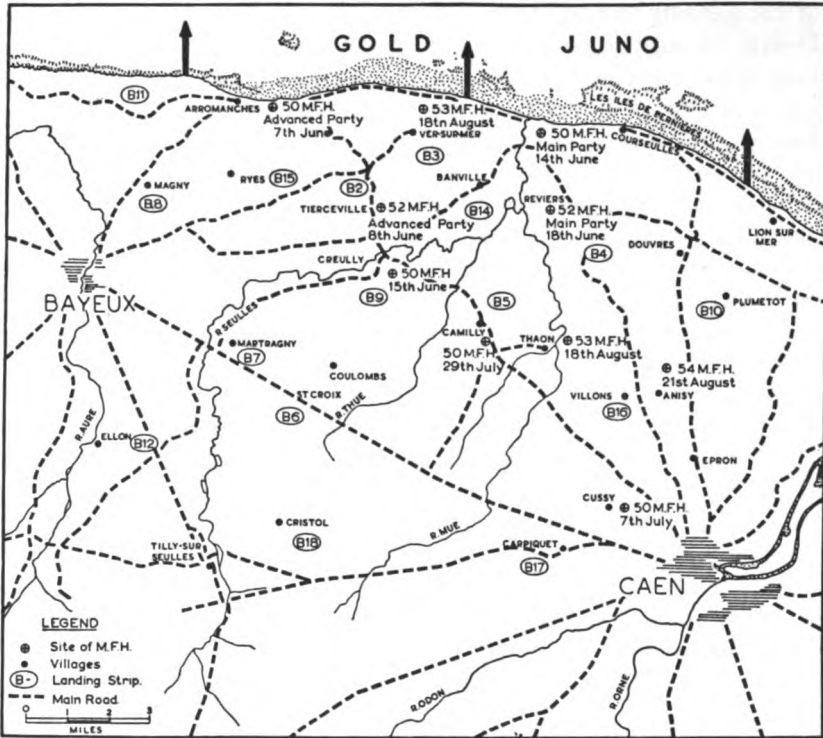
The formation and initial training of the five mobile field hospitals (Nos. 50, 52, 53, 54 and 55) have been dealt with elsewhere in this History (R.A.F. Volume II, Chapter 10, The Second Tactical Air Force, page 615) and further allusion to these aspects has been made in the operational account of this narrative. In view of the historical and medical importance of these units, however, a brief review of each hospital will be made here, stressing the individual differences and points of interest, but omitting the general working of the units, except where clarity demands it, as this has already been covered in Volume I, Chapter 5.

Greater detail will also be given for Nos. 50 and 52 M.F.Hs. as these were the first two R.A.F. hospitals to land in Normandy and consequently encountered more problems in the initial difficulties of the beachhead.

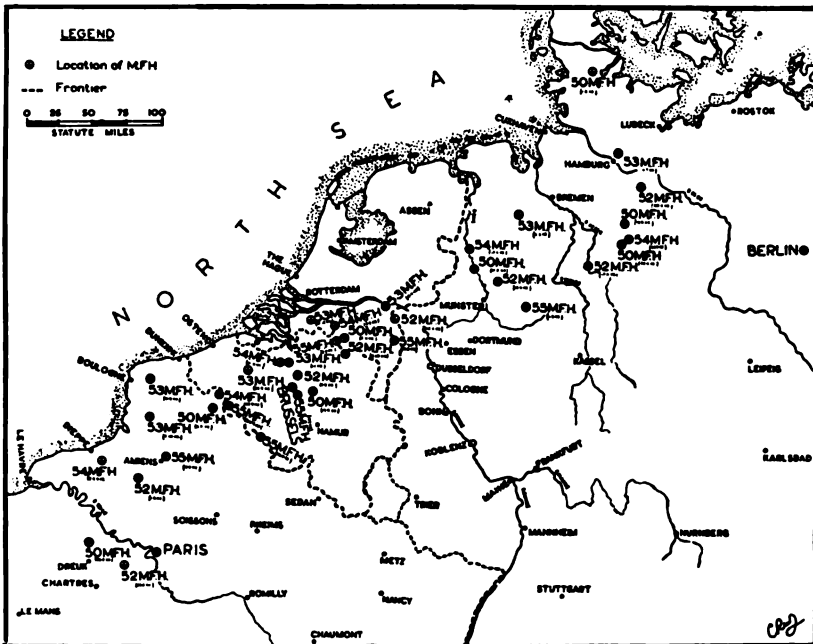
The air evacuation flights attached to the M.F.Hs. have been described in Volume I, Chapter 10, and to avoid recapitulation little reference will be made here to what was, by this stage of the war, a relatively standard procedure. Map 4 shows the approximate positions of M.F.Hs. in the beachhead area and indicates the initial moves, while all movements subsequent to the break-out are shown in Map 5.

#### NO. 50 MOBILE FIELD HOSPITAL

This unit, which formed in February 1943 at Wroughton Hospital, was one of the earliest of the Invasion M.F.Hs. and one in which many



MAP 4. Locations of the Mobile Field Hospitals in the Beachhead area with special reference to Landing Strips.



MAP 5. Movements of Nos. 50, 52, 53, 54 and 55 M.F.H.s in France, Belgium, Holland and Germany.



of the teething troubles were solved in the months of practice prior to D-day. In early June the unit, now fully trained, was expecting the long-awaited order to move into the 'sausage machine' (the apt slang term used by all forces to denote the Concentration, Marshalling and Embarkation Areas) and on June 5 the unit moved in its entirety into the Concentration Area at Old Sarum. The advanced surgical party, which was to land, set up a camp site and be ready to carry out emergency surgery before the arrival of the main party, was immediately detached and embarked, arriving in Normandy, as stated in the general narrative, on the evening of D-day. The main body of the M.F.H. moved into the Marshalling Area at Fareham, Hampshire, on June 9. Medical officers were surprised at the excellence and smooth running of this camp, for it was expected, with good reason, that in an operation of this magnitude much inconvenience would be experienced; the fact that two nursing sisters (the first women in the invasion forces to land in Normandy) were present and that the organisers, who had not catered for women, took this in their stride, amply proves the excellence and elasticity of the arrangements. On June 12 the M.F.H. moved to the 'hards' at Gosport and embarked on a tank landing ship (which, by coincidence, had transported the advanced surgical team to Normandy one week previously) which proceeded to take its place in a vast Normandy-bound convoy. One medical officer counted over 200 vessels in this convoy, which accomplished the crossing on the night and early morning of June 13/14. Apart from its naval escort, the force was continually under the protection of fighter aircraft, as many as 20 at a time being on patrol during the hours of daylight.

While lying off the Normandy beaches waiting for a suitable tide, very considerable shore activity was observed. Throughout the morning, the sky was filled with Allied aircraft and fighters could be seen taking off in clouds of red dust from a strip near the shore, being almost immediately attacked by enemy anti-aircraft fire, but only once were any German aircraft seen. A further grim reminder of the fight that was being waged in the immediate vicinity of the shore on which the M.F.H. was soon to land was provided by a cruiser moored nearby, which throughout the day engaged enemy shore positions with her 6-inch guns.

By the afternoon of the 14th the tide was suitable for landing and M.F.H. personnel and equipment were transferred to landing craft which carried them to the beach. Just after the ramps were dropped and the first 'water-proofed' lorry had descended preparatory to driving ashore, an untoward incident occurred. As the lorry left the ramp it tilted alarmingly, all but overturning, and it was obvious that there was a large hole in the shingle. It was therefore necessary to wait until the tide receded sufficiently for this hole to be filled, but when this

had been done the landing was effected without further difficulty. The M.F.H. formed up on the beach (Juno/Red, near Courseulles-sur-Mer) and waited for the guide from the R.A.F. beach party which, they had been assured, would be present to conduct them off the beaches and guide the M.F.H. to its proposed camp site. (See Maps 1 and 2.) After a considerable delay a search was made for the beach unit, but without success, and as night was falling rapidly it was deemed prudent to move away from the beaches; the unit accordingly formed up in convoy and moved inland in the direction of the proposed camp site. Unfortunately no contact was established with the R.A.F. beach unit, and, as it was dark by this time, the commanding officer decided to halt the convoy at the road side, where all personnel slept in the vehicles. At first light the M.F.H. moved to its allotted site, only to find it already occupied by Army units; the latter were not inclined to vacate the area, so that the commanding officer of the M.F.H. had perforce to seek another suitable site, one eventually being found at Creully, approximately 5 miles by road from the beachhead.

On this site the M.F.H. set up and camouflaged its tents, while the commanding officer notified all units in the locality of the hospital's presence and made contact with the M.F.H.'s advanced party, who were engaged in making the initial arrangements for the early evacuation of casualties by air from a nearby strip. By the end of the evening the hospital was ready to receive casualties and had, in fact, admitted 13 patients, although to the surprise of the staff the cases were far from what was expected, only two being battle casualties and the remainder comparatively trivial conditions such as balanitis and ear infections. However, on this first night of operating, the M.F.H. was able to assist a neighbouring Army casualty clearing station by holding 34 serious casualties in readiness for their embarkation by sea the next day.

In view of the expected rush of work the next five days were a complete *dénouement*, as very few surgical cases were received and the majority of the medical staff were able to assist in the air evacuation that was getting under way. By the 20th 1,023 cases had been flown out. (See Operational Narrative, Casualty Air Evacuation.) On June 29 the M.F.H. was for the first time working at full capacity, when it became responsible for the overnight treatment of a convoy of ambulances containing 201 cases which were to be emplaned the following day, the majority of the patients being surgical cases and many of them in very poor shape.

The first week of July saw an increase in the amount of work demanding surgical intervention and retention prior to evacuation by air and the M.F.H. was relatively busy, although never to an embarrassing degree. At the end of this week (July 7) the unit moved to Cussy (12 miles distant) on the Bayeux-Cherbourg road where camp

was set up in a suitable field. The arrangement of the M.F.H. was facilitated by the fact that our air superiority made it unnecessary to camouflage the unit. (See Plates LIV and LV.) Unfortunately, although this field had been pronounced 'safe', it was here that the first casualty to M.F.H. personnel occurred, when a sergeant trod on a hand grenade which exploded and injured his left foot sufficiently to necessitate his evacuation to the United Kingdom.

The unit remained in this site until July 29 when it was moved to Camilly, which lay  $3\frac{1}{2}$  miles south-east of the original site at Creully. Here the unit stayed until the end of August. Little of interest was recorded as the actual hospital work was relatively slack and the main task of the unit centred around assisting in the C.A.E. scheme which was now running at full pressure. The enteritis outbreak, which is discussed at length in the section on The Health of the R.A.F., was responsible for the majority of the medical beds occupied while in this camp. One incident which, although of no direct medical import, nearly spelt disaster to the M.F.H., occurred when a stricken Liberator aircraft, from which the crew had baled out, ran amok in the air over the camp; despite efforts by Allied fighters to shoot it down in a safe locality the aircraft, after being overhead for about fifteen minutes, slowly losing altitude, crashed in flames within 400 yards of the camp, fortunately with no loss of life or hospital equipment.

At this period an interesting general note is found in the history of No. 50 Mobile Field Hospital. Personnel had now been in Normandy sufficiently long to establish some contact with the civilian population; prior to leaving England many had formed the opinion, based largely on propaganda, including posters which were prominent in the 'sausage machine', that the civil population were on the verge of starvation, subject to atrocities and living only for the day of liberation, when they would welcome their liberators with open arms. This pre-conceived picture proved to be far from correct. The population gave every appearance of being a well-fed, prosperous farming community which had, in fact, had little contact with the Germans, no stories of atrocities were forthcoming, and the only strong feelings which were seen were those of resentment towards the Allies who were 'invading' their fields, spoiling their crops and damaging their farms. It is not surprising that the less perceptive were puzzled at this apparent paradox.

At the end of August the M.F.H. was moved just over 100 miles to the south-east in support of units fighting in the Le Mans area and was located at Moiseville between Evreux and Dreux. At this site the M.F.H. was primarily engaged in the evacuation of casualties by air and at no time were the facilities of the unit overtaxed.

On September 6 the M.F.H. was ordered to move to Courtiche approximately 8 miles south of Lille. This move was in support of

our troops who were now pushing on into Belgium with Brussels as the objective. Again the work was mainly confined to casualty air evacuation support and little of interest was recorded.

By September 19 our Forces had pushed well into Belgium and the M.F.H. moved on this date to Wesemal, 5 miles north of Louvain and 20 miles from Brussels. The main work centred around evacuation and very considerable numbers were passed through the hospital, but the actual amount of medical and surgical attention required was never of any magnitude.

In further support of our drive into Holland the next site chosen was a large civilian hospital in Eindhoven, this being the first time that the M.F.H. was housed in a permanent building. This hospital, known as St. Joseph's Hospital, was taken over from an Army C.C.S., but was too large for the M.F.H. to operate in full. On taking over the building the M.F.H. 'inherited' 56 German prisoners-of-war, who although formally placed under guard actually showed little desire to escape—in fact they appeared to welcome the medical attention and food offered by the M.F.H. and showed much reluctance at being transferred at a later date to a prisoner-of-war hospital.

On October 4 the M.F.H. opened in its new location and soon became very busy with a diversity of cases—a pleasant contrast from the previous weeks. In connexion with the running of the hospital one interesting difficulty arose; although the M.F.H. was capable of operating most successfully in the field with its limited staff, it was found that the cleanliness demanded in a permanent hospital was beyond the unit's resources and it was necessary to engage both nursing and domestic help from Dutch civilian sources. Fortunately this was easily achieved, and the situation was further relieved when No. 52 (R.C.A.F.) M.F.H. took over part of the hospital; the accommodation was adequate for two M.F.Hs. and allowed each to maintain its independence.

It was while the M.F.H. was at Eindhoven that true malnutrition and hardship were found for the first time among the civilian population who had been living for some time on a diet of approximately 1,400 Calories; many stories of German atrocities were also recorded, including a number of executions which had been carried out immediately prior to the Allies' entry into Eindhoven.

In these winter months certain domestic problems were encountered, the most important being that of heating. The heating system in the hospital was far from new and in a state of disrepair, and fuel was scarce, but in spite of these difficulties a reasonable standard of comfort was maintained. Over Christmas it was possible for the hospital to entertain a party of Dutch children—50 being invited and 200 turning up! The fare provided by the M.F.Hs. from their limited

comforts was greatly appreciated by the children, most of whom had, since birth, been unaccustomed to even the simplest luxuries.

On New Year's Day 1945 it was seen from the hospital roof that the local airfield was being determinedly attacked and immediately the hospital prepared to receive casualties. Eighty-two cases were admitted of which 14 were classed as seriously or dangerously ill. (See Plate LI and page 466.)

On April 11 the hospital moved to Rheine (22 miles north of Munster) and opened up under canvas. Unfortunately it was discovered that Field Marshal Montgomery's personal Dakota had been allotted exactly the same site as that planned for the M.F.H., but this matter was smoothed out by judicious liaison between the C.O. of the M.F.H. and the pilot of the aircraft. While at this site little work was done and orders to move to Celle, 20 miles north of Hanover, on April 25 were welcomed. From Celle, members of the M.F.H. visited Belsen Concentration Camp and were able to render some slight assistance by the loan of the M.F.H.'s field telephone exchange and also by gifts of all available comforts and medical stores. It had been suggested that one of the M.F.Hs. in No. 83 Group should assist in giving urgently needed medical attention to the inmates of Belsen Concentration Camp, but as there was a possibility at the time that the Group would have to move to start air operations in Denmark, the plan did not materialise. The medical arrangements for dealing with the Camp were, therefore, left entirely in the hands of the R.A.M.C., who were assisted in the actual work by various voluntary bodies and individual doctors.

On May 16 the unit moved to Kreussen near Fassberg and on June 1, 1945 the final move was accomplished to Schleswig, 20 miles south of Flensburg, where a small brick German civil hospital was taken over. Although of pleasant appearance this building needed many repairs and such drawbacks as an outside and detached cookhouse had to be overcome. On October 1, 1945, the hospital was renamed R.A.F. Hospital Schleswig; it was disbanded in April 1946.

#### NO. 52 (R.C.A.F.) MOBILE FIELD HOSPITAL

This hospital, eventually staffed by members of the Royal Canadian Air Force, formed at R.A.F. Station, Detling, Kent, under the administration of No. 83 Group, a few months after No. 50 M.F.H.; the first members of the unit reported for duty on August 23, 1943. No. 52 was thus one of the early M.F.Hs. in which the initial teething troubles were most evident, although the majority were overcome during the lengthy period of practice prior to D-day. The unit had only been formed for a short period before it was moved a few miles to Woodchurch, where field practice was begun and all personnel familiarised themselves with both medical and field equipment. After a period of

two weeks the unit was moved into its winter quarters at Dutton Holmstall on October 23. At this site the unit was accommodated in what had been a 'rest home' for pilots, originally equipped by Fighter Command as a 60-bed sick quarters; this site was ideal although it was unfortunately not sufficiently large to accommodate the whole unit and certain sections had to be billeted out in buildings lent by the Canadian Army.

The months prior to D-day were spent in intensive training. All ranks were given instruction in their particular tasks in the unit and wherever possible overlap was provided, so that those holding key jobs could be replaced if they became non-effective. Courses were arranged for medical officers and several of the latter were attached, for varying periods, to local E.M.S. hospitals, so that a wide range of specialities were covered. Surgeons, in particular, attended courses at the British Post-Graduate School, where lectures were given on war surgery in general and on specialities such as orthopaedics and chest surgery; in addition, particular care was taken to see that sufficient medical officers were conversant with the newer trends in anaesthetics—e.g. intravenous technique.

Late in December 1943, No. 1 C.A.E.U. was attached to the M.F.H. and it was possible to practise the liaison which was essential between the two units. The value of this training is reflected in the large numbers of casualties who were later evacuated through these channels.

On December 11, 1943, the Commanding Officer, with members of his staff, attended the stone-laying ceremony of the Canadian Wing at the Queen Victoria Hospital, East Grinstead—an event which forged another link between the Canadian and British medical professions. Reference is made to this hospital in R.A.F. Volume I, page 300, of this series, but for a comprehensive description of the Canadian Wing the Official History of the Canadian Medical Services should be consulted.

Attention was naturally directed mainly towards the attainment of a high standard of medical efficiency, but much importance was also attached to the physical fitness of all personnel and from December onwards physical training formed an integral part of the day's routine; on occasions it was possible for a unit ice hockey team to play matches at Purley (Surrey) Ice Rink against other Canadian teams—an opportunity to play their national game which was appreciated by all ranks.

In April, further intensive training began, the unit being sent on a circular tour for one week to familiarise all personnel with the necessary routine for convoy work and in particular the rapid pitching and striking of camp in the field—an exercise that in later months was to prove of great value. At the end of the month the advanced surgical team, which by this time had been completely formed and trained,

was sent on an amphibious exercise ('Trousers') to gain experience for the initial landing; this exercise was unfortunately never completed owing to rough seas, but much valuable experience was gained, especially in the waterproofing and stowage of equipment.

In May, No. 52 M.F.H., like No. 50, was advised not to admit patients who were likely to remain in the hospital longer than 7 days—this order being, as everyone surmised, a prelude to the opening of the Second Front.

Immediately before D-day the unit entered the Concentration Area and on D-day + 2 the Advanced Surgical Team, after an uneventful crossing of the Channel, landed on Gold beach in the Normandy beachhead and became established at Tierceville, between two refuelling and rearming strips. The Team had more work to do than No. 50 M.F.H. and after dealing with 76 Army casualties, who were then evacuated by the sea route, employed themselves as an air evacuation pool for B.2 and B.3 air strips. (See Map 4.) The remainder of the M.F.H. arrived on D-day + 12 (two days behind schedule, as were many other units) and the hospital opened up at Reviere; very little work was done, apart from casualty air evacuation, as No. 50 M.F.H. was adequate to deal with the requirements.

On July 4 the M.F.H. moved to the Banville area and was situated within one mile of the airport—a factor that greatly facilitated the despatch of casualties. By the end of the month 228 cases had been admitted (Army 31; R.A.F. 76; R.C.A.F. 119; Others 2). It is noted in the hospital records that at this time many of the cases referred to the M.F.H. for evacuation were unsuitable and that often little beyond elementary first aid had been carried out; in spite of instructions on this point, little improvement was noticed.

On August 7 the unit moved to Parfaron d'Eclin, where again little work other than casualty air evacuation was received, and at the end of the month the unit moved into the area west of the Seine, camping at Val David. When this move was ordered it was necessary for a small party, including one nursing sister, to remain behind to care for a very dangerously ill abdominal case which could not be moved; the party rejoined the main unit seven days later.

Only 177 cases were admitted in August, this drop being due partly to the opening up of the M.F.Hs. of Nos. 84 and 2 Groups, and partly to a change in Army policy which now permitted their hospitals to hold patients for longer periods.

On September 3 No. 52 M.F.H. moved to Grandvilliers, near Amiens, and a week later, in support of our advancing forces, to Steerebeek near Brussels, from where a very busy evacuation service was maintained, a total of 251 cases passing through the unit during the month, excluding patients evacuated by air.

In October, in common with other M.F.Hs., it was necessary for winter quarters to be found and for the first time since arriving on the Continent the M.F.H. was housed in a building—St. Joseph's Hospital, Eindhoven—this accommodation being shared with No. 50 M.F.H. The building was excellent from every point of view and medical arrangements for the two M.F.Hs. were entirely separate, only messing being communal; the logical policy was adopted that No. 52 M.F.H. should take all Canadian casualties. During October 586 cases were admitted to St. Joseph's—230 to No. 52 M.F.H. and 356 to No. 50. The work of No. 52 M.F.H's. C.A.E.U. for the month is of interest as it evacuated a total of 4,357 patients to the United Kingdom.

The unit remained at St. Joseph's until April. During this period, although the work was always brisk, it never amounted to unmanageable proportions and the hospital enjoyed a routine comparable, apart from battle casualties, to that of a large peace-time hospital. On two occasions when there were sudden rushes of surgical cases the two M.F.Hs. pooled resources, but in the main they worked as separate though complementary units.

On April 13 the unit moved to a site at Goch (B.100) in the Siegfried Line zone and in two days' time was moved to Achmer (B.110) across the Rhine. The M.F.H. itself remained non-operational at both sites, although its C.A.E. unit was very busy, evacuating over 400 patients a day for much of the period. On the 17th instructions were received for the M.F.H. to move to Wunstorf (B.116) in Germany, where it became operational for a short time before receiving orders to move to Luneberg (B.156) on April 28.

The site at Luneberg was that of a Luftwaffe hospital which, although in a singularly filthy condition, was soon transformed into an excellent hospital for approximately 200 beds. The M.F.H. became static at Luneberg until August 1945, when, after transferring all patients to No. 53 M.F.H. at Hamburg, the unit packed up and moved to Dunsfold, England, where it was disbanded on August 11. During the stay at Luneberg the work was mainly of a routine nature, but the following incident is worthy of record:

In the first week of May a report was received from the Army *via* a squadron of the R.A.F. Regiment that a R.A.F. pilot was seriously ill at a German hospital at Neumünster. The patient was found to be a Canadian pilot who had crash landed near the hospital some two weeks previously. A surgical team including a nursing sister was immediately dispatched from No. 52 M.F.H. The pilot's condition was found to be deplorable—he was suffering from head injuries, with damage to the left eye, an extensive wound in the left arm with cellulitis, bilateral bronchial pneumonia and toxic hepatitis. He was extremely dehydrated



with acidosis, and was irrational with rare lucid intervals. This officer had been accorded only the most cursory of medical attention and his nursing had been deplorable; he had numerous pressure sores and the bed was wet with faeces and urine. It was apparent that the hospital staff had given him up as hopeless, although much of his condition was directly due to their own ignorance and inefficiency.

With the aid of the squadron leader in command of the R.A.F. Regiment the assistance of the German staff was forcefully engaged and under a regimen of good nursing, penicillin therapy, transfusion and adequate nourishment it was possible to have the patient evacuated to the United Kingdom for further treatment 10 days later.

#### NO. 53 MOBILE FIELD HOSPITAL

This mobile field hospital formed at Sawbridgeworth in September 1943 and was able to obtain a reasonable amount of practice in the field before moving to France. On D-day, with a move to the beach-head considered to be imminent, all patients were transferred to R.A.F. Hospital Wroughton and the M.F.H. was prepared for immediate departure; these preparations were, however, somewhat premature, for the unit did not move to the Concentration Area until two months later. Though this delay was irksome it had the advantage of allowing time for information to be transmitted to the M.F.H. concerning the experiences of other medical units who had been through the 'sausage machine' and had already set up hospitals in the Normandy beach-head; the M.F.H. was additionally fortunate in receiving a visit from the P.M.O. Second Tactical Air Force who outlined the immediate position in Normandy and commented on other matters pertinent to the forthcoming move.

On August 14 the unit moved into the Concentration Area, the main party consisting of 25 vehicles and being preceded by a reconnaissance party in a jeep. This principle of a small and highly mobile advanced party making arrangements for the main hospital was adhered to throughout the existence of the M.F.H. and paid good dividends as it allowed the immediate difficulties encountered on a new site to be solved before the majority of personnel arrived.

The unit was moved into the Marshalling Area on August 16, embarked the following day and after a calm and uneventful crossing arrived at the beachhead on the 18th. The unit was fortunate in that it was able to disembark without difficulty directly on to the Mulberry harbour at Juno/Gold beach, and the main party proceeded inland to set up the M.F.H. at Thaon, approximately 7 miles north-west of Caen, the site having been reconnoitred and approved by the advanced party; the M.F.H. was prepared to receive patients within 16 hours.

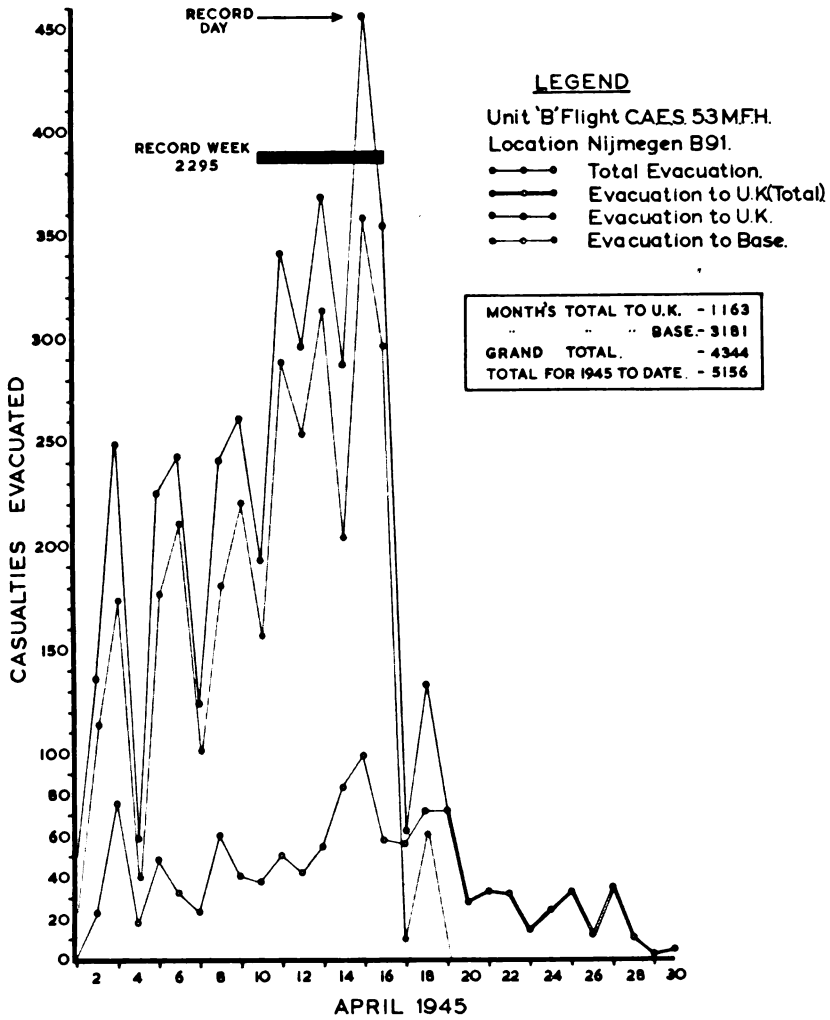
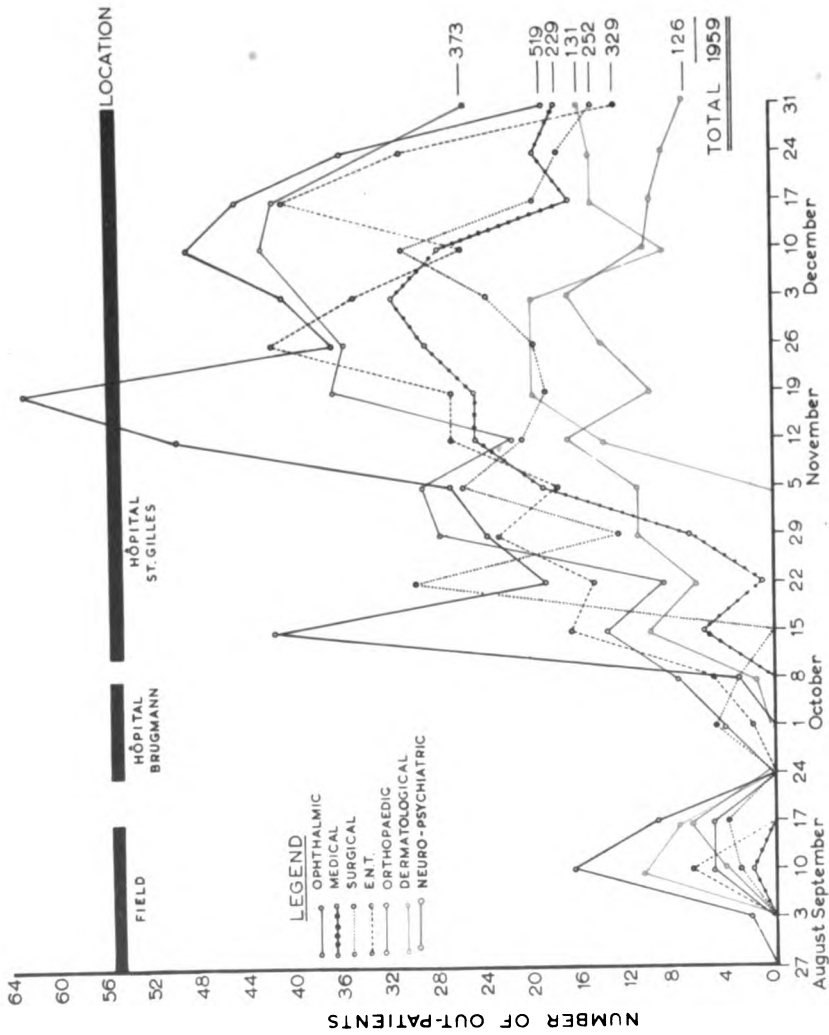


FIG. 5. Casualties evacuated by 'B' Flight. No. 53 Mobile Field Hospital. April, 1945.



**FIG. 6. Comparative figures for out-patients. No. 8 R.A.F. General Hospital. 1944.**  
C.B.H.

The total amount of medical and surgical work that the unit was required to carry out by the end of August was something of a disappointment to the staff, who had imagined, not unnaturally, that they would be working to capacity. From the 50 or so units that the M.F.H. served in the beachhead area a total of 105 cases were received (medical 61, surgical 38, S.T.C. 6) and 60 X-rays were taken either in connexion with admitted patients or at the request of medical officers at neighbouring units. The principal disease encountered was enteritis, for the M.F.H. had arrived almost at the peak of the beachhead outbreak.

Immediately following the break-out the M.F.H. moved in support of the Canadian Armies in their drive north-east for the Channel ports, arriving on October 3, 1944, at Hesdin, a small town 15 miles east of Etaples; the 150-mile journey from Normandy was accomplished without incident although with little enjoyment, as the weather was particularly bad and it rained incessantly throughout the drive and the pitching of the tents.

At this site little work was carried out although the M.F.H. was able to organise and assist in the evacuation of casualties by air; a further move on September 11, therefore, despite the still incessant rain, was welcomed by all. The new site was at Th rouanne, 25 miles east of Bologne, but again there was little work for the M.F.H. A third move took place on September 23 to Rosdam near Ghent. It is not surprising, in view of these frequent moves, that the M.F.H. only treated 66 in-patients during the month (medical 27, surgical 31, S.T.C. 8. Operations 30, X-rays 77).

With the winter drawing on and the likelihood of the front becoming relatively stable for the next few months, it was necessary for suitable accommodation to be found and the M.F.H. was fortunate in being able to take over a large girls' school in Ghent called St. Pierre's, moving into these quarters on November 3, 1944. It was possible to establish over 100 beds with the ability to expand if the necessity should arise, and the ancillary departments of the M.F.H. were also reasonably housed in the school buildings. By the middle of the month it was obvious that the M.F.H. was going to be busier than in the past, although unfortunately the S.T.C. was found to be the growing department. By November 14 the M.F.H. had over 85 in-patients and by the end of the month the admission figures were quite impressive and gave a fillip to the morale of the unit. (Total cases admitted 401: medical 108, surgical 147, S.T.C. 146. Out-patients: medical 57, surgical 90, S.T.C. 157. Operations 95, X-rays 262.)

The stay of the M.F.H. at Ghent was relatively short, however, and early in December it was known that a move was imminent; it was with no surprise therefore that the M.F.H. received orders to move to Oudenbosch, 14 miles west of Breda, to support Allied troops fighting

in this area. The move was accomplished without incident on December 18, the new location being a pleasant civilian hospital in which it was possible to deploy the full equipment of the M.F.H. with ease. While in this hospital the surgical division of the M.F.H. was very fully engaged with casualties and on occasions worked to full capacity. Again, the stay at Oudenbosch was short, for in early January the risk of encirclement from the German 'push' became very real and it was necessary to withdraw the M.F.H. to Boom, 8 miles south of Anvers, where it shared a requisitioned civilian technical building with No. 54 M.F.H. No. 53 M.F.H. was only quartered with No. 54 for three weeks, however, for at the end of this period the operational situation improved and the hospital returned to Oudenbosch on January 23, 1945, with little difficulty apart from that caused by road conditions due to the singularly cold weather which prevailed all over Europe.

January and February produced little of interest. The M.F.H. was continually employed with a diversity of illnesses but never was it unduly taxed or in any difficulty over bedstates; perhaps the only item of interest was a small outbreak of Weil's Disease (*leptospira icterohaemorrhagae*) which was recorded in the middle of February and in which 12 cases were conclusively leptospiral in origin. On consultation with local doctors it was found that the disease was well recognised in the area though never occurring in such numbers as to be truly epidemic. During these months the German flying bomb attacks on Antwerp caused much anxiety; no incidents were recorded at Oudenbosch, but many of the hospital patients lost sleep.

On April 12, 1945, orders were received for the hospital to move to a school in Grave, 10 miles south-west of Nijmegen on the River Maas. The school was satisfactorily converted into a hospital and from this centre a very considerable air evacuation of patients was organised. Although the work of the M.F.H. was not conspicuous during this month, its casualty air evacuation section\* was working to full capacity and the graph in Fig. 5 illustrates most forcibly the potential of such small but highly trained units when backed by air superiority. The tenure of the hospital was again short and on May 4 the M.F.H. moved to Ahlhorn 30 miles south-west of Bremen. As no suitable building was available for the hospital it was necessary to use a tented camp—which produced the rather anomalous situation of patients being admitted from sick quarters in requisitioned houses to tented wards! However, these conditions only prevailed for two months as the M.F.H. was then moved to Hamburg, occupying the Reserve Lazarette No. 4 Beim Schlump. Here it was to establish itself as a

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\* Official Establishment of a C.A.E. section—One medical officer, two sergeants, one corporal, six airmen and a despatch rider. Transport—one 3-ton lorry, three ambulances and two motor cycles.

full scale hospital to serve the comparatively large numbers of R.A.F. personnel in the area and for convenience of administration the hospital was transferred from No. 84 to No. 85 Group. This hospital was a permanency and its formation saw the end of No. 53 M.F.H. as such and the birth of R.A.F. General Hospital Hamburg, which was destined to have a very busy life, as the only other large R.A.F. hospital established at that time was at Rinteln, which was too far distant conveniently to take patients from this area.

#### NO. 54 MOBILE FIELD HOSPITAL

No. 54 M.F.H. was initially formed at R.A.F. Station, Sawbridgeworth in September 1943. The unit was slow to reach its full complement of staff, largely because most available and suitable personnel had been absorbed into the already functioning M.F.Hs.; by the end of October, however, the unit was sufficiently manned for practice to begin and No. 4 C.A.E.U. was also attached for training purposes.

The M.F.H. left Sawbridgeworth at the end of November and moved into R.A.F. Station, Snailwell, for the winter; at this station it was possible to bring the unit up to full strength in both personnel and equipment.

The months prior to the crossing to Normandy saw the unit making several moves, the last before entering the embarkation area being made in July 1944 when the unit was located at Heyshott Green near Midhurst, Sussex. These moves were of considerable value as they gave opportunity for practice in making and breaking camp, while the normal medical work of the unit when it was static and small numbers of patients were admitted, allowed the staff to become familiar with the equipment of the unit.

On August 18, 1944 the M.F.H's. advanced party moved into the concentration area, being followed by the main party on the 21st. The move to Normandy was unspectacular and accomplished with the minimum of discomfort and no loss of equipment. The crossing was made in L.S.T. and L.C.T. and the unit was landed on the beaches in the Arromanches area, using the now fully operational Mulberry Harbour. By the time that the main unit landed the advanced party had been able to reconnoitre the proposed site; this was fortunate, as it was discovered that the area allotted had been traversed many times by tanks which had rendered the fields unsuitable for setting up a camp. After considerable search a suitable site was found at Anisy near Calvados; here the unit was able to pitch camp with little difficulty and within 24 hours the M.F.H. was prepared to receive patients.

While in the bridgehead area the work of the M.F.H. was relatively slack, the hospital being used mainly for medical cases, a large proportion of which were enteritis, for the outbreak was at its height. A

certain proportion of the unit's effort was directed towards assisting in casualty air evacuation, but on the whole the M.F.H. was never unduly busy. This was something of a disappointment for the staff, who had been prepared for large numbers of casualties and found the trickle that arrived an anticlimax.

On September 7 the unit received orders to move to Londinières near Dieppe, in support of the drive by the Canadian Forces to seize the Channel ports. The move was timely, as a large number of battle casualties were received and a very large C.A.E. commitment carried out. On the morning of the 13th sixteen Dakota loads of casualties were flown out, the pilots bringing the aircraft in on the evening of the 12th and staying overnight at the M.F.H. preparatory to a dawn take-off; the mass evacuation of this large number of casualties allowed the nearby Army hospitals, who were at that time very hard-pressed, to gain a considerable respite.

The unit advanced on September 28 to Lauwe just inside Belgium, but it remained here only until October 8 when it moved to an airfield (B.56) in the Brussels area. Here the M.F.H. functioned as a C.A.E. unit and at times the work was very heavy, as is shown by the fact that over 2,200 casualties were flown out during this month.

Following the advances of the Allied Forces into Holland the M.F.H. arrived at Boom in Belgium on December 11, 1944 and for the first time was housed in permanent buildings, a technical school being taken over for the purpose. In this excellent accommodation all departments were suitably located and the status of the M.F.H. was analogous to a cottage hospital. According to the records of the M.F.H. the work undertaken was neither heavy nor of particular interest—in fact most of the conditions encountered were those connected with a severe winter in any country; when the flying bomb attacks developed, however, a certain number of casualties, mainly civilian, were admitted and provided the surgical division with some welcome traumatic surgery.

The hospital received notice to move to Holland on March 3, 1945, the move being somewhat precipitate and disorganised by a flying bomb which landed in open ground near the hospital. Although both Service and civilian casualties were limited to minor injuries due to flying glass, the hospital was rendered untenable by the complete loss of glazing and patients who were not sufficiently well to be discharged had to be transferred to Army hospitals in the area as it was impossible to keep the hospital warm.

The M.F.H. took over the Maria School for Girls at Vught, 5 miles south of 'sHertogenbosch, in Holland, and in this ideal building 100 beds were equipped. Again the hospital was not worked to anything like capacity but sufficient patients were received to keep all departments busy, as is shown by the figures for the month of March given opposite:

Beds equipped . . .	100	Admissions medical	92	Operations major	19
Average occupied . . .	54	„ surgical	64	„ minor	32
Maximum occupied . . .	73	„ V.D. . .	40	Plasters . . .	15

The hospital records show that little laboratory work was done. Some blood investigations could not be made as the unit did not possess a Comparator (Lovibonds) although the instrument had been on order for over a year. It is well known that certain pieces of medical equipment were practically impossible to replace or obtain in the war period but the results of such shortage, as shown above, point to the advisability of building up large stocks of essential apparatus in peace-time to meet such emergencies.

It was while the M.F.H. was at Vught that an epidemic of infective hepatitis occurred, particularly among Norwegian personnel, many of whom were admitted to No. 54 M.F.H. Although the outbreak is discussed at length in the section on The Health of the R.A.F., one remark from the M.F.H. records is of interest: it was discovered from a non-medical and disinterested source that the numbers of cases were highest in a unit which was known to have very bad cookhouse hygiene, this fact lending some support to the intestinal-oral circuit theory of causation.

One of the duties carried out by the M.F.H. while at Vught was that of holding sick parades for Army and R.A.F. units who had no medical officer. The number of units concerned was surprisingly high and amounted to 14 Army and 7 R.A.F. units with a total strength of well over 4,000 personnel.

On April 17, 1945, the unit moved into Germany, occupying a small hospital at Nordhorn 15 miles north of Rheine, which accommodated 100 beds in ideal conditions. Unfortunately the M.F.H.'s stay in this location was short and on June 1 the unit moved to Celle, 20 miles north-east of Hanover, where tented accommodation had to be used, as no buildings were available. The move is of some interest, as the distance by the prescribed route was over 190 miles and the move was accomplished in one day (0600-2000 hours), largely through the excellence of the roads and the high standard of serviceability of the M.F.H.'s transport.

The site allotted to the M.F.H. was ideal from a camping point of view, but with hostilities ended and over 50 per cent. of the Group billeted in permanent buildings, it was considered regrettable that a hospital, which should obviously receive a high priority, should be under canvas. That local units endorsed this view was shown by the fact that few patients were sent to the M.F.H., medical officers preferring to treat cases themselves in their own requisitioned sick quarters or admitting them to Army hospitals in permanent buildings.

On July 1, 1945 the M.F.H. moved into excellent accommodation at St. Joseph's Hospital, Celle, where it remained until disbanded in



December 1947. From the date of moving into the hospital buildings the records show little of interest with perhaps the exception of the Commanding Officer's remarks on venereal disease after the raising of the non-fraternising rule in July 1945. He pointed out that the expected increases in the figures for V.D. did not occur despite the ominous forebodings of certain newspapers and official memoranda and he reasoned that the type of man liable to contract venereal disease would run the risk whether a non-fraternising order was in force or not.

#### NO. 55 MOBILE FIELD HOSPITAL

Formed at Fontwell, Sussex, in January 1944, this M.F.H. had a relatively short time in which to form up, practise and solve any initial difficulties before becoming an active unit; nevertheless, the unit was able to profit from the experience gained by M.F.Hs. formed earlier and for this reason many of the difficulties which the latter had experienced did not arise.

In early August 1944, it was evident that the unit would soon be moving abroad to play its part in the Second Front and on the 20th orders were received for the M.F.H. to move to the Marshalling Area. Here it split into 2 main parties, embarked on L.C.T. which formed up in convoy, and passed the night at anchor in the Solent. The heavily escorted convoy set sail at first tide the following morning and crossed the Channel safely, the only incident of note occurring when the engine of one of the L.C.T. carrying members of the M.F.H. broke down and repairs had to be carried out in mid-Channel before proceeding, unescorted, to rejoin the rest of the convoy.

The M.F.H. staff landed with little difficulty on Juno/Mike/Red beach on August 23 and were met by guides detailed from the R.A.F. beach party, who escorted them to their first site at Banville, a little village 2 miles from the coast and adjacent to the airstrip B.14. The M.F.H. set up its tents in a field which allowed them the necessary facilities to co-operate in the evacuation of casualties from nearby airstrips.

The M.F.H. was not scheduled to open until August 28 and the free days were spent in perfecting the camp and in establishing liaison with local units, emphasising in particular the rôle of the M.F.H. The initial task of the unit, apart from providing for medical needs in the immediate neighbourhood, was to receive and care for casualties who were to be flown into B.14 from the Paris area. It was understood that the reception of casualties in England was particularly difficult at this time and that patients received in the immediate future were to be either sent to the Bayeux military hospitals or held by the M.F.H. itself until the position in the United Kingdom became easier.

These first casualties received by the M.F.H. on August 28 were of interest for two reasons; firstly, 30 per cent. of them were Germans

and secondly, all of them, Allied and German, were in very bad shape.\* Dressings were filthy and stale, P.O.Ps.† had been badly applied and, quite apart from the danger involved, were causing many of the patients considerable discomfort, while the general condition of all patients suggested a total lack of resuscitation or proper treatment. It was further discovered that penicillin therapy for those patients receiving the drug had been haphazard both in dosage and frequency of administration; after consultation among the local medical specialists it was decided that a routine of 12,000 units three hourly should be adopted for all patients.

On September 3 evacuation to the United Kingdom was again possible and the M.F.H. became very active in assisting in the evacuation of patients from B.14. In this task little difficulty was encountered and, as the supply of Dakota transports was plentiful, large numbers were evacuated. Early in September the M.F.H. rightly foresaw the likelihood of a move in support of our now advancing forces and on the 8th, camp was struck and the unit moved to Amiens, covering the distance of 180 miles both rapidly and uneventfully. The M.F.H. remained in this town for one week but did not become operational, as another move was imminent and the use of the hospital in the area was not imperative. While awaiting the move members of the medical staff were conducted over a hospital that had been used for and still contained British prisoners-of-war—the conditions beggared description and gave proof of the enemy's failure on this occasion to honour the Geneva Convention.

A week later the M.F.H. moved forward 130 miles to Brussels, the journey being uneventful except for one slight accident in which a lorry overturned and slightly injured a corporal. The unit was ready to receive casualties on the following day in the large civilian hospital—L'Hôpital Brugmann—earmarked for its use. The M.F.H., however, could not attempt to staff anything but a small portion of this extensive accommodation and on the 21st No. 8 R.A.F. General Hospital took over the building and No. 55 M.F.H. moved to Lille. The building allocated, a polyclinic, was found unsuitable for the M.F.H. and a number of alternative sites were inspected; finally, a girls' school, the 'Froyenne Tournai', was selected and the M.F.H. took possession on September 22.

Shortly after this date information was received that units of No. 2 Group would be taking over airfields in the vicinity and that No. 55 M.F.H. would be required to provide medical cover for forthcoming operations. After some difficulty a suitable site, located to

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\* This was one of the very few instances recorded in which treatment prior to evacuation by the forward shuttle aircraft was collectively bad.

† Full cast plasters had been applied in nearly all instances.

cover as many of the proposed airfields as possible, was found, largely due to the generosity of the Prince de Ligne, who offered the use of a wing of his château, in which it would have been possible to erect 200 beds. These arrangements had been finalised by September 26 but they did not come to fruition, as No. 2 Group did not make the proposed move; units of the U.S.A.A.F., however, which ultimately occupied these airfields, were able to use this château as a field hospital.

On October 3 the M.F.H. received orders to move to Lens, 12 miles north of Arras, where a small civilian hospital was occupied and the following beds were established: 56 surgical, 58 medical, 40 S.T.C.; there were two operating theatres. While at Lens the hospital did little work other than that arising from day to day sickness, but certain domestic incidents occurred which are worthy of mention. On October 6 lice were discovered in the S.T.C. division of the hospital and gave rise to considerable alarm, as the dangers of typhus were at this time receiving special publicity (*see* *The Health of the R.A.F.*, page 512). Further lice were then found in the sisters' quarters and it is likely that more would have been discovered in other places but for the speedy use of 'dusting squads', the efficiency of whose work was demonstrated by the fact that no further lice were discovered. On October 8 (five days after occupation) the water supply was found to be definitely unsafe and it was necessary for chlorination and water bowsers to be used for all drinking and cooking purposes; it is of interest that although the water supply was proved to be highly contaminated and both members of the hospital staff and patients had for five days been drinking the water, no untoward results are recorded!

One incident of very considerable medical interest occurred when the emergency mobile surgical team was called out after a fighter aircraft had crashed in the neighbourhood. Though the team proceeded with all possible speed to the scene of the accident a civilian French doctor arrived first on the scene and when the team arrived had just finished carrying out a high guillotine amputation of the left leg and was preparing to do the same to the left arm; fortunately the R.A.F. surgeon was able tactfully to dissuade the civilian from this course and the arm was thus saved. The interest lies in the differing points of view between the British and French surgeons: the former had absorbed the vital tenet of conservatism in surgery, an attitude fostered continually throughout the war years, whereas the latter was familiar only with French surgery which had had, by force of circumstance, to stand relatively still during a similar period of time.

The months before Christmas saw the hospital engaged in unspectacular routine work although assisting very considerably in the task of casualty evacuation, in which it acted as a 'major' holding unit for

difficult cases or overnight stops; the majority of the patients evacuated came through 77 British General Hospital which was located in the immediate vicinity. It is interesting to note that of the 248 patients admitted in December 106 were evacuated to the United Kingdom.

In the following three months a very considerable number of patients passed through the hospital, but if air evacuation cases are excluded the hospital was rarely more than half full:

January 1945	Cases admitted	257	Cases evacuated	205
February "	" "	206	" "	183
March "	" "	237	" "	325*

(\* Cases admitted for a 'token time' were not counted as admissions, which explains the apparent anomaly.)

On April 8, 1945, the M.F.H. moved to Eindhoven in support of the advancing Canadian First Army. The building allotted to the M.F.H. was St. Joseph's Hospital which was opened with a bedstate of officially 200—although in practice the M.F.H. was too small a unit to run such a large establishment. (See No. 50 M.F.H. narrative, page 531.)

It was known that the tenure of the hospital would be short as the civilian authorities were pressing for its return and had in fact expected to have the building in their hands before No. 55 M.F.H. had arrived; it was agreed that the hospital should be handed back to the civilians by May 15 at the latest. In order to honour this agreement the M.F.H. moved from Eindhoven to Sterksel. The move was carried out department by department, while patients were temporarily admitted to 79 B.G.H.; when the building, which was most suitable for a M.F.H., was fully prepared, the patients were readmitted. The M.F.H. remained in this site for four months, engaged primarily in the holding and evacuation of patients from the several large hospitals in the neighbourhood—79 British General Hospital and Nos. 8, 10 and 20 Canadian General Hospitals. The figures for these months are tabulated below:

May 1945	Admissions to No. 55 M.F.H.	. 188
June "	" " " " "	. 173
July "	" " " " "	. 183
August "	" " " " "	. 94
May 1945	CAE through No. 55 M.F.H.	. 304
June "	" " " " "	. 674*
July "	" " " " "	. 563
August "	" " " " "	. 273

(\* This large number was due to the local military hospital emptying as many beds as possible in preparation for expected large numbers of casualties and illustrates most admirably one of the uses of organised casualty air evacuation.)

In September a move of the entire M.F.H. into Germany began and on the 1st the unit moved to Gütersloh, 30 miles north-west of Hamm, taking over a small German civilian hospital, and being known henceforth as R.A.F. Hospital, Gütersloh. From this date until the disbandment of the hospital on May 31, 1946, nothing of significance was recorded, the whole function of the unit reflecting the run-down occurring in the forces of all Services.

#### NO. 8 R.A.F. GENERAL HOSPITAL

In the general plan for the medical welfare of the R.A.F. in the invasion of Europe, a full scale R.A.F. general hospital was considered essential and to ensure that such a hospital would be available the necessary personnel were earmarked early in the medical arrangements for Operation 'Overlord'.

The hospital was formed initially at Aston Down, Gloucestershire, early in August 1944 and was at full strength by the middle of that month. As a large staff would be required, it was decided that senior medical and surgical specialists should only be called to the hospital when its move across the Channel was imminent; this allowed a considerable number of specialist officers to be usefully employed elsewhere up to the time of entering the Concentration Area. The main party set up the hospital and equipment under canvas at Aston Down and on August 21, 1944, travelled by motor convoy to the Concentration Area at Old Sarum, Wiltshire, entering the embarkation area two days later. This party comprised the commanding officer, 15 medical officers and 126 other ranks.

*Crossing and Landing.* The crossing of the Channel in L.C.T. was accomplished without incident and unloading on the Normandy side took place rapidly and without loss of equipment or enemy interference. A suitable site for the hospital was chosen near Bayeux and by the end of the month the hospital had two hundred fully equipped beds under canvas and was ready to receive patients. Apart from the male staff expert nursing was provided by a matron and 26 nursing sisters who were flown out on August 26. The official date for the hospital to become operational was September 1, but it was possible to accept ten medical and eighteen surgical patients on August 30 from No. 50 M.F.H. which was closing in preparation for moving forward.

In view of the relatively small number of casualties being received it soon became apparent that the R.A.F. hospital was not essential in the Bayeux area, mainly because of the efficiency of the air evacuation scheme but also because the fighting had now receded from the area. Thus on September 5 the commanding officer was notified that the hospital was to be transferred to the Brussels area and he was accordingly advised to travel to Brussels and seek out suitable accommodation in a

permanent building. It was found possible for the R.A.F. to take over a civilian hospital—L'Hôpital Brugmann—which was well suited for R.A.F. purposes, and the main party moved in convoy from Normandy to Brussels on September 19, enjoying a relatively uneventful journey. The hospital was ready to receive patients 24 hours after the arrival of the main party, this being mainly due to the fact that the building was already occupied by No. 55 M.F.H. (September 16–21) and an Army general hospital, which had overcome many of the initial difficulties.

At this stage the hospital was equipped to hold a maximum of 200 patients. During September the daily average of beds occupied was 128, but on one day 228 patients had been accommodated. The hospital was being used as a large holding unit for the casualties being evacuated from the airfields near Brussels and the numbers given above reflect the effort being made to evacuate patients rather than the turnover of the hospital (*see* Plate LVI). The final figures at the end of the month were:

Medical patients	.	.	215
Surgical patients	.	.	231 (includes 121 battle casualties)
Venereal disease	.	.	20
Major operations	.	.	40
Minor operations	.	.	23
P.O.P.	.	.	48
Laboratory investigations	.	.	216

On October 4 an advance party took over L'Hôpital St. Gilles and the main party vacated L'Hôpital Brugmann one week later; they were joined on the 27th by the rear party that had been waiting in England. This move to another building was necessitated by the increasing difficulties of having both an Army and a R.A.F. general hospital under the same roof, for although relations were most cordial it was found impossible to share facilities satisfactorily. The hospital at St. Gilles had previously been used by the Luftwaffe as a general hospital and had been redesigned to meet their needs; all the additional buildings were well planned and of excellent quality, particularly the operating theatre.\* The move was accomplished under the best conditions but all serious cases were left at L'Hôpital Brugmann until they were fit to be moved into St. Gilles or evacuated to the United Kingdom.

By the end of the month 375 beds had been equipped and the work of the hospital was in full swing. The daily bedstate had increased to 260, the majority of patients being those accommodated overnight before evacuation to the United Kingdom. In November, however, it was

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\* In the record of No. 8 R.A.F. General Hospital the senior surgeon notes that all the German surgical equipment and facilities which he inspected were of the highest quality and left nothing to be desired. (*See also* section entitled 'Observations on a Visit to the Continent', page 559.)

found necessary to increase the number of beds to 440 and the figures for the month show a considerable increase in all Divisions.

Medical patients . . .	347
Surgical patients . . .	255 (includes 47 battle casualties)
Venereal disease . . .	159
Major operations . . .	81
Minor operations . . .	83
P.O.P. . . . .	53
Laboratory investigations . . .	1,154 (The majority V.D.)

While in Brussels an attempt was made to control the flow of out-patients who, since the hospital's opening on the Continent, had arrived for attention at any time of the day or night, a most unsatisfactory state of affairs for both patients and hospital staff. An effort to encourage out-patients to attend on specific days had been made early in the hospital's operational career, but, although Group had given every assistance by notifying all units of this policy, it was found impossible to implement the scheme in an operational area where units changed location so quickly and transport was often difficult. Now that the hospital was on a more permanent footing in Brussels a further attempt at control was made, by suggesting that patients within one hour's motoring time of the hospital should attend on specific days for the various specialities, those more remote still attending when possible. This method of running an out-patients department was not ideal, and on operating days or during ward rounds was extremely trying, but the scheme worked fairly satisfactorily and helped to spread the load to some extent. Some idea of the activity of the out-patients department can be obtained from the graph in Fig. 6. which shows the separate departments concerned and the totals of patients treated. All the numbers given are lower than the true figure, as a patient is only shown as attending the original division, whereas in point of fact he might have been seen by several specialists; this discrepancy was a result of efforts to cut documentation to the minimum.

On December 21, the busy life of the hospital was further enlivened by a flying bomb which landed close to the building. Two nursing sisters, slightly injured by flying glass, were the only casualties among Service personnel, but a number of civilians were injured and these were cared for in the hospital. Considerable damage was done to the airmen's and W.A.A.F's. living quarters and the ensuing lack of glazing rendered the accommodation singularly cheerless in the prevailing inclement winter weather; repair was difficult as, not surprisingly, window glass was very scarce on the Continent.

*Messing.* Throughout its existence the hospital was relatively fortunate in this respect, partly because of the normal priority accorded to a hospital and partly as a result of the efficient supply through the base

depots of the R.A.S.C. In the beachhead area 'compo' rations were used initially, but after a short period rations were drawn from the base depot at Bayeux. For about three weeks after the arrival of the hospital at Brussels the standard deteriorated owing to the constant moves of the base depots and the mobility of the front line at this period, but when conditions became more static the improvement was noticeable. After V.E. Day there was again a marked deterioration in the quality of food, and this, coupled with the prohibition of local purchase from civilian sources, caused considerable misgivings to catering officers who had, up to this time, managed to provide both nourishing and attractive diets for all types of patients.\* Although buying food from the local population was forbidden, it was not against regulations for the hospital to receive gifts and in this respect the Belgian people were most generous, the eggs and fruit thus received being greatly appreciated by all patients.

Young Belgian girls between the ages of 14 and 18 would bring trays piled high with grapes as gifts for the inmates of the hospital. They would present a bunch of grapes to patients in the wards and sitting gravely on the bed would gaze deeply into the eyes of the occupant and murmur 'gravement blessé, monsieur'. Quite a few of these sympathisers on the first day the hospital was opened to the public found their way into the V.D. block, where they unwittingly congratulated the inmates on the honourable scars they had received! The matter was soon discovered and further visitors to this section of the hospital were forbidden.

During the ensuing three months there was little change in the function of the hospital, which was still employed, for the most part, as an overnight holding unit for patients about to be evacuated by air to the United Kingdom. At the same time a considerable volume of routine hospital work was carried out, for the hospital was now situated in an area where large numbers of British soldiers and airmen were located, and all the normal medical and surgical emergencies arose.

*Venereal Disease.* The V.D. clinic of the hospital was particularly busy and this fact stimulated the Service medical authorities to seek further methods of decreasing the discredibly high rate. The system devised was considered to be effective to some degree and it is therefore outlined briefly in the following paragraph.

A special *pro forma* was devised in conjunction with the R.A.F. police, and all V.D. patients, on admission, were questioned by a police N.C.O. in an effort to trace the source of infection. If this was satisfactorily established the civil police were informed of the contact's name and address and compulsory treatment was insisted upon (*see*

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\* See R.A.F. Volume I, Chapter 6, Hospital Catering, page 338.



section on V.D.). The scheme began in a small way in December 1944 and by May the following year had fully justified itself by the fact that out of 275 cases investigated only 58 sources of infection had not been traced—a very considerable triumph for the police in a city abounding with displaced persons from nearly all the countries in Europe.

The success of the scheme was underlined by its adoption by all United Nations Forces in March 1945 when a Joint Contact Tracing Register was set up. Although full control of V.D. was never achieved this system was a very considerable advance and of all the attempts made during the war years to control the disease, this was perhaps the most fruitful method and fully justified the time spent in tracing contacts.

The figures for March 1945, shown below, were very similar to those for previous months and indicate that the hospital was kept comparatively busy. The bedstate remained at 440 beds equipped.

Medical patients	.	.	358
Surgical patients	.	.	364 (Enemy action 44)
Venereal disease	.	.	141
Major operations	.	.	101
Minor operations	.	.	82
P.O.P.	.	.	192
Laboratory investigations	.	.	1,301

From this date onwards there was a continual lessening of all types of cases, though venereal disease always remained high,\* and in early October 1945, it was obvious that a R.A.F. general hospital was no longer necessary in the Brussels area. This fall in work was due to a combination of the cessation of hostilities, demobilisation and our Forces taking up permanent quarters in Germany. This latter fact was responsible for the hospital moving in the same month to Rinteln, 10 miles south of Minden, where it served the R.A.F. population as a general hospital.

#### DIVISIONS OF NO. 8 R.A.F. GENERAL HOSPITAL

In many respects the detailed work of the hospital did not vary from that of a normal peace-time hospital, and for this reason the following paragraphs are confined to a brief account of the principal departments.

*Surgical Division.* This division started work at Bayeux on September 1, 1944, with 100 beds allocated as follows: 30 general surgical, 30 orthopaedic, 40 E.N.T. They were housed in four tents holding 30,

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\* From November 1944 onwards, V.D. cases and battle casualties treated at the hospital were in the proportion of 4:1. It should be remembered, however, that V.D. patients requiring intensive treatment were sent to the general hospital from a wide area, and the figures do not therefore give a true picture of the incidence in the locality of the hospital.

30, 20 and 20 beds respectively. In the light of war-time experience and in view of the likelihood of the hospital suddenly receiving convoys of up to 60 or more badly injured cases, special attention was devoted to resuscitation, and a tent holding a further 10 beds was set aside for this purpose. The operating theatres consisted of two marquees each containing two tables, one marquee being reserved for 'dirty' and plaster cases while the other was kept, as far as possible, for 'clean' surgery. The hospital records contain a number of severe criticisms of the standard operating tent. One such criticism concerned the size of the tent, which made the manœuvring of stretchers difficult and led to congestion of the tent and excess handling of the patient. These tents had, in fact, been adversely commented on by nearly all R.A.F. surgeons in the practice period before the invasion but it had been impossible to obtain any improvement in the design; the tents were the same as those used by the Army, who were the suppliers to the R.A.F., and the dictates of economy demanded that existing stocks, even though unsuitable, must be used.\*

During the beachhead phase, the volume of surgical work was small and in no way justified such a large department; from the period September 1 to 19, when the hospital moved to Brussels, only 35 operations had been performed.

When the division opened in L'Hôpital Brugmann on September 22, it was again possible to provide 100 surgical beds, all of which, together with the operating theatre and X-ray department, were in relatively good accommodation; four days later 108 surgical cases were accepted from a nearby Army hospital, which had become saturated during the recent fighting. After these patients had been sorted and, where necessary, resuscitated, the three surgical teams operated solidly for 18 hours, during which time 21 major operations alone were performed.

On October 5, 1944, the department was moved to L'Hôpital St. Gilles, taking over accommodation previously used by a German surgical division and excellent in every way. In this final location the division dealt with a steady flow of work but was never seriously pressed, except on two occasions when flying bombs caused a number of casualties in the immediate vicinity. The first of these incidents, on December 21, 1944, resulted in 51 cases being treated, mainly by minor surgery; the second and more serious incident occurred on January 1, 1945, when 41 major operations were performed, the three teams operating for 16 hours without a break. An important part was played by the resuscitation ward, particularly in the latter incident, and the excellent results obtained and low mortality rate were largely attributed to its activities.

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\* See Chapter 3, Middle East Campaign for information on the excellent German operating tent, page 121.

*Medical Division.* The history of this division is relatively unspectacular. In the beachhead area a large number of enteritis cases were treated, but apart from this the work varied little from peace-time practice. In Brussels, small outbreaks of diphtheria, fortunately of a low virulence, occurred as also did minor epidemics of dysentery of the Sonne and Flexner groups, but the numbers involved never exceeded 20. The main diseases encountered by the division throughout its existence were dyspepsia and respiratory infections.

*Dermatological Division.* This division received few patients while in the beachhead, probably because the importance of the operation dwarfed the significance of such complaints in the men's minds. After the move to Brussels, however, the volume of work increased considerably and during the first six months of 1945 a total of 747 patients were seen, of whom 300 were admitted. The two commonest diseases were eczema and impetigo. Fifteen cases of sulphonamide dermatitis were seen, but all were patients who had been incorrectly treated with sulphonamides, so that little blame could be apportioned to the drug in question. Although the total figures for patients passing through this division may appear large, it should be remembered that the hospital was responsible for a very large number of personnel who were always on the move and often living, unavoidably, in poor conditions.

*Neuropsychiatric Division.* During the period September 1944 to June 1945 psychiatric facilities were available and employed from 10 to 25 beds in an 'open' ward. A total of 523 in-patients and 769 out-patients passed through the division; of these cases psychological illness accounted for 835 and organic neurological symptoms for 305, the remainder being of mixed origin. Only 12 patients were seen twice, because the Department aimed at either effecting a cure or returning the patient to the United Kingdom in order to reduce the 'infectivity of neurosis' and the 'passenger rate' in Second Tactical Air Force. An additional result of this policy was that no case of suicide or self-inflicted injury occurred among patients under the immediate care of the division.

Among psychological disorders anxiety states and disorders of affect were markedly predominant. In ground personnel fatigue and exposure to V.1s. and V.2s. were outstanding precipitating agents, although in nearly every case predisposing constitutional factors could be detected. In flying personnel the incidence of neurosis and loss of confidence was extremely small.

*E.N.T. Division.* This division, which operated from the opening of the hospital in Normandy, had a busy though unspectacular career and by the end of June 1945 had treated a total of 1,713 cases; this figure comprised 1,150 new and 563 old cases and included 149 aircrew personnel. Admissions totalled 476 and 182 operations were performed,

the majority being tonsillectomies, sub-mucous resections and anrostomies.

The most troublesome condition encountered by the division was otitis externa, for which prolonged treatment and individual attention was necessary and which carried a distressingly high relapse rate. There were two small outbreaks of acute otitis media, one in February 1945 and the other in early June, and although most of the patients responded well to chemotherapy, it was necessary to perform four mastoidectomies. Among the chief traumatic injuries were broken noses resulting from motor accidents or brawls and ruptured tympanic membranes due to close proximity to exploding V.1s. or V.2s. Comparatively few cases of chronic suppurative otitis media were encountered owing to the 'weeding out' process which had been adopted during Second Tactical Air Force's training period.

*Dental Division.\** The division commenced work in the early days of the beachhead, when two adjoining tents were set up and fitted as surgery and laboratory respectively. The latter also undertook work on prosthesis for two outside independent dental surgeries. The work of the division suffered only a brief interruption during the move from Normandy to Brussels and showed a continual increase, particularly in conservative treatment. From September to December 1944 over 230 patients were dealt with, including 13 maxillo-facial injuries, 14 impacted wisdom teeth, 4 dental cysts, 3 cases of osteomyelitis and 2 of necrosis. The laboratory completed 52 new dentures, repaired 62 and constructed 18 jaw splints.

From early 1945 until the hospital closed, the division continued to provide routine conservative and prosthetic treatment for personnel of units scattered throughout Belgium. Early in February it was found that the volume of chair-side work had increased to such proportions that the dental officers were unable to give sufficient time to ward patients and the Inspecting Dental Officer gave instructions, albeit reluctantly, that only personnel of No. 111 Wing should receive routine treatment at the hospital.

A considerable number of maxillo-facial cases were received from all over Belgium, mainly as a result of road accidents but a few from aircraft crashes; the majority did not involve loss of tissue or bone. The general policy of primary surgery, splinting and immobilising of the fragments and later evacuation to the United Kingdom was adopted with considerable success, all cases being 'blanketed' with penicillin.

*Burns Division.* At the end of August 1944 a special tent holding 10 beds was set aside for the specific treatment of burns. This accommodation was immediately swamped by the first convoy and additional beds

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\* See also R.A.F. Volume I, Chapter 4, page 160.

had to be 'borrowed' from E.N.T. wards. Rather undramatically, the majority of patients were cooks and the burns had been acquired from misuse of petrol in lighting fires. As no saline baths could be contrived the lines of treatment were saline and *tulle gras* and it was a point of considerable interest that infection was rarely seen, even though field conditions prevailed. Following the move to Brussels it was possible to expand the department to 28 beds (St. Gilles) and a bath for saline treatment was available. In all, the division treated over 170 cases, the majority of these being returned to full duty after three to four weeks and very few requiring evacuation to the United Kingdom for grafting or burns centre treatment. Only two fatal cases occurred—one from severe burns of over 75 per cent. body area, the second from a Curling's ulcer (acute duodenal ulcer following on severe burns—a rare condition). Treatment was again relatively standard, although there was a swing in favour of penicillin and sulphathiazole powder instead of sulphathiazole alone, while penicillin systemic injections later became standard practice. In the control of pyocyanous infections 1 per cent. acetic acid was found to be of value and was commented on most favourably.

#### OBSERVATIONS ON A VISIT TO THE CONTINENT BETWEEN OCTOBER 7 AND 20, 1944

In the preparation of a history such as this it has been necessary to rely, in the main, on semi-official or completely formal reports from medical and executive sources or on accounts written by eye-witnesses many years after the event. Such methods were unavoidable, for the manning position during the war did not permit the detachment of medical officers—or of any other officers—for the specific purpose of obtaining information for medical historical records. In 1944 however, the Air Ministry department responsible for the compilation of such data was able to send a medical officer to the Continent to visit R.A.F. units there and record his impressions.

This officer's report is too long to be reproduced in full, but, as the following extracts show, it is notable for its diversity of subject and accuracy of observation. Many of the matters referred to do not, at first sight, appear to be the direct concern of a R.A.F. medical officer, but such descriptions as are given here show the background against which the medical work was being done, as well as indicating the many fields of service open to medical officers, outside their official R.A.F. duties.

'My visit to the Continent took place during a phase in which there was active preparation for a further advance after the failure of the Arnhem Salient. The whole front was in a fluid state and regrouping was taking place. Antwerp had been captured, but the Germans still

held both sides of the Scheldt Estuary, and, although the harbour facilities were intact, the port was unusable. Shortly after my arrival, operations began to drive the Germans out of both sides of the Estuary. The approximate front line and places visited during the tour are shown in the sketch map. (Map 6.)

'Collaborators were still being rounded up and put into concentration camps and there were many anti-Allied personnel and Gestapo



MAP 6. Areas visited during tour October 7 to 20, 1944.

agents in civilian clothes left behind in the advance. It was not always healthy to be out late at night in country districts, though the big towns were comparatively safe. Ghent, for instance, had a 9.30 p.m. curfew and shooting could be heard in the town every night. Despatch riders were being intercepted occasionally and knocked off their motor cycles by trip wires. The local F.F.I. and other resistance units were slowly but surely weeding out both German sympathisers and enemy agents.

'The Allied occupation had not yet eased the food situation, and in quite a few instances it was, in fact, worse than during German occupation. The measures taken by the Belgian Government to curb the Black Market by the introduction of the new Belgian currency were drastic, and though they caused great inconvenience they certainly ruined overnight anyone who had made a fortune during the German occupation.

'First impressions tended to be misleading because on walking round any town or village, there seemed to be enough of everything. However, it was soon apparent that the goods which were abundant were those in short supply in this country and that the necessities of life were very meagre. I searched in every town or village for a butcher or a fishmonger who had any goods for sale, but I was unsuccessful. The quality of dresses was poor though their style was intriguingly good. Leather goods were to all intents and purposes non-existent. Soap was made from horse fat and sand or pumice and would not lather.

'It was impossible to judge by appearances only whether the children had suffered. To my eye every child looked small for its age and sallow, but then all Continental children have always looked small and sallow to me anyway. I did notice however, that the prams, push-chairs and other children's furniture, designed for children up to two years, would not have accommodated an average English infant of a year to eighteen months of age.

'*Transport.* There was a shortage of transport in every Group; firstly, because units had arrived in Normandy not up to establishment; secondly because many vehicles had been destroyed or damaged; and thirdly, because of the attachment to various Groups and to T.A.F. Main H.Q. of units such as the official Financial Adviser and his staff, who had come over by air without transport.

'*Headquarters.* Tactical Air Force Main and Rear Headquarters were accommodated in the Residency Palace buildings in Brussels. Offices and accommodation for Main Headquarters staff were in the super-luxury flats of which the building consisted. Both Main and Rear Headquarters had separate messes and there was a cinema seating 400, and a swimming pool in the basement. At the time of my visit, personnel living in such luxury still drew field allowances.

'*General Administration.* I noticed a big difference between the type of medical officer in Nos. 85 and 83 Groups. No. 84 Group had so many personnel of different nationalities in it that it was not fair to draw any comparison, but it was my impression that the medical officers of No. 85 Group were not experienced, though there were several exceptions, in any form of field warfare taken as a whole, and that there was a tendency for the junior medical officers to rely too much upon obtaining advice from Group Headquarters rather than carrying out decisions themselves.

## AIRFIELDS

*'Evere.* Evere is a large grass airfield on the north-east outskirts of Brussels. It had been severely blitzed and hardly a single building was undamaged. The water supply and conservancy had been interrupted and were still out of action. The civilians living in the proximity of the airfield spoke most highly of the accuracy of the bombing carried out by the Royal Air Force. The airfield was being used for the rear end of a shuttle service from the front and as a terminus for supplies and transport of personnel from England.

'There were about 20-30 Fortresses and several Liberators parked near one dispersal, and an efficient system of convoys had been organised to take supplies from incoming aircraft up to the front. Four days before my visit there had been over 700 Dakotas on the airfield. The aircraft had landed six abreast at 60 yard intervals at a rate of eighteen a minute. When drawn up they made six lines of aircraft round the perimeter track. The two medical officers were of the impression that greater use could have been made of casualty air evacuation if an allocation of aircraft for this specific duty had been available. The unloading and loading was greatly assisted by voluntary help given by members of the local Boy Scout movement. I was told that some 2,000 German prisoners had been recently flown back to hospitals in Normandy. The W.A.A.F. nursing orderlies said that these patients were very well behaved. Some of them were impressed by their treatment and only one had objected to air transfer on the grounds that the aircraft would most certainly be shot down by the Luftwaffe.

*'Amiens-Glisy Airfield.* This was a large airfield with two 1,600-yard runways and good dispersal points, well camouflaged with imitation cane houses over the airfield buildings. The airfield had obviously been a permanent German station. Nearly all the buildings and hangars had been destroyed, but several of the "blister" type hangars, made from pre-fabricated wooden sections, were repairable or in fairly good condition. Personnel were still under canvas, though they were in the process of moving into winter quarters.

'The layout of the wing on the airfield was excellent, and even though it had been raining hard the day before, the ground was not water-logged. Officers' and men's lines were clean and there were plenty of duck boards in use. Ground personnel on duty had "scrounged" two four-tiered German bunks for personnel on call for maintenance duties. The commanding officer of the wing believed in providing the basis for comfortable accommodation for other ranks and at the same time encouraged initiative among all airmen to improve their living conditions, provided that the proposed improvements had been passed by the medical officer.



'No. 24 Sector Headquarters. Headquarters, No. 24 Sector was situated at Boves, about five miles from the airfield. The plotting boards were manned by three shifts of W.A.A.F. personnel working in four watches.\* The girls were experiencing a sense of frustration caused by the anticlimax of not having any work to do after the excitement of coming to the Continent. The Luftwaffe had only sent out small numbers of aircraft into the Sector area, and for long periods of each shift there was only the movement of friendly aircraft on the plotting board.

'There were 80 W.A.A.F. personnel in the Sector and it had been possible to house them all in an excellent requisitioned building which included good dining, recreation, ironing and washing facilities; together with adequate N.A.A.F.I. and sick quarters accommodation.

'When I arrived, the girls were just coming in from playing hockey. I spoke to several of them and they were bursting with energy and very happy and particularly praised the unit food. The W.A.A.F. officer in charge was, I think, handpicked for the job. She was young, good-looking, had a pleasant manner and was approachable by all the girls, but yet managed at the same time to maintain her authority.

'Nearly all the letters censored from this unit were without complaint. I quote one letter: "For the first time in my four years career in the W.A.A.F. I have no complaints to make of any sort!"

'*Volkel Airfield.* This airfield was the largest I have ever seen. It had two main runways of approximately 1,600-1,800 yards, but there was a grass overshoot of nearly 2,000 yards at either end of each runway. Personnel had moved in about a week before I arrived, when everything was a complete shambles. The Otway pits, which were of the open variety, had a cloud of flies over them. There was hardly a building with a roof intact and the Germans had slaughtered all their cattle and left large piles of entrails, teeming with flies and maggots, in the kitchen precincts. Aircrew and officers were accommodated in a building about 3 miles from the airfield used normally for probationary priests. This accommodation was most suitable, as it contained good eating and recreation rooms, a sound kitchen and two large dormitories upstairs with baths and basins attached. One of the dormitories was divided up into 74 monks' cubicles, 8 ft. long, containing a bed, small shelf, table and a curtained closet to hang clothes.

'*Grave Airfield.* Grave was the northernmost airfield of Second T.A.F. and was situated in a bend of the River Maas. The airfield, which was of grass, was very wet and muddy; this was due to the Dutch habit of opening dykes in the winter to decrease the flow of flood water down the river, the airfield becoming submerged under 4-5 ft. of water in the process.

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\* See R.A.F. Volume II, Chapter 11—No. 60 Group, page 668.

'The M.I. room, an old ammunition bunker, faced the airfield and was protected on the other three sides by earth banks 10-15 ft. thick and 10 ft. high. Within this sheltered area the marquee tent was pitched and camouflaged. This form of protection was very necessary because of frequent sporadic attacks made by Me.262s. carrying anti-personnel bombs. Three days before I arrived, 15 R.A.F. Regiment personnel had been killed and about 35 others injured. There were also occasional rockets in the area.

'Dispersed sick quarters was situated in a Capuchin convent about half a mile from the airfield. The nuns were Redemptionists, and, until the senior medical officer of the Wing had fixed up a ward in the building, the airmen admitted were the first men, except for a visiting priest, that these women had seen since they took their vows. The whole building was spotlessly clean and one English-speaking nun acted as interpreter between the S.M.O. and the Mother Superior. This woman, whom I estimated between 65 and 75 years of age, was most charming and unselfish; she set such an example of service that she impressed all who had the privilege of knowing her. The nuns cooked the food for the patients and in return the S.M.O. carried out what medical attention he could for two of the nuns who were dying from tuberculosis in their isolated cells upstairs, and by arranging treatment and rendering first aid to nuns of similar orders who had been wounded and were taking refuge from convents further north.

#### *No. 8 Royal Air Force General Hospital*

'*Operating Theatres.* Absolutely first class. In my opinion they were better than in either of the Royal Air Force Hospitals at Wroughton or Ely.

'*Dispensary.* A modern dispensary, containing large quantities of German drugs and stores. There was storage cellar space underneath the dispensary in four cellars which were full of abandoned German medical supplies. I endeavoured to look round these supplies to see what might be missing or in short supply, but they had been ransacked before I could go over them and I only obtained a superficial impression. There were hundreds of trusses of all sizes and an equal number of arch supports made of leather with an interleaf metal spring. There seemed to be no lack of rubber equipment and a very good range of excellent catheters, rubber hot water bottles and rubber sheets had been appropriated for hospital use. There were also some synthetic rubber sheets and rubber tubing. I saw no dried serum, but found large quantities of saline-glucose glass ampoules. The stock mixtures were well balanced and there seemed to be no lack of camphor in various forms.

'*Mobile Field Hospitals.* Nearly all the mobile field hospitals were either packing up or actually on the move during my visit. There seemed

to be no point in visiting these and the only ones I saw were Nos. 50 and 52, which were set up in St. Joseph's Hospital in Eindhoven. This well appointed hospital had been built by the Phillips' family to cater for the population of the town who were almost exclusively employed in the Phillips' factory.

*'Airfield Construction Wing.* I visited the headquarters squadron at Aath, 15 miles south-west of Brussels. The wing consisted of 2 squadrons out on work, a plant squadron and a headquarters unit. The total strength was 2,400, for which there were three medical officers and 9 nursing orderlies. The construction wings were unlike any other wing I had seen in the R.A.F., not only because of the work which they did but because of the general atmosphere pervading the personnel. It seemed to me that the wing could be placed midway between a normal Royal Air Force ground unit and an American construction unit. There was a sense of efficiency throughout and a distinct "go to it and get it done" attitude everywhere.

The headquarters squadron personnel, numbering 500, were housed in old cavalry barracks built in 1830, which reminded me at once of the type of barracks read about in *Beau Geste*. The rooms were large, wooden floored and had steel bars across the windows and walls two metres thick. The outstanding section of the wing was the kitchen, which had been set up in some old existing kitchens. The place was spotless and the senior N.C.O. in charge was sterilising all kitchen utensils with a steam Jenny before placing food into them for the midday meal. This was a normal procedure. I also saw a captured German stove, capable of holding 24 gallons, mounted on a trailer. This stove was used on convoy, and supplied everyone with hot drinks at frequent intervals.

*'Medical Officers.* I was fortunate in being able to attend two meetings, one at No. 85 Group, which the medical officers of the isolated units in the Group attended, and another at St. Joseph's Hospital, Eindhoven, attended by those medical officers of No. 83 Group who could get there. At the former meeting, several points were raised and difficulties brought forward, but it was apparent that most of the difficulties arose from lack of initiative on the part of medical officers rather than inherent difficulties in the organisation. For instance, some medical officers were unable to draw comforts, whereas others had managed to obtain them, albeit without being entitled to them, from Army sources by a system of co-operation and wangling. Medical stores, particularly stock mixtures, were in short supply in most of the medical officers' units and this matter had arisen because the M.F.Hs. from which they were supposed to draw their stocks held such small quantities as a result of being continuously on the move, that they could not meet demands. One medical officer stated that he was always hungry with the existing

'compo' ration, and it was found that at his unit all the meat in the ration was being served at one meal instead of two. Laundry had been a problem in some instances when the local population could not help out with the matter. Army laundries had been helpful, but on occasion they had refused R.A.F. laundry because they were already working to capacity. Another interesting point was that R.A.F. laundry demanded considerably more sorting than that of the Army because of the detachable collars used by the R.A.F.

*'Establishments.* Nearly everywhere I went in Nos. 83 and 84 Groups I found medical officers who were disgruntled because they considered themselves to be over-established and had very little work to do.\* Although they were very fond of their squadrons they welcomed the idea of being put on a wing basis. At Volkel there were 13 medical officers and the work could easily have been done by 7 or 8. It was possible for medical officers not on duty to visit various hospitals and units in the vicinity, and this was done by many; a few merely used their time off as an excuse for some active recreation in one of the big cities, such as Brussels. Most of the wing medical officers had fostered an extremely good liaison with their commanding officer and could get almost anything they wanted. This was one of the most satisfactory findings of my visit.

*'Ambulances.* All wing medical officers were unanimous in condemning the Fordson ambulance. The reasons given were that it was under-powered and the slightest hill necessitated changing down. I was told that they were big, cumbersome and difficult to handle in the country lanes on the Continent. Even with unofficial changes to the engine (removal of the governor) the vehicle was hopelessly under-powered. In the opinion of many, the ambulance was almost the worst vehicle in which to take anyone on a rough road, and if possible patients were transported in jeeps. Medical officers envied the Army their Austin ambulance and they all thought that the American Chevrolet ambulance, with its soft springing, was by far the finest vehicle for Continental roads. These opinions have been confirmed wherever the question of ambulances has been discussed. I went into this matter carefully because in the Western Desert the Fordson was most highly praised.

*'Entertainment.* There was plenty of entertainment in the big cities, but units in the field were not so well looked after. *Pro formæ* were sent out by the E.N.S.A. authorities to nearly all units asking their size, where they were and how long since they had had any form of entertainment. This was duly completed, but it was quite common for a unit

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\* It was often forgotten by medical officers that their job was, in a sense, like that of an insurance company, and that if things had gone badly with our forces they might have been working to capacity. The small amount of work they had to do was thus, to some extent, an indication of our success in the field.

of, say, 150 men living under canvas, to receive notification that an entertainment troupe would arrive on such-and-such a date, and that a stage measuring so much by so much would be required, a piano and accommodation for the personnel in the troupe.\* It was impossible for such units to comply with these requests, and until they were more fortunately situated nearer to other units who had a garrison theatre or cinema, they were without organised entertainment.

*'Food.* I thought that the food was of a high standard everywhere and with one exception was better than I had expected. Field rations, 'compo' and normal rations were being issued depending upon the preference and the location of units.

*'During my visit I avoided eating salads and unwashed fruit, and although messes were never completely free from flies, I did not suffer from any of the intestinal upsets so common to visitors to the Continent. From the discussions I heard at Volkel before the wings moved in the flies were as thick as at any time during operations on the beachhead in Normandy. I think that it speaks highly for the sanitary medical supervision carried out that within one week flies were conspicuous by their absence.*

*'Captured German rations were used and some were very good indeed. The peas, carrots and tomatoes put up in refrigerated cardboard boxes tasted indistinguishable from the fresh product. How these cartons worked I did not find out. The Germans also had toast wrapped in cellophane; when the cellophane was removed and the toast heated, the resulting product was indistinguishable from fresh toast.'*

#### VENEREAL DISEASE

*Editorial Note.* The final report by this medical observer deals with Venereal Disease. It should be remembered that his visit took place just after the tour of inspection by the Senior Consultant in Venereology already alluded to in the section on Venereal Disease and the following remarks are therefore of particular interest.

*'During my stay in Ghent the following facts were obtained from the town medical authorities. Since 1932 there had been no controlled brothels in the town but at the present moment there were some 200 registered and 700 unregistered prostitutes. Nearly all the small cafés, of which there were approximately 148, were in fact brothels. During 1942-3 there had been 1,400 cases of gonorrhoea and 700 of syphilis. The recent returns showed an alarming rise in the incidence of primary syphilis, so much so that it was now higher than that of gonorrhoea. Statistics had not been fully kept since the Germans had left, but during their occupation they had instituted their own houses.*

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\* Troupes of entertainers were invariably of both sexes, which further complicated the question of accommodation.

'Cases occurring in Ghent were sent to No. 53 M.F.H. or the No. 8 R.A.F. General Hospital, Brussels. The E.T. rooms were very good indeed and there was an ample supply of sheaths.

'Entertainment facilities were still poor, but a large centre was being opened shortly. Alcohol was cheap. Beer was 2 francs a glass in messes and 10 francs in the cafés.

'*Brussels.* In endeavouring to ascertain the degree of prostitution in the city I was handicapped by not having a basis for comparison, being unaware of the position, for example, in London, so I can only state my impressions for what they are worth. When walking round the main streets after nightfall, it was impossible to go more than 10 to 20 yards without meeting a fresh street walker, who, nothing daunted by the fact that she had obviously seen the previous two dozen street walkers refused, made an effort to take one away for 100 francs plus 45 francs for the room. One brothel, some twenty yards off the main square in the centre of the town, had a good trade, though I had noticed that the Army had strung a cordon around the place and were stopping all Army personnel.

'The opening of the Malcolm Club was very much appreciated, particularly by the more junior officers, who seemed to have a stronger wish for the more normal methods of day-to-day entertainment and recreation than many of their older and senior colleagues.

'*Antwerp.* There were no brothels in Antwerp, prostitution being carried out in the many cafés throughout the town. Below are given two extracts from copies of reports which I managed to obtain of the general situation. Just before I left the Continent the system of official venereal disease police squads was being introduced:

*'EXTRACT 1—Explanation of System of Control of Prostitutes.  
Town of Antwerp*

Before 1940 and the entry of the Germans into Belgium, no Venereal Service existed and prostitution was not controlled. On demand of the German Authorities, the aforementioned Service was organised and prostitution was controlled.

Every prostitute had to be registered and such women working as barmaids, etc., were obliged to undergo medical examination every week. When a German soldier contracted V.D. a complaint was lodged detailing date and place of intercourse and name and address of the woman. The German Authorities ordered us to arrest these women and take them to St. Elizabeth's Hospital, where they were to remain for treatment until cured. The women were conveyed to hospital by car.

A brothel existed for the use of German soldiers only.

On the evacuation of the Germans from Antwerp, our Service ceased to function and 35 women suffering from V.D. were released from hospital and are out of control at this moment.

Before 1940, no communal regulation existed for the control of prostitution, although by Article 96 of our Communal Law, the Lord Mayor gave authority for the arrest of prostitutes. Attached is a list of statistics [see Extract 2] which show that V.D. has been on the increase since the year 1940. It is imperative that steps are taken at once again to control prostitution.

The Town administration can be requested to make a regulation to control prostitution and the houses where brothels may be instituted. If thought necessary by the military, these houses could be open to soldiers only.

The women who were released from hospital can, by order of the Allied Forces, be brought again to the hospital by us. The treatment in the hospital is as follows:

- (a) The rooms used by our Service are specially reserved for these women. No one may enter except our personnel.
- (b) The treatment is carried out by a specialist doctor, assisted by other doctors and nurses.
- (c) The women are kept in a specially locked room.

There are not any brothels in Antwerp, although nearly every public house where barmaids are employed can be looked upon as a clandestine prostitution house.

The Antwerp Venereal Service is headed by the Police Chief and 16 assistants (constables).

(Signed) Police Chief of the Venereal Service,  
Antwerp. 11th September, 1944.

*'EXTRACT 2—Medical Statistics—Venereal Disease*

No. — Wing,  
Royal Air Force,  
c/o B.L.A.

13th October, 1944.

Sir,

I have the honour to submit the following reports which deal with the prevalence of venereal disease in Antwerp. In collaboration with Lieutenant ———, who is in charge of investigation on behalf of the Army, certain data are now available and the various reports are attached.

I have contacted Headquarters, Antwerp Police and have reviewed the excellent card index system that the Germans created following their occupation of Antwerp, and, according to the Police Reports, the system worked excellently.

Further, with police direction, I have visited certain areas in the town, including the dock area, and the prevalence of prostitution is very apparent. As was clearly evident from this visit the cafés and bars, of which there are literally thousands, were by far the greatest menace in the spread of infection and the control of these houses immediately forms a very great problem.

The following statistics obtained from German figures are quoted for information. The cases referred to are those which were actually under treatment at one time or another in the St. Elizabeth Hospital, Antwerp.

	Prostitutes	Barmaids	Women arrested by the Prostitute Squad, having infected soldiers
1940	62	362	158
1941	119	651	320
1942	139	1,057	436
1943	179	678	520
1944	125	301	336
<b>Total</b>	<b>624</b>	<b>3,049</b>	<b>1,770</b>

The Army authorities at present in Antwerp are pressing the Burgomaster for permission to re-introduce the system of Venereal Disease Control, but so far their requests have not met with official approval. It is imperative that some form of control is instituted without delay.

I have the honour to be, etc.:

(signed) Senior Medical Officer.

The Senior Medical Officer,  
No. 84 Group, Royal Air Force.

'*Eindhoven. No. 52 M.F.H.* I looked at the admission book of No. 52 M.F.H. and since their setting up at St. Joseph's Hospital there were on an average between 5 and 6 admissions of V.D. per page of the book.

'*No. 83 Group.* The incidence of V.D. in No. 83 Group among the Canadian personnel was extremely high. In contrast the R.A.F. Wings in the Group had comparatively low incidences. In going round the wing sick quarters at Volkel airfield I found next to no V.D. on record in the R.A.F. Wing sick books, but when I reached No. 126 (Canadian) Wing I was informed that there had been 6 cases that morning at sick parade.

'*Civilian Medical Stores.* Medical stores for civilian purposes were, during the Occupation, demanded from the German Army, demands being sent to Rotterdam or Amsterdam. Anything up to a year might elapse before the drugs were received, and even then the full quantities ordered might not be supplied.

'Arsenicals were in very short supply and conferences were in progress at the time of my visit to obtain adequate drugs to treat the increasing number of civilian V.D. cases.

'It might be of interest to add that the general practitioners of Eindhoven had not heard of penicillin and requested a senior R.A.F. medical officer to tell them something of the drug. This officer had the



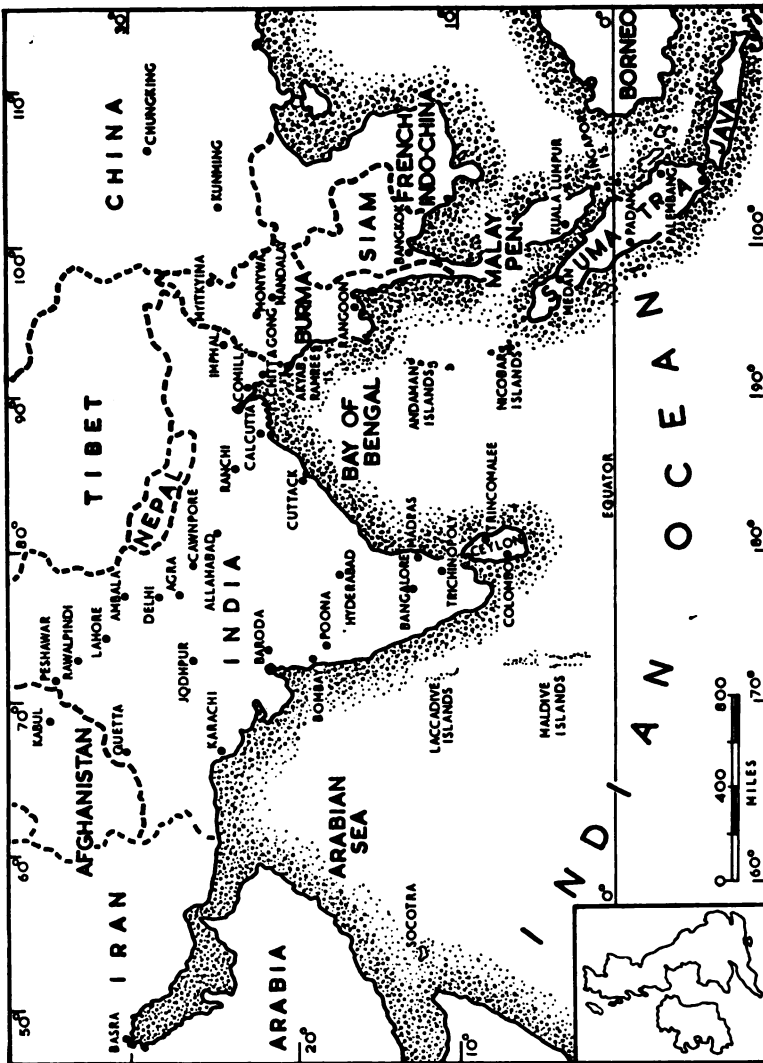
synopsis of the use and action of penicillin, published in the *British Medical Journal*, extracted and translated into French and he delivered this extract in the form of a lecture at a meeting of the general practitioners. The impact of the discovery and scientific use of penicillin was profound and innumerable questions were asked. When the senior medical officer did not know the answers his French "broke down" and he thereby saved face!

# CHAPTER 11

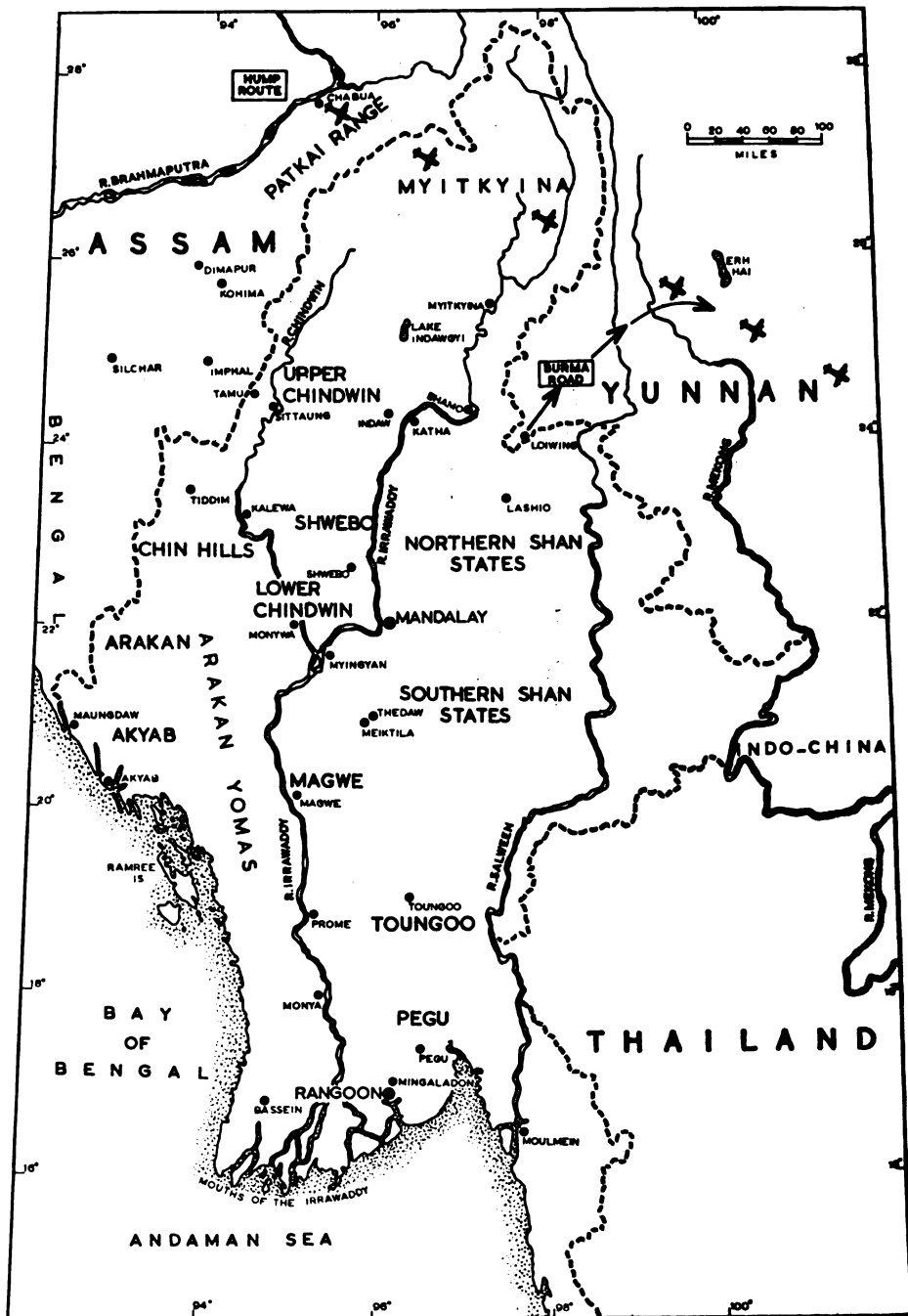
## INDIA AND FAR EAST

### INTRODUCTION

**T**HE AREA covered by the Royal Air Force in the Far East during the Second World War stretched from 60° East at the borders of India to 114° East at Hong Kong and from approximately 35° North in the frontier area of India to 10° South at Java. (See Map 1 (a).)



MAP 1 (a). Area of operations of India and Far East Command.



MAP 1 (b). Burma.

Small numbers of R.A.F. personnel, many of whom had been on garrison duty in the area before the war, gallantly fought in obsolete aircraft in a vain attempt to defend the eastern outposts of the area against the advancing Japanese in 1941 and early 1942. By the spring of that year Hong Kong, Malaya, the Netherlands East Indies and Burma had been lost after small, valiant, but hopeless campaigns and the remnant of the Far East Air Force had withdrawn to Australia or India. With the Japanese in control of the Bay of Bengal and massed on the undefended North East border of India a small force of less than 3,000 R.A.F. personnel controlled by the Government of India and organised for garrison duties on the North West frontier was all that remained to provide air defence for the vast sub-continent. During 1942 this force was rapidly reinforced and reorganised for defensive and later offensive operations on the Assam-Bengal border. By the end of the war Burma had been recaptured, a seaborne force ('Zipper') was preparing to invade Malaya and the R.A.F. strength had risen to 136,000.

The full story of the part played by the Royal Air Force in this rapid retreat, long containment and final advance would fill several volumes and for that reason the reader is advised to consult one of the standard histories of the campaigns\* for the non-medical details regarding operations.

In order that this chapter may be kept within reasonable limits, the short campaigns in 1941 and 1942, which resulted in the loss of Hong Kong, Malaya and the Netherlands East Indies have been ignored, as the Medical Branch of the R.A.F. played little or no part in them.

Only a short summary of the small part played by the R.A.F. in the retreat from, and the subsequent advance and recovery of, Burma has been given, as little of value from the point of view of the Medical Branch was learned from these campaigns owing to the paucity of available material. This, however, does not mean that the Medical Branch was wholly inactive in these campaigns.

During the retreat from Burma in 1942, a small trickle of wounded personnel, civilian and Service, were flown out to India by the impromptu use of transport aircraft; the relatively insignificant number is not surprising when it is recalled that the Japanese had overwhelming air superiority. After the Allied Forces had regrouped in the autumn of 1942 for the strategic defence of India—a force composed of elements which had retreated through Burma and the Eastern Indian Army—a very high sickness rate was recorded, necessitating the evacuation of over 35,000 men back to India. Unfortunately it was impossible to use air evacuation as neither were the aircraft available nor could the necessary air superiority be guaranteed.

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\* *Royal Air Force 1939-45.* (H.M.S.O.) Volumes II and III.

In 1943, it was possible to evacuate casualties by air during the First Arakan campaign though the numbers were still very small owing to the paucity of transport aircraft. The First Chindit Expedition in 1943 marked a definite improvement in the situation when 17 men were flown out from hastily built jungle air strips; this again was only a very small percentage of the casualties incurred by the force, but such an achievement underlined the importance of air evacuation in a jungle terrain. However, from this date onwards the numbers of sick and wounded evacuated by air began to grow until it became a major operational factor and one on which commanders in the field put very considerable reliance; for example, in the Second Arakan campaign in early 1943, over 300 casualties a week were flown out of the celebrated 'Admin Box', mainly by Auster aircraft piloted by members of the U.S.A.A.F. During the Second Chindit Expedition in 1944, air evacuation had become so common that the well-known light aircraft used for the purpose had earned the affectionate appellation of 'Blood Chariots', and flying boats had been pressed into service using Lake Indawgyi from which 537 casualties were flown out. Nevertheless, throughout the whole campaign, apart from the Chindit Expeditions, aircraft were rarely earmarked for casualty work alone, the wounded and sick always being considered as freight, albeit priority freight, which the transport aircraft took on after discharging their cargo of vital supplies, a principle of the utmost importance in a campaign where all supplies were flown in and every pound of weight was of the greatest importance.

The rapid increase in strength of the R.A.F. in India from an average of 2,881 in 1941 to 67,718 in 1943 presented many problems in planning and constructing new stations and camps throughout the sub-continent, and it is at this point that this medical history of the R.A.F. in the Far East begins.

The narrative comprises three main sections: the first deals with the problems of preventive medicine in the field of accommodation and domestic services, the second is concerned with some of the health problems encountered and the third describes the build up of a R.A.F. hospital service in the Command.

The Medical Branch was faced with a tremendous problem in this theatre where large numbers of unseasoned airmen had to serve and operate in a country in which the variations in climate are extreme, where numerous serious diseases were endemic and where civilian standards of hygiene and sanitation were sometimes exceedingly primitive. Two circumstances which will be referred to again in the narrative made the task of the P.M.O. and his staff very difficult. Firstly, the position of the R.A.F. in India differed from that of other R.A.F. formations overseas in that it was controlled and financially maintained by the Government of India. Air Ministry was responsible only for

the supply of trained personnel to fill the establishments laid down by that Government, and all accommodation and supplies were provided by the Indian Military Directorate; the Army Commander-in-Chief decided on the overall nature of air operations. Secondly, and partly as a result of the foregoing, there was little co-operation between the P.M.O. and other senior R.A.F. staff officers, while the general knowledge of and interest taken in preventive medicine by the executive was minimal in an area where it should have been maximal. For reasons of economy enforced by the Indian Government, in spite of protests from Air Ministry, in 1931 the P.M.O. and his department were separated from Air Headquarters and stationed at Lahore, four hundred miles away from the headquarters he was there to advise and inform on medical matters. Not until 1942 did the P.M.O. reunite with A.H.Q. and it is therefore not surprising that in the interval a generation of staff officers had grown up to whom the P.M.O. was a shadowy figure in the background, too far away for easy consultation and not sufficiently important to be sought out for advice. The difficulties of the R.A.F. as a whole thus fell particularly heavily on the medical branch, who were rarely consulted in war planning and who were completely out of touch with the executive and administrative staffs they were supposed to advise.

## Hygiene and Preventive Medicine

### WORKS SERVICES

#### NEW WORKS

The expansion of the Air Forces in India and Ceylon from just under 3,000 in 1941 to over 100,000 in 1945 necessitated the construction of a very large number of airfields and stations. The ten airfields in India and two in Ceylon in 1941 had grown by the end of the war to many hundreds of airfields, landing strips and stations spread over the whole sub-continent.

In Ceylon, the Air Ministry Works Directorate (A.M.W.D.) had their usual responsibility for the construction of new stations and the maintenance of those in existence. In India and Burma the organisation was vastly different. The Government of India, as already mentioned, was entirely responsible for all administration, including administrative planning and building for the Air Force in India. No separate Air Force organisation equivalent to A.M.W.D. existed or was permitted.

Planning of new stations was carried out by the Organisation Staff at Air Headquarters in conjunction with the War Department Engineers. Financial approval had to be obtained from the Finance Department.

The work was supervised by the Public Works Department (P.W.D.) or the Military Engineers Service (M.E.S.), depending on the area and the type of construction required. Both P.W.D. and M.E.S. were organised on an area basis and were responsible for all construction within their area. Thus from the beginning, Air Force works had to fight for priority of construction and supervision with Army and Civil expansion plans.

Little R.A.F. building had been carried out for many years and what had been done was mainly of a minor nature, such as expansion and maintenance of the existing airfields. No separate Air Force building plans existed.

1942

In 1942 both P.W.D. and M.E.S. had to expand rapidly and sufficient skilled civil engineers were not available. As a result much of the supervision of contractors had to be left to inexperienced and frequently incompetent officers. The vast distances involved made this lack of supervision a problem which was aggravated by the fact that many of the new airfields were being constructed in areas where no Air Force had previously existed and where local contractors had little idea of what was required. The existing labour force of skilled tradesmen was inadequate and had to be shared with the construction required by an expanding Army. Essential building materials were also in short supply.

The divorce of the P.M.O. from A.H.Q. in 1931, and the subsequent failure of other departments at A.H.Q. to consider medical advice in planning, applied particularly to this construction work. In 1942 stations were sited, planned and constructed without medical advice, while standard P.W.D. and M.E.S. plans, where they existed, had not been seen or approved by medical staff officers of the P.M.O's. branch.

As a result the works expansion of the Air Force had a bad start from which it never fully recovered. Domestic accommodation was often sited in most unsuitable places for health control when healthier sites were available; priorities in construction were ignored and much of the construction was so bad that it could not be used.

The rapid expansion in 1942, when the R.A.F. strength rose from under 3,000 to over 24,000, mainly in the second half of the year, caused many stations to be occupied before construction was complete. The task of a medical officer, new to the East, arriving at such a station with no satisfactory water supply, primitive conservancy, no adequate cooking arrangements, and with all ranks living in tents in monsoon weather, was often made well nigh impossible by the lack of knowledge or co-operation of his executive officers. It is little wonder that the total sickness rate in India rose from 826 per 1,000 in 1941 to

1,588 per 1,000 in 1942 or that the dysentery rate per 1,000 was 64 in 1942 compared with 32 in 1941.

During the build up in 1942 a major feature in the planning of new stations was dispersal. Accommodation was spread over a wide area and many small sites were formed to simulate native villages from the air. Apart from the administrative and sanitary problems resulting, aircrew reported that in most cases domestic accommodation looked exactly like that of a native village.

### 1943

During 1943 the position gradually improved and while the shortage of material, dilatoriness and incompetence of contractors and difficulties in supervision remained, more medical officers were arriving in the Command and the Organisation staff, under pressure of rising sick rates, were asking for and accepting medical advice. With the formation of Bengal Command in October 1942, covering the area of major expansion, the new P.M.O. arranged for a medical officer to inspect all sites for proposed new stations and to advise on their construction. Particular attention was paid to the proximity of native villages and the siting of the S.S.Q. Wherever the construction was not too advanced alterations were made in existing plans but many had to be resited or rebuilt wholly or in part. For example, No. 509 A.M.E.S. in East Bengal controlled 25 radar stations; 23 of these had to be resited or reconstructed. Many stations, such as Baigachi 20 miles north of Calcutta, though condemned, were occupied until a new station was sited and constructed; this work frequently took over a year to complete. On other stations water supplies were improved and conservancy arrangements altered to suit local conditions.

On stations with a keen and experienced medical officer much was done by local arrangement with P.W.D. At Worli in Bombay, which became the main reception camp for all personnel entering or leaving the Command, the S.M.O. Bombay, a squadron leader, on reviewing the original plans found them unsatisfactory in many ways. The cookhouses had already been constructed and were a source of trouble to the station for a long period thereafter; but the plans for barrack rooms, latrines, and washhouses were reviewed and altered after consultation between the S.M.O. and the Engineers. These plans will be considered later.

In 1943, Bengal Command agreed to their P.M.O's. standards for accommodation on advanced landing grounds as follows:

1. A medical officer was always to be consulted by the representative of the Airfield Siting Board and the Army Resident Engineer when deciding the site.
2. The site to be as far as possible from native villages.



3. Where a village was to be taken over it was preferable to take over one or two small villages rather than partially encroach on a large village. All poorer houses to be demolished.
4. Domestic accommodation to be demarcated by bamboo rails.
5. Satisfactory water supply, drainage, and conservancy systems to be constructed before occupation.

In the base areas of India, which were commonly at great distances from the control of the responsible authority and where officials and contractors often had fixed Victorian standards, the improvement was in many cases not so great unless an efficient medical officer was on the spot. Plans were often old fashioned, involving unsatisfactory ventilation and drainage.

Errors occurred even at the largest headquarters. In New Delhi, for example, provision had to be made for a very great increase in strength and during 1943, a large camp was constructed to house nearly 1,000 airmen in Factory Road. Water carriage sanitation was installed, but the main sewer ran under the airmen's mess with its principal inspection chamber opening into the food preparation room!

#### 1944-5

Although siting improved and the Engineers obtained standard R.A.F. plans the Indian contractor remained a problem until the end of the war. Even with constant supervision (which was not always available) the majority of contractors produced work of a lamentably poor quality. Buildings sometimes collapsed within a short period of completion, doors did not fit, concrete cracked and crumbled, drains ran uphill, or ended within a few yards behind some convenient bush. In June 1944 when a short, sharp storm struck New Delhi, the Factory Road Camp (*see* preceding paragraph) completed at the end of 1943, disintegrated, killing two airmen, seriously injuring another and causing numerous minor casualties. The majority of roofs with their supporting beams were ripped off. An inspection of these supporting members revealed that in no instance were they secured by more than two 6-in. nails, one at each end. Many beams showed no evidence of having been nailed at all and frequently the nails had not been driven true and therefore did not penetrate the second board; when they had penetrated they did not project more than 2 in. into this beam. Another example occurred at Mauripur near Karachi where 'feet' in the plans were mistaken for 'yards' and buildings were very widely dispersed in consequence.

By 1944 new siting and construction were usually satisfactory but the area of the sub-continent was so great that mistakes still occurred, particularly in distant base areas. In the early months of 1944, a radar station was built in a densely populated part of Orissa where there was a

spleen rate of 90 per cent. and where the route to the nearest hospital was over 200 miles of dirt road. After medical inspection this site was condemned and was never occupied.

In the latter years the main difficulty experienced was a legacy of the 1942 lack of medical planning. Several of these badly sited stations for operational reasons required to be expanded, with results which can be demonstrated by the example of Sambre, a large base signals unit in the south of Bombay Presidency. Here the original site was so close to a large native village that early in 1944, the S.M.O. No. 225 Group was compelled to place part of the technical accommodation out of bounds because of an outbreak of cholera in the village. In May the D.P.M.O.(H.) paid a special visit to the station and found the cookhouse, which was swarming with flies, located half way between two native villages. Resiting or evacuation of the villages was strongly recommended. In June the Organisation Branch proposed to expand the domestic accommodation in the area (hardly more than a few hundred yards across) between these two villages. Despite three months of protests by the P.M.O.'s. department, an administrative decision was made in September that building was to continue at the site in question and that evacuation was impossible owing to the high cost. The P.M.O. recorded that he had 'no alternative but to stress again in the strongest possible fashion that the situation brought about is highly unsatisfactory from a medical standpoint.' In March 1945 this station lost 2,576 man-hours through sickness due to fly-borne infection.

In very large headquarters, when rapid changes of plans were necessary for operational reasons, it was an obvious risk that one branch might have no knowledge of another's decisions which altered the general programme. For instance, in 1943 a flying boat base was built near Bombay for a strength of 35 personnel. After a few months Air Staff increased the commitment of the base and the Personnel Branch raised the establishment to over 200 and posted personnel to the vacancies, but the Organisation Branch, who had not been informed, took no action to increase accommodation or to arrange an additional supply of water.

#### WORKS MAINTENANCE

The lack of A.M.W.D. and the failure of the executive to appreciate the importance of hygiene was felt in the maintenance of stations to an even greater extent than in their construction. The absence of a Clerk of Works or a Station Engineer with specific responsibility for the station was a continual drawback. A medical officer troubled by rising sick rates and the fear of an epidemic had difficulty in convincing the executive that labour and time spent on works maintenance was not wasted effort. Statements such as 'Why all the fuss about water supplies? Production

must not suffer,' or 'We cannot take men off work for maintenance, the sanitation coolies must do it', were all too common. This problem was more often met in base areas. When the executive took, or were made to take, maintenance seriously the next question was to make a very elusive P.W.D., Army Resident Engineer or contractor carry out any of the work required in a satisfactory manner. Constant complaint and constant supervision were the only answer. An example, late in the war, but demonstrating the action necessary, occurred when No. 298 Squadron arrived at Raipur, in the Central Provinces, from the United Kingdom in early 1945. A huge amount of works maintenance was found to be necessary and a list of defects was given to the local P.W.D. for action, but without result. After a fortnight, when an outbreak of gastro-enteritis had started, the station commander initiated a weekly conference attended by the local Army Field Engineer, the P.W.D. contractor, the medical officer, the catering officer and the station warrant officer regarding works services. The results were immediate.

In the forward areas, east of the Brahmaputra, the problem was of a different kind. Here the executive rapidly came to appreciate the importance of correct maintenance, particularly of cookhouses, latrines and water supplies. But few civilian tradesmen were available, and the Area Army Engineer with his large military commitments and his base miles away, was often unable to help; operational units had therefore to carry out the necessary work with their own limited labour. The following is one typical example of this kind of difficulty:

In May 1943 an operational squadron moved to Khumbirgram, a new station in the Surma valley, for operations on the central part of the front. On arrival airmen were housed in tents, there were a few full deep trench latrines heavily fly infested, the cookhouse was not fly-proofed, and there were no drains or grease traps. There was no incinerator and no ablution facilities. The responsible Army Engineer was based at Silchar, 25 miles away, across two ferries, and was busy with construction supervision over a wide area for both Army and Air Force. As a result this squadron, engaged on intensive operations, had to divert considerable man-power to the construction of latrines and drains and to the temporary fly-proofing of the kitchen with old mosquito nets.

#### MOBILE HYGIENE UNITS

This problem was appreciated by the P.M.O. Third Tactical Air Force who suggested, late in 1944, the formation of mobile field hygiene sections whose function would be the maintenance, speedy repair and construction (in emergency only) of field sanitation when such work was impracticable for the engineers because of the time or distance involved. It was argued that the function of these units was

already covered by the engineers' maintenance personnel, but experience had shown, as recorded above, that emergency R.A.F. assistance was often necessary owing to the shortage of personnel and the highly mobile disposition of Nos. 221 and 224 Group units. After considerable obstruction from the Finance Department, four of these units were approved in January 1945 with the following establishment:

<i>British</i>	<i>Indian</i>	<i>Transport</i>
One Corporal	12 Enrolled	One
4 A.C.H./G.D.	Followers	3 ton lorry

One A.C.H./G.D. to be annotated for driver training. Each section to have a complete set of tools (A.P.830 Vol. III, 1941 Edn. Part E). Essential material to be supplied by the C.R.E.

Formation of the sections was delayed owing to the shortage of suitable airmen and the necessity for all those selected to attend a course at No. 3 R.A.F. School of Hygiene at Ranchi. The first unit did not start work until May when it immediately proved its worth.

Reports from S.M.Os. in the forward areas on the success of these units were so glowing that in June the P.M.O. sought Air Ministry approval for the formation of a further 14 mobile hygiene units, two for use in the base areas and the remainder for the forward areas and as a reserve for future operations such as 'Zipper' (the Malayan Invasion) which were being planned. Air Ministry approval was obtained to form an additional 12 in August, but the end of the war removed the requirement and no further units were formed.

#### ACCOMMODATION

Barrack blocks on the permanent stations in India and Ceylon in 1941 were solidly built structures with high ceilings, good ventilation, and adequate ablution and latrine facilities attached. The very rapid expansion in 1942, often in areas where it seemed there would be no need for stations after the war, made necessary some less permanent and less costly type of building which could be constructed rapidly. A few solidly built stations were constructed, either where a permanent commitment in peace-time could be foreseen or as at Jodhpur, where local stone was the material most readily available, but the majority of the new stations were only planned on temporary or semi-permanent sites and were built, often with local material, on very flimsy lines. The main types of building used are described below:

#### SEMI-PERMANENT BUILDINGS

In the base areas billets were built with brick half-walls three to four and a half feet high on a raised concrete or brick foundation. The roof of tiles and thatch was supported by brick columns at the corners

and down each side, and between these pillars the upper walls were composed of bamboo matting. The building was so constructed that at least one side had a wide shaded verandah. The size of these barrack blocks varied from place to place but they were usually constructed to accommodate about 20 airmen. At Worli, the transit billets were each  $200 \times 40$  feet and contained four rows of 25 beds giving each junior officer and airman 80 sq. ft. of floor space. In 1944 when incoming and outgoing convoys met at Bombay these billets on occasion held up to 200 men each without gross overcrowding. One difficulty which was found in the original plans was that the M.E.S. standard size of window for such buildings,  $3 \times 4$  ft., was insufficient for adequate ventilation during the hot weather. These windows were later increased to  $4 \times 4\frac{1}{2}$  ft., which was still barely adequate.

In many areas where bricks were scarce, other materials were used; for example, a new material was made by forcing wood shavings and concrete into moulds to form sheets about two inches thick. These sheets of 'Indianite' were then placed between brick or cement pillars and covered on each side by a thin layer of cement. The many air cells present in these sheets, apart from giving added lightness and elasticity, also made the material an efficient insulator against heat.

Certain other camps were constructed of 'Ferracrete' which consisted of pillars of jungle wood between which were stretched sheets of 'gunny' sacking, the whole being covered with layers of cement. This formed a durable and cheap type of structure almost as satisfactory as 'Indianite'.

Nissen huts were used in small numbers in 1942 and were found to be satisfactory when modified by adding extra ventilators at either end, widening the doors and covering with a thatch roof supported on bamboo or wood supports; occasionally the outside was painted white. By 1944 these modified Nissens were being used in increasing numbers.

#### REQUISITIONED BUILDINGS

In the cities buildings of solid construction were requisitioned but these gave rise to difficulties in anti-mosquito and anti-fly control and the overloading of water carriage systems. Occasionally, especially in the tea area of Assam, it was possible to take over bungalows as billets but these were unsatisfactory for the same reasons. In the Imphal Valley and during the advance into Burma entire native villages were taken over, the poorer huts being demolished and the remainder used as billets, dining halls and canteens. These buildings were solidly constructed, cool and weatherproof but with mud floors and walls and thatched roofs which attracted insects and were impossible to keep clean. Certain more unusual requisitioned billets were house-boats taken over by No. 180 Signals Wing for small radio units in the

Sundarbans in 1943 and stables in New Delhi used by airmen during the hot weather of the same year, while the Factory Road camp was being constructed.

#### BAMBOO HUTS

In the more outlying regions, particularly in the forward areas of East India, a more primitive type of construction was made using bamboo. In one type, bamboo was split into strips which were woven together in a loose manner round a bamboo scaffolding. Mud was then plastered on each side of this framework and allowed to dry. These *mutti* huts had a concrete or brick floor and the inside walls were usually coated with a cover of whitewash; window openings had bamboo shutters. This form of construction was inevitably subject to disadvantages not found in more solid structures. The mud covering required constant repair as it crumbled in dry weather and fell away during the monsoons; the walls and roofs harboured insects and sometimes snakes; efficient fly and mosquito proofing was difficult. Thatch or thatch and tile were used as roofing; tiles alone were found unsatisfactory because they were not efficient insulators in the hot weather, and also because the bamboo warped when weathering and moved the tiles, causing the hut to leak like a sieve. (See Plate LVII.) Nevertheless, well constructed billets of this type were surprisingly popular as they had the merit of being cool. The lizards attracted to the walls and thatch by the surfeit of insects were a constant source of interest and relieved boredom. Where abundant cement was available, as at Khargpur, a thin cement plaster finish to these walls improved the life, appearance and comfort of the huts.

Another type of hut used was similar to the above, the only difference being that the walls were made of closer woven bamboo matting with no mud covering. These *busti* huts could be more rapidly constructed but were not so successful as they had all the disadvantages of *mutti* buildings with the addition that they were anything but waterproof during the monsoons unless very carefully constructed.

The term *basha* applied correctly to the *busti* hut but was used generally to indicate any building of bamboo construction. (See R.A.F. Volume I, Plate XXXV.)

#### MOSQUITO PROOFING

Proofing of buildings was not generally possible in 1942 owing to shortage of wire net and the impossibility of satisfactorily proofing *busti* and *mutti* huts. Some brick or concrete camps were adequately proofed but only on camps in highly malarious areas was proofing attempted east of the Brahmaputra where bamboo buildings were the rule. At Khumbirgram and Mauripur Road a trial was made with such

huts, but experience showed that unless the huts were of very solid construction it was a waste of time and material. More wire net became available in subsequent years but it was always in short supply and the standard of mosquito-proofing inadequate.

Early in 1943 the Army proposed to construct 'Lloyd' huts in the forward areas but these were rejected and condemned by the R.A.F. Built of bamboo with very low thatched roofs these huts were inadequately ventilated and there was a lack of air space to floor area. Bamboo bunks were built in close to the thatch and were therefore very liable to insect infestation.

#### NORTH WEST FRONTIER

In this area accommodation was either of brick or stone to the 'Frontier Hutted Scale' which was satisfactory on paper but not always so in practice, as each contractor interpreted the scale according to his own ideas. By the end of 1943, however, a standard had been fixed which gave satisfactory results.

#### USE OF TENTS

During 1942 throughout the Command and in the forward areas during the whole campaign tents\* had to be used. These were very satisfactory in the cool weather but created insoluble problems during the hot season and the monsoon. A light thatch over-roof made them just habitable where the maximum temperature was not too high. A concrete, brick or wooden base was an essential which too often was not available. In the Karachi area until late in 1943 the numbers of personnel greatly exceeded the available accommodation with the result that large tented camps had to be used.

#### FORWARD AREAS

During active operations accommodation in the forward areas had to be bamboo *basha* huts or tents, but in the base areas considerable research was undertaken by the engineers to evolve some prefabricated building which would facilitate rapid construction. One such type, the 'Lahore' shed, was tried in 1944 but tests proved that the temperature in them at 11 a.m. was 10° higher than in adjacent standard accommodation. The general principle employed was a semi-circular iron outer shell rather like a large Nissen hut but provided with an additional inner shell. The distance between the two shells was about a foot and when modifications were introduced which provided adequate ventilation of this space they were passed for use by the R.A.F. These improvements, however, made the shed of such elaborate construction that rapid general introduction was impossible.

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\* In the repeated moves which were necessary, many of the tents were reduced to tatters, but the general shortage of tentage often made replacement, especially in forward areas, an impossibility.

## 1944 ONWARDS

The acceleration in *tempo* in the theatre in 1944 due to the favourable turn of events in Europe resulted in a great increase in the strength of the Command; so much so, in fact, that the standards of accommodation for the R.A.F. in base areas which had been built up from the black days of 1942 began to undergo a gradual but progressive deterioration. From a more or less semi-permanent type of building constructed to the 'cheapest possible specification' billets deteriorated to 'Lahore' sheds in selected areas, then to 'Lahore' sheds in all areas with Nissen huts in selected areas, and finally Nissen huts, often without modification, in all areas. By October 1944, the P.M.O. had to intervene and after consultation with the Army Engineer-in-Chief it was agreed that 'the accommodation to be provided for domestic purposes at all Royal Air Force camps must comply with approved scales and must give a standard of protection from weather, heat or cold, equal to that of normal hutted construction in the area concerned'. Instructions were issued accordingly to the Chief Engineers and Directors of Works, Commands/Armies, and it was further stated that 'the Senior Medical Officer of the R.A.F. units concerned would be consulted'. The directive to Commands/Armies indicated ways and means by which such standards could be attained; these embodied postulates of the P.M.O. Where a difference of opinion arose between the Commands/Armies engineer services and the Group S.M.O. reference was made to the Air representative of the Engineer-in-Chief and the P.M.O. for a decision.

## LIGHTING AND VENTILATION

Except on units such as Signals Wings and stations with several electrical generators, electric light was rare in the forward areas during the whole campaign, but by late 1943-4, as electric wiring became available, most base stations were supplied. Electric fans were always in short supply and not until the 1944 hot season were they at all common even in base areas. On several semi-permanent stations old style native-operated *punkahs* were fitted but quite apart from the increased malaria risk involved, the coolie force required was usually not available; for example, one Maintenance Unit at Lahore where such *punkahs* were fitted required a labour force of between 300 and 400 coolies for this purpose alone!

## BEDSTEADS

A proportion of iron bedsteads were available on the old peace-time stations but in the great majority of camps Indian pattern beds of the *charpoy* type were used. The most satisfactory consisted of a wooden frame across which was stretched a double layer of rope; bamboo was used on occasion, particularly in the early days, but its use was



condemned because of the large numbers of insects it attracted; bamboo was also very uncomfortable and was therefore not popular. Officers all had the standard camp kit and east of the Brahmaputra usually used the camp bed supplied with it. The major drawback of this camp kit was its bulk, for it made up about 80 per cent. of the 66 lb. which was the total allowed, when travelling by air, for all kit and personal possessions.

A diagram taken from Air Ministry Pamphlet 160—'Health Hints for Warm Climates' issued by D.G.M.S. September 1943 is reproduced in Fig. 1 below. It was found, however, that these beds, designed on

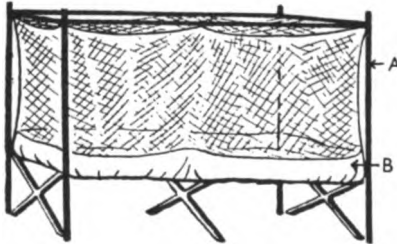


FIG. 1. Mosquito net erected on camp bed.  
A. Pole of mosquito-net frame.  
B. Calico hem.

the lattice principle, broke easily if they were not placed on a level and firm surface; in forward areas particularly this was impossible to achieve and the beds therefore soon resembled 'cats' cradles' and were worse than useless.

A standard floor area of 45 sq. ft. was laid down for each airman as a minimum but except during the build-ups in 1942 and 1945 when there was much overcrowding the normal average was 70-80 sq. ft.

## CONSERVANCY

### LATRINES

India and Ceylon were countries with very primitive ideas regarding sewage disposal; only in the larger cities and towns was there organised sewerage on any scale. Certain of the pre-war stations had water-carriage systems draining into septic tanks, rivers or, rarely, sewage works, but many old-established cantonments still used bucket latrines cleared by contractors. No standard plans were possible because of the varying climatic conditions and physical features and there was, therefore, no ready system of sewage disposal which could be used on the many new stations erected during the expansion, when rapid construction was necessary and materials very limited. The different methods employed over the sub-continent during the war are described below with some notes on their suitability in the varying conditions.

*Water-Carriage Clearance.* Owing to the need for economy, lack of skilled labour, and shortage of suitable material, very few water-carriage systems were installed, but where this method was used careful supervision of plans and construction was essential. Mention has already been made of the Factory Road site at Air Headquarters in New Delhi, where the main sewer ran under the cookhouse and had its inspection chamber in the food preparation room. Another example was at Bairagarh where a complete system of fittings and drains leading to septic tanks was installed before it was discovered that there was insufficient water available for satisfactory working. Many of the requisitioned buildings taken over in the large cities had water-carriage fittings but experience soon showed that they could not be used with safety owing to overloading and alternative arrangements had to be made. A septic tank large enough for a normal family rapidly overflowed when used by a number of airmen. Another difficulty was that in some cities the water supply was shut off for considerable periods during the day with the result that lavatories could not be flushed, drains were blocked, and flies had access for long periods to potentially infected faeces.

Two simplified forms of water-carriage clearance were adapted with some success, for use on base stations. For many years the Army at Poona had used ablution water for flushing latrines and after trials and modifications at Worli this system was introduced at several stations—notably Worli, Secunderabad, Andheri and Raipur. Latrines were built in blocks of six near to the ablutions; the base of each block consisted of a channel made of 9-in., half-rounded stone-ware pipe sunk in a solid concrete foundation. This pipe was laid level from end to end and connected with a 6-in. sewer leading to a septic tank or a river. Where the channel entered the sewer there was a 2-in. high concrete weir which left 2 in. of water in the channel yet did not interfere with flushing. Waste water from the ablutions was piped to a 2-ft. cube tank, the bottom of which was raised about 2 ft. above the level of the channel; this tank was fitted with a simple syphon valve which emptied when the tank became full, the waste water being led by a 4-in. pipe to the start of the latrine channel. A concrete trough urinal was often fitted into such a system. The sides and end walls of these latrines were of concrete on which were positioned tightly fitting wooden seats. Metal hinges were not used as they were found to break easily, a strong wooden hinge socket and rod being fitted instead. Wooden blocks were firmly fixed on the back of the wall to prevent the seat being left open. This type of latrine gave very satisfactory service, was easily kept fly-proof, and required few coolies for maintenance. Where there was an abundant water supply the tank could be connected separate from the ablution waste pipes.

The other system of water-carriage clearance which was developed

in Ceylon was of simpler construction and was first used in Asiatic type latrines, being modified later for use with a seat (see Figs. 2 and 3). No drains were required, the faeces being flushed into a deep trench latrine. The principle was to construct a simple water seal which was

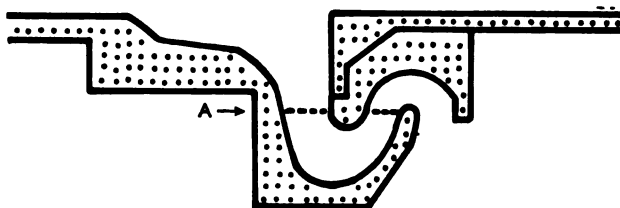


FIG. 2. Asiatic type water-flush latrine.  
A. Water seal level.

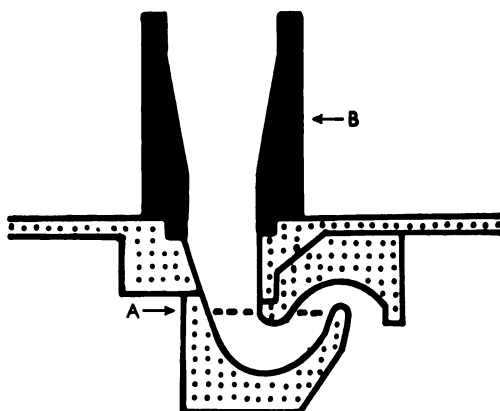


FIG. 3. European type water-flush latrine.  
A. Water seal level.  
B. Concrete supports.

capable of being flushed with about half a gallon of water. The necessary parts were prefabricated in concrete from moulds as shown in the diagrams and the latrines worked well as long as there was a fair seepage. The 'S' pipes were 3 in. in diameter. The great advantage of this modification was that the complete deep trench could be covered with concrete and as long as the water seals survived the latrine was fly-proof. Failure to flush the pan certainly left faeces exposed between visits of the latrine cleaner, but this was not so serious as the exposure of the whole trench to flies, which was what usually happened with deep trench latrines. The latter were used in a great variety of forms both in the forward areas and the base establishments. The trench itself was usually 8-10 ft. deep and varied in width from 2-5 ft., depending on the type of superstructure. Where concrete was available the trench was usually made wide and the whole pit covered by a thick layer of concrete

**PLATE LVII:**  
Cholavarum. Typical  
sleeping accommoda-  
tion. Basha hut  
reconditioned 14 days  
before photograph was  
taken



**PLATE LVIII:**  
Cholavarum. A typical  
native village within  
R.A.F. station  
perimeter. Square  
building in background  
is the airmen's mess,  
No. 27 Squadron. No  
permanent sanitation  
existed in village



**PLATE LIX:** Kolar  
1944. Ten yards  
separating native latrine  
and cookhouse. When  
latrine condemned  
natives advised to use  
nullah on extreme right





PLATE LX: Water supply at Phaphamau. (1) *Dhobi ghat*



PLATE LXI: (2) Coolie emptying goatskin container



PLATE LXII: (3) Open storage tank

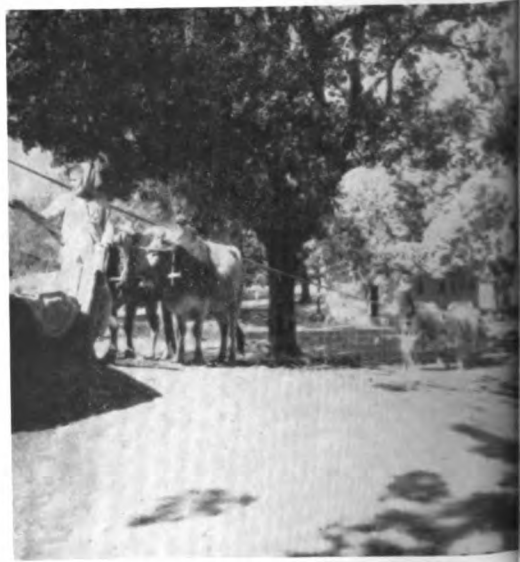


PLATE LXIII: (4) Bullocks providing motive power and inevitable fouling of the water

which formed a floor and in which holes were left for individual latrines. It was usual to construct a wooden seat over each hole but if this was not done, a simple wooden lid covered the gap in the concrete. Once personnel became used to this more natural squatting method of defaecation it was often preferred to the usual sitting posture and on at least two operational squadrons the men, after experience of this type of latrine, complained when they returned to seat latrines. An additional advantage was that such structures were more easily kept clean, for airmen tended to cover the normal wooden seat with old newspaper or toilet paper before using the latrine and left this litter to blow about. Where concrete was in short supply trenches were usually narrower with wooden superstructures which were difficult to keep fly-proof as the new wood tended to warp within a very short time. Bamboo was used east of the Brahmaputra and this was even more difficult to fly-proof; sacking covered with mud was satisfactory for a short time but required constant repair.

The greatest drawback to deep trenches, however, was the high level subsoil water, all the year round in the valleys of the great rivers, and practically everywhere during the monsoon months. Building latrine blocks on small areas of natural or artificially raised ground helped to overcome this difficulty but was not always possible. Following satisfactory reports from the American Army in Panama a trial was conducted at Mauripur into the use of yeast to increase the efficiency of such latrines. The results were unsatisfactory, there being no increase in the rate of dissolution in the trenches and no diminution in odour. The Senior Medical Officer pointed out that the conditions were very different from those in Panama as Karachi is in a dry zone with low subsoil water. He considered that the regular addition of water to the latrines might produce different results but no report is available of further tests with added water.

*Fly-proofing of Deep Trenches.*—As already mentioned briefly the fly-proofing of deep trenches was always a great problem. Even when the superstructures were constructed in detail to prevent fly admission the contents rapidly became maggot infested. The Senior Medical Officer at Digri in 1943 had a special latrine constructed at the side of Station Sick Quarters. This latrine was made as fly-proof as possible, with a self-closing door and lid, and it was only used by a few of the sick quarters staff, but even with such care the latrine was maggot-infested within seven days of being first used. Before the D.D.T. group of insecticides became available several methods of killing these larvae were tried, with limited success. Bleach, either dry or in solution, had no effect, while oiling had very short term results. For example, No. 110 Squadron at Chiringa treated a trench with no less than 50 gallons of used Beaufighter engine oil applied in one lot, followed by 5 gallons in



divided lots down each aperture every day for a fortnight, but larvae still formed floating islands on the surface of the latrine. The difficulty was that a reasonable depth of clear fluid could not be kept in the trench, as in time a pyramid of faeces and paper formed below each seat the apex of which rose clear of the oil and on which breeding continued. Stirring with poles lowered the pyramids but unless digestion was good the contents soon became pasty and each new lot of faeces bred flies. No. 110 Squadron also tried a 2 per cent. solution of sodium arsenite sprayed and poured into the trench with negative results. Fire gave equivocal results, certain squadrons reporting only short term success whereas others claimed freedom from breeding for long periods. It is possible that differences in the resulting pH were the cause of these varying results but no experiments were carried out to confirm this. Aviation petrol was a common fuel for such fires but care was required if the superstructure was not to be destroyed as well as the larvae. The practice of covering the surface of the latrine with such fuel, while destroying larvae and preventing breeding, caused several fatal accidents due to personnel breaking the 'no smoking' rule; one particularly unpleasant accident occurred at Meiktila Main airstrip in early 1945.

*Borehole Latrines.* These proved very satisfactory in many areas but their use was limited by shortage of the necessary augers. To function efficiently a borehole had to be at least 15 in. in diameter and 15 to 20 ft. in depth, so that subsoil water did not interfere with their working. Bamboo or oil drums with the bottoms removed were used to line the top portion of these holes in order to retain the sides and to prevent fouling of the walls. A well-constructed latrine of this type did not require a fly-proof cover as the depth prevented breeding, but a solid seat or concrete top facilitated cleaning and prevented soiling of the surrounding ground. Many boreholes were constructed on base stations as a reserve in case of labour troubles.

*Bucket Latrines.* These were the most common type in both the forward and other areas, the contents being disposed of in a number of ways depending on local circumstances. Local contracts, Otway pits, deep trenching, tidal water, and incineration were all used with varying success. 'Thunder boxes' with an access door at the rear to remove the pail were the usual type of latrine, but were unsatisfactory as they were practically impossible to fly-proof; furthermore, the containers were of varying size and type and as a result fouling of the floor and sides was common. The one satisfactory form consisted of a seat and lid with no sides which fitted tightly on to the top of the container. This type gave adequate fly-proofing as long as the lid was closed and left no enclosed space to harbour dirt and vermin. The tradition that each officer must have his own latrine, always of the commode type, caused much unnecessary trouble. This old Indian custom was carried

to absurdity at Air Headquarters, New Delhi, where a water-carriage was constructed for the airmen's lines while the large officers' mess and quarters were fitted with a commode for each room. It was difficult to convince the Indian servant of the dangers of inadequate faeces disposal when he saw his master using a small box in the same room where he washed, shaved and had his bath.

*Disposal by Contract.* This was the usual method in the base areas. On the few permanent stations using this type of disposal these contracts since 1936 had been forwarded by the station commander to the P.M.O. for approval but in late 1942, with the large increase in stations it became obvious that this policy required revision and from that time the Equipment Branch took over this responsibility. Waste contractors required constant supervision or latrines would be left until absolutely overflowing and then emptied into leaking rusty containers; the buckets would be left filthy, the surrounding ground soiled, and the faeces removed in a totally unsuitable vehicle to be dumped round the nearest corner, often still on the station. Even with constant supervision the cleanliness of the buckets left much to be desired and the ground surrounding the latrines was frequently badly soiled. The most satisfactory scheme to overcome this difficulty was developed at Cuttack in 1943 and later adopted by many other stations. On a site agreed by the medical officer in charge, a central cleansing station and store was erected. This consisted of a well drained concrete platform with a constant water supply, either from the mains or from a tank, and a well-fly-proofed store. Sufficient spare buckets were kept in this store to replace all in use plus a reserve for normal 'fair wear and tear' replacements. Large drums were also kept for faeces and urine storage during removal. Each morning the contractor called at this centre and picked up the drums and sufficient latrine buckets for all latrines and urinals. He then called at all the latrines, where the used buckets were emptied into the large containers, the fouled buckets placed on the lorry and sufficient clean buckets left as replacements. Before leaving the station the dirty buckets were left at the cleansing station for thorough scouring and oiling by a special staff of coolies and after disposal of their contents the large drums were also returned for similar treatment before being issued the next morning. The sanitary orderly with the lorry was given a form on which to obtain, where possible, the signature of an officer or N.C.O. to confirm that each section had been visited. Swill disposal was organised on similar lines using the same cleansing station.

*Incineration* was the most efficient method of night soil disposal, but unfortunately the well built incinerators, fuel and trained personnel required were seldom available. Where well constructed closed incinerators were erected either fuel was scarce or staff were posted as soon as they had been trained, leaving incompetent successors with insanitary



results. In Imphal No. 155 Squadron constructed an oil-water flash fire incinerator which successfully burnt the night soil from 400 men.

*Entrenching* was the most satisfactory disposal with the labour available but this also required constant supervision and the co-operation of the executive. A site had to be found (and approved by a medical officer) at least one mile from the nearest camp buildings, and here a minimum of seven trenches 10 ft. long, 4 ft. wide and 7 ft. deep would be constructed. Each of such trenches took the waste from a camp of 2,000 men each day and had to be covered immediately after filling. A layer of waste oil on top of the faeces prevented fly-breeding and it was essential for the same reason to have at least two feet of soil on the surface. A party of coolies was kept employed digging new trenches so that there was always a reserve of five or six.

*Otway Pits* proved very satisfactory when properly constructed and used and in regions where the subsoil water was neither too high nor too low. European supervision to make sure that fly-proofing was maintained and that the surroundings were not soiled was essential. The common error in construction was to make the pit too small for the amount of waste. For large numbers it was found advisable to construct a battery of pits each 10 ft. long by 4 ft. wide by 8 to 10 ft. deep with at least 18 in. of subsoil water in the bottom. These pits were constructed at least 10 ft. apart and were used on alternate days. When stations were sited on ground with very high subsoil water during the monsoon it was often possible to site the Otway pits on raised ground near the camp. Oiled sacking was useless as a fly seal as it was destroyed in a few days by ants.

At Chittagong and on other Arakan stations buckets were emptied into the tidal *chaungs* but this method had little to recommend it except cheapness. The foreshore became even fouler than normal, the stench was atrocious and the action of the tide uncertain.

It is now clear that more attention paid to the education of administrative officers in the principles of elementary hygiene would significantly have diminished the incidence of intestinal disease. For example, at a station near Secunderabad after the first hot weather with its large sickness rates due to bowel diseases, considerable time and money were spent in attempting to make European latrines as fly-proof as possible but very little was done to provide adequate and sufficient latrines for the large native population of the stations. A proportion of European troops carried bowel diseases in their stools but a very much higher proportion of Indians were infected. The Indian would not touch a latrine seat with the result that no matter what type of latrine was used it was never covered. He did not use toilet paper but carried a small can of water with which to clean himself after defaecation and, therefore, the ground all round the latrine was waterlogged and

ideal for fly breeding. The deep trench latrine with a water seal described earlier solved the problem where it could be fitted but its use was not common. The only other type of any value was a cubicle where the lid opened backwards to form a door after the Indian had entered, so that he could not leave before lowering the lid again. This proved satisfactory for a short period until the lid was torn off. In the event of the R.A.F. operating in future in an area where numerous servants are accommodated on the station this problem will require much intensive study to prevent a large incidence of bowel disease. (See Chapter 7, 'Native Latrines', page 317 and Plate LIX.)

#### URINALS

Even on the semi-permanent camps in base areas adequate arrangements for urine disposal were rarely included in the plans. The usual system was some form of stall-trough leading to either a simple type of soakage pit or to open ground. This was often totally insufficient for the numbers on the station and created a considerable nuisance particularly in the fly-breeding season. Satisfactory arrangements were eventually made on one of the following lines.

Urine stall fittings connected to water-carriage systems were the method of choice wherever possible. Stall troughs leading to a soakage pit worked well when the pit was of adequate size and the ground drainage good, but usually the high subsoil water level made the pits non-operational for most of the year. Most of these structures had either to be destroyed or substantially modified, as at Kalyan, where the troughs led into a concrete pit which was a two foot cube with no outlet! Four gallon drums were adapted to fit these pits and the drums were emptied each day by the conservancy contractor. The remaining problem of keeping the troughs clean was practically insoluble.

Where soakage was impracticable the 'desert lily' type of urinal with an improvised drum or tin receiver was much easier to keep free from smell. On stations with bucket latrines, bucket urinals were standard and the contents were emptied either into the deep trenches where the water level allowed or into rivers or specially constructed soakage pits. The use of buckets as night urinals was also common. Fortunately, under mechanised warfare, with the necessity for abundant petrol and oil, there was always a good supply of used drums which could be adapted as replacement buckets.

#### DRAINAGE

In India and Burma, where much of the country was flat with a high subsoil water level and where the annual monsoon brought many inches of rain in a few months, adequate drainage was difficult. When the incidence of fly-borne disease was high the effect on sickness rates

of inadequate clearance of sullage water, with its consequent increase in fly-breeding grounds, created a major problem. The Public Works Department took little interest in the matter and as a result in the early days of the expansion during 1942-3 many camps were occupied with either no drainage or some totally inadequate system. The ignorance of the executive regarding the importance of preventive medicine aggravated the problem. No consideration was given to the nature of the ground on the camp site or to the increase in drainage that would be required during the monsoon. Where the subsoil water was high even during the dry season, soakage pits were planned and built when it was obvious that they would be unserviceable within a very short time. At Campbellpur a complete system of concrete channels was built incorporating both surface and sullage drains. This functioned well until the first monsoon storm when the whole system was washed away. Many other examples could be given of similar waste of money.

Apart from this bad planning, in general Indian contractors had little idea regarding the use and function of grease traps and produced some weird contraptions on new stations where qualified supervision was lacking. At Chittagong five drains from a cookhouse led into a small concrete box with no outlet; on another station a completely covered concrete box 6 ft. deep with covered inlet and outlet pipes was constructed. Baffle plates were frequently forgotten and one contractor produced a concrete walled hole filled with broken bricks and with no outlet, as a cookhouse grease trap!

#### OBSERVATIONS AND RECOMMENDATIONS

From the discomfort so frequently caused by imperfect drainage and from the waste of public money which so often resulted the following elementary lessons can be drawn:

- (i) A drainage system must be planned for the whole camp area as one project, with a capacity sufficient to clear the maximum water likely to be met during the wettest season of the year. In monsoon countries the main drains should be wide open ditches to save expense, for during the major part of the year they will have very little water in them. In such countries it is always advisable to have two separate and distinct systems, one for sewage and sullage and one for storm water; maintenance is then considerably easier and there is less risk of contamination of ground to encourage fly breeding, the storm water channels being dry for the greater part of the year. Where sullage channels or drains empty into a tank or river it is of first importance to make sure that the outlet pipe is at the dry season level and *not*

at the monsoon height. This was not done at St. Thomas's Mount, near Madras, where the cookhouse drains discharged into the river Adyar at the monsoon level, with the result that a stinking swamp was formed some square yards in area, becoming a ready breeding ground for flies. The failure to construct storm water drains round all buildings and even tents can cause much unnecessary structural damage after a severe tropical storm.

- (ii) As will be discussed in considering cookhouses the different messes should be near the perimeter of the camp and if possible on higher ground above the sullage disposal area. This was not done in planning many of the expansion stations, with the result that a number of patches of fouled ground were formed round the cookhouse in the centre of the station when alternative sites were available. For example, at Imphal such a fly-breeding nuisance was created when the airmen's mess could have been sited on slightly raised ground just above the Manipur River which would have cleared all the sullage.
- (iii) Grease traps must be made of concrete with a sufficient capacity to remove adequately the bulk of the grease. The size will of course vary with the numbers using the mess, but in general traps should be about 7 ft. long by 2 ft. wide by 3 ft. deep; efficiency diminishes when the trap is any larger than this and it is advisable to construct a number of traps to the dimensions given rather than one very large trap. Where materials and space permit traps should be paired (as was done at Cawnpore) so that each can be used on alternate days while the other is being thoroughly cleaned. Only two baffles are required, one at each end, for a central baffle rising from the floor of the pit serves no useful purpose. Baffles should be constructed as a part of the trap and should always be of concrete, because wood warps, particularly in the Tropics, and this lessens the efficiency of the trap; it was not unknown for wooden baffles to be stolen as firewood. Where natives are employed to clear grease traps, a job which must be done every day, there should always be efficient supervision, as apart from the nuisance which can be caused by spillage on surrounding ground, it is too easy for a lazy labourer to tip the grease over the distal baffle.
- (iv) Where a station has expanded and the existing drainage becomes inadequate it is always advisable to plan a complete new system, as 'tinkering' is rarely successful. At Lahore the station formed part of the old cantonment and each building had one or two open drains leading to small grease traps which drained into

a large number of circular soakage pits. As new buildings were constructed more and more of the drains and small grease traps were built, all draining into the old soakage pits. Within a short time the latter became blocked with grease and marshes of foul smelling sullage formed all over the camp. This lack of planning persisted when the problem was not considered as a whole but each individual soakage pit was replaced by an evaporation bed in whichever part of the station it happened to be sited.

- (v) Where a river is available this is the obvious outfall for effluent and where grease and soap traps are efficient no nuisance should result. When, as so often happens, this is not possible, the form of disposal must depend on the nature of the surrounding ground. Where the soil is porous and the subsoil water level low, large soakage pits are efficient; the effluent pipe must run to the centre of the pit and the pit should have a good cover.

In monsoon districts it is essential that storm water entering the soakage pit be kept to a minimum and as much as possible should be by-passed in special drains. High subsoil water necessitates the use of some form of evaporation bed. Sufficient pans should be constructed to allow at least one day's complete rest after evaporation before the bed is used again. One type which was used with success at Salbari consisted of a number of pits, each 8 ft. square and 3 ft. deep, with a layer of bricks on the bottom; these bricks absorbed any grease which remained in the water and could be replaced at intervals. The area of evaporation space required varies in each particular instance depending on relative humidity, the average temperature, the degree of the wind over the beds and the porosity of the ground. On low lying ground, where the relative humidity is high, evaporation may be so slow that large areas may be required for complete disposal. This created a major problem in many parts of India, particularly in the Ganges and Brahmaputra valleys. Long branching herring bone channels were tried, each channel being 2 ft. wide and 18 in. deep, filled with stones or hard metal; bricks were not used in this type because of the difficulty of removing and replacing them. These channels, an attempt to use both evaporation and soakage, were often most successful. Occasionally the extra water was used for irrigation either on the station or by local farmers, but this method had little to recommend it. The amount of extra vegetables produced did not compensate for the even greater increase in flies and mosquitoes and the overpowering smell. Whichever type of evaporation or soakage is used, it is essential that a large final grease trap be fitted as a last purifier just before the place where the main drain enters.

## ABLUTIONS

During a campaign in which skin diseases were always one of the main causes of non-effectiveness, the attention paid to the facilities for personal cleanliness was totally inadequate. Even in base areas stations were constructed with too few showers and with ablution rooms which consisted of no more than a concrete or bamboo bench and a tap. Basins were scarce and cut down tins were frequently all that was available. Rarely were there shelves or mirrors and as there were no facilities for shaving in the ablution rooms, this was usually done in the billets or tents, with the consequent nuisance of waste water thrown around the sleeping quarters. The original P.W.D. plans for ablutions provided for only one tap in each block and this tap was fixed to one wall at a height of only 18 in. to 2 ft. from the ground. Stations were opened without even these minimum facilities and at Cholavarum in Madras, although there were a number of showers complete with fittings when the station was first occupied in 1943, no water pipes were fitted until some months later during 1944.

A further difficulty was water shortage. In some cities the water supply was often only running for a few hours each morning and evening. Worli, the main Command Transit Camp at Bombay, became notorious for shortages of water. Here, when incoming and outgoing convoys met and the camp was crowded, it was often impossible for officers and airmen to wash and shave. The water was only on for one hour each morning and each evening and the number of basins was limited, with the result that those who wished to wash had to stand in long queues—often to find, after waiting for nearly two hours, that no more water was available. It was usual at Worli to form 'washing clubs' of six men, one man being responsible for the daily queueing; if he was successful in obtaining water, each member received one mugful for shaving and washing. As personnel were sometimes detained in this camp for as long as a month awaiting disposal, the result can be imagined.

In the forward areas, where conditions were expected to be more difficult, washing water was usually brought by bowser to a central tank of either metal or canvas and from here a container full was drawn as required. The ablution facilities existing on an operational strip gave a good indication of the degree of preventive medicine practised by units. On the poorer units, usually with a high sickness rate, no organised washing arrangements existed. On others, each section had its own oil-water flash, built from salvage, which was used for heating ablution water. Some units constructed portable showers from old oil drums with great success. No. 181 Signals Wing medical section in Imphal built a flash-fire system which not only heated sufficient washing water for the whole section to wash, shave and if desired have a shower, but

also had a hot-plate attachment which was used for cooking the section's supper of locally acquired eggs!

Paradoxically, it was rare for forward units to be deprived of their evening hot bath, while in base formations, in permanent quarters, a bath often became a luxury.

#### WATER SUPPLIES

The provision of an adequate and safe water supply, so essential for the prevention of bowel and skin diseases in the Tropics, was one of the greatest problems of the war in India and Burma. Some of the large cities and the older cantonments had a piped supply but rarely could this water be considered safe for drinking without further treatment. The remainder of the sub-continent drew both drinking and washing water from rivers, tanks, or shallow wells. It would seem that the general standard for water supplies to R.A.F. stations was based rather on that of the surrounding villages than on the standards to be expected for British troops! The provision of an abundant safe supply was certainly difficult on many stations, and too often the story was one of patching and make-shift extensions, with the constant excuse of shortages of stores and equipment. In the forward areas, where conditions were affected by the temporary nature of camps and the necessity for mobility, a sufficient supply of water safe for drinking and cooking was usually available, but the quantity was frequently insufficient for ablution supplies to be maintained at the same level of purity. This could be forgiven, but no excuse could be accepted for the inadequate and unsafe supply provided at many of the base stations even as late as 1944-5.

#### PIPED SUPPLIES

Sometimes, where municipal supplies were in use, water was only available in the dry season for a few hours each day. Adequate supplies could not in every case be stored for drinking and cooking and this created a serious problem in a hot climate where alternative sources were always contaminated and where heat exhaustion was a likely cause of illness. A few of these city supplies could not always be considered safe for drinking, either because the system of filtration was faulty or because, as at Calcutta, the water was only sand-filtered with no chemical treatment. Such supplies had to be chlorinated in special tanks or boiled before using for domestic purposes.

It was not only the civilian supplies which were suspect, for many of the Army systems in the pre-war cantonments were similarly contaminated. For example, at R.A.F. Station, Lahore, part of the military cantonment, piped water from a number of tube wells had been available for many years when, in June 1943, the medical officer in charge of the R.A.F. section discovered that samples of water from various taps

produced an average of 35 colonies of *B. coli* per 100 millilitres. Cholera was prevalent in the surrounding villages and as a precaution, while the system was being investigated, water was chlorinated in trailers and supplied to the various messes. Not only were the pipes found to be leaking in many places but the walls of the tubes were also cracked and admitting contaminants. While major repairs were being carried out four aircraft petrol tanks with a total capacity of 700 gallons were placed outside each mess and were chlorinated by hand by an airman specially detailed for this one duty.

Another difficulty in cantonments and in the cities was the scarcity of supply caused by extensions to existing pipe lines. In Delhi in 1943 water was in very short supply, due partly to increased demand on the filters but mainly because of the large number of extra taps added to existing pipes. For example, a single 1-in. pipe supplied a large *dhobi ghat*, 27 showers, 40 ablution taps, 4 septic tanks and a M.T. wash-down.

At Karachi, where the civilian requirements had greatly increased and where a new Indus Water Supply Scheme was planned, only a fraction of the requirements of the numerous R.A.F. stations was met. The existing system was very old and the mains and pipes allowed a great deal of contamination, the usual bacterial content at R.A.F. Mauripur, for instance, being 180 coliform bacilli per 100 millilitres.\* As a result, not only had special arrangements to be made at each camp for purification of drinking and cooking water, but ablution water was very scarce. Skin diseases were very common and caused much disability; at R.A.F. Station, Drigh Road airmen suffering from such conditions comprised 33 per cent. of the daily sick parade. Although more water became available when the new civilian scheme was functioning late in the war the R.A.F. stations at Karachi never obtained even their minimum requirements and there was always a shortage of washing water.

#### WELLS

The water supply at the majority of the stations constructed during the war had no existing system which could be expanded. Where any

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#### \* Normal Standards of Water Purity

		<i>Presumptive coliforms/100 ml.</i>
Class 1.	Highly satisfactory	less than 1
Class 2.	Satisfactory	1-2
Class 3.	Suspicious	3-10
Class 4.	Unsatisfactory	greater than 10.

(All chlorinated water supplies should fall in Class 1.)

#### *Non-chlorinated rural supplies from wells.*

Coliform counts of 10-25/100 ml. not unusual.

Counts over 50/100 ml. condemns the supply, unless adequate means of chlorination exist.

Note. Coliform count does not differentiate, unless specifically stated, between faecal *B. coli* and *B. coli* not necessarily of faecal origin.



water was in use at a proposed site it was nearly always drawn from grossly contaminated shallow wells or direct from a river, stream or tank. The ideal solution would have been to bore a deep well or a series of deep wells on each site to supply a sufficiency of water at the driest season for the maximum expected population of the camp, this water to be automatically purified and pumped to one or two large storage tanks. Unfortunately for a variety of reasons this was only rarely possible; the necessary drills with trained workmen to use them were very scarce, there was a shortage of piping, and no standard rules for water supply had been laid down. Water was drawn from anything up to a hundred shallow wells, rarely more than a hundred feet deep and as a rule between twenty and fifty feet deep. Frequently, each well had its own small storage tank which had to be tested and chlorinated by hand. The supply from these wells was erratic and often ceased completely in the dry season. It was impossible to maintain a constant supply from such sources. As a result 1943 and 1944 saw time and money being spent in attempts to improve these very unsatisfactory systems, much avoidable loss of working time and efficiency from skin and bowel diseases and much argument between medical officers and the executive as to what was required.

Deep wells were sunk on many new stations; the more unsatisfactory shallow wells, particularly those near native villages and those which gave a poor supply were closed and others at a greater depth constructed; all wells were lined, to a depth of at least ten to fifteen feet, with some impervious material to prevent surface contamination; and lastly, wells were covered, fenced in and provided with solid concrete aprons at the surface.

In 1942-3 few mechanical or hand pumps were available and many stations had to rely on 'Persian wheels' or other primitive methods for raising water. The latter were gradually replaced, at first by manual pumps which required full time coolie labour, but which permitted better protection of the top of the well, and eventually by mechanical pumps driven by petrol, diesel and oil or, more rarely, electricity. This process of replacement, however, was far too slow and even late in the war the number of satisfactory pumps being supplied was insufficient. In 1944 many stations in Nos. 223 and 225 Groups still used water raised by bullocks from shallow wells. Phaphamau, near Allahabad, for example, in mid-1944 obtained all its water from a series of shallow wells with unpointed brick sides and a concrete platform about three feet wide round the surface. The wells were uncovered and above each was a wooden crossbeam over which passed a rope with a goatskin bucket attached on the well side. The other end of the rope was pulled by two bullocks down an earthen slope to raise the filled goatskin. A coolie sat at the head of the well and emptied the bucket on to the

concrete apron around the top, from whence it drained through open channels to ground level tanks, where it was chlorinated by hand before being pumped manually to high level tanks. One thing which could be said for this system—which is illustrated in Plates LX–LXIII—was that it was cheap and did not often break down.

The water, of course, was only rendered potable by boiling or chlorination. Similar systems were in use at several other stations.

#### CHLORINATION

The numerous small tanks provided when stations were opened made the adequate chlorination of a constant supply impossible and they were gradually replaced by larger central tanks. An example of the problem of stores contracts in India may be mentioned in this connexion. In April 1943, No. 17 Squadron occupied Kalyanpur, an airstrip near Calcutta, and was provided with five 250 gallon tanks in series for water storage. At the first filling, four tanks shot several rivets and the plates came apart. On examining the fifth tank more closely it was found to have rivets set twice as close as the other four tanks. Stencilled on the bottom was the word 'SAMPLE' !

The different speeds at which manual pumps were operated by coolies and varying storage capacity made the problem of adequate chlorination very difficult. The usual practice was for one man, either an A.C.H./G.D. or a nursing orderly, to travel round, test each tank filled and add the appropriate quantity of bleach. The tank was then supposed to be locked and left to stand for several hours. In practice this procedure frequently deteriorated into an airman, with little idea of what he was doing, adding bleach to each tank at some time during the day without worrying about whether the tank was in use or not. Until there was an outbreak of bowel disease the executive were perfectly happy that 'something was being done about the water.' Regrettably, the same attitude was found in many unit medical officers.

The problem of automatic chlorination was appreciated by the P.M.O's. department in 1942 and the Research and Development Branch B.A.F.S.E.A. were asked to attempt to find a solution. After more than two years, at the end of 1944, a prototype apparatus was tried at Delhi. Briefly, the apparatus consisted of a mechanism attached to the pump which was designed to eject into the water, after every so many strokes, a tablet of compressed bleach. Unfortunately, sometimes only half a tablet was ejected and sometimes no tablet at all, while when a tablet was added it frequently failed to dissolve. No further models were produced and no further solutions were provided by the Research Department.

Meanwhile the Group Sanitary Assistant at No. 225 Group, a sergeant who was a fully qualified Sanitary Inspector in civilian life,

had been working on the problem and produced from scrap a machine which worked well on several stations. This consisted of a container, holding about 40 gallons of concentrated bleach solution, which led to a small two gallon balancing tank to maintain a constant head. A  $\frac{1}{8}$ -in. pipe led from this tank into the water pipe just before the pump. A ball valve was fitted between the two tanks and at the outlet of the second tank. Thus a controlled quantity of chlorine was introduced into the main supply by the suction of the pump, and the chlorine and water were well mixed by the turbulence created by the pump at work. The great advantage of this apparatus was that the supply of treated water was constant, which was never possible with hand chlorination. The concentration of bleach required was easily calculated by (a) determining the quantity of water sucked from the second tank while the pump raised a given quantity of water, and (b) carrying out a Horrocks test on the untreated water.

Chemical impurities did not present a major problem except at Salbari in Bengal, where the water contained a large amount of iron which precipitated out in about half an hour as a heavy deposit of iron oxide; the precipitation was increased by boiling, so that the water was useless for cooking. It was eventually made potable by fitting aeration sprays followed by sand filtration immediately after the pumps.

On many base stations there were two piped supplies—one chlorinated for drinking and one untreated for ablutions. This system had nothing to recommend it except cheapness, but even the apparent economy was an illusion, for it did not take into account the large number of man-hours lost through bowel disease. Troops wilfully or through ignorance drank the untreated water; native servants (many of whom could not read) used whichever water point was nearest; cooking and drinking vessels were washed in the wrong water, and personnel forgot, or did not bother, to use chlorinated water to wash their teeth, but used untreated water.

#### FORWARD UNITS

In the forward areas sources were very variable. It was usual for the Army Engineers to organise water points where water was purified using the two tank method and where water could be drawn into water trailers by units. Where units had serviceable water purification vehicles and trained personnel to use them they selected their own water point and arranged their own supply, but this was the exception and not the rule.

In 1942 the majority of forward units were equipped with the 500-gallon E.C.D.\* water trailer, which was found, for a variety of reasons,

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\* E.C.D. = Electrolytically controlled dosing.

to be totally unsuitable. In practice over 90 per cent. of these vehicles were used as tanks and the intricate and expensive purifying mechanism was never used. For correct use the machines required trained operators who were not available; they needed servicing by trained mechanics, but the few available were overworked with other tasks; spare parts required for replacement in the electrolytic mechanism and the magneto (parts which soon became unserviceable) were unobtainable in the East; most of the water contained a large quantity of silt which rapidly blocked the filter, thus slowing down and eventually stopping the pump. By 1943, when the P.M.O. called for a report from his S.M.Os. as to the serviceability and use of these machines, it was found that practically all those in Bengal-Assam were unserviceable and could not be repaired locally. Senior Medical Officers reported that apart from the difficulties mentioned above the trailer was too heavy and could not be used at many water points as it became bogged. The difficulty in finding a towing vehicle while on operations also restricted their use.

A high level conference at Command decided on the formation of a specialist repair party based on Calcutta to tour the forward areas and to make as many as possible of the trailers serviceable. Meanwhile the Senior Equipment Officer at Bengal Command was instructed to obtain as many galvanized tanks as possible by local purchase. These tanks, with canvas filters and pumps, were then fitted to four by four 3-ton trucks and issued as prime mover water purifying vehicles. Sixty-five such tankers were sent to units in the latter part of 1943. In 1944 a Ford prime mover of lighter weight and with a hand operated pump became available and was issued with improved results.

The Bell steriliser was issued to all units east of the Brahmaputra and proved very successful in providing palatable water in messes and canteens. Occasionally, through laziness or ignorance it was only used as a large water container, but the necessary chemicals were usually available and most units found it a great boon.

The provision of safe water on the long train journeys during movement of personnel either as units or as individuals will be considered later in a special section on these moves. ('Rail Travel', page 617.)

## FOOD SUPPLIES

### COOKHOUSES

In a country where bowel diseases were endemic the lack of adequate plans for cookhouses and the inefficient and substandard messes actually constructed were little less than criminal. Even in 1945 totally unsuitable messes were being built and only where a keen and determined medical officer was checking and amending all plans were major errors necessitating subsequent alteration prevented. Varying conditions in different parts of the sub-continent made standard building plans

impossible, but certain essential rules and requirements for all cookhouses should have been laid down and have become second nature to all civil engineers engaged in the construction of Air Force stations. At the end of the war there were few kitchens which could be considered up to more than a minimum standard and these had all had considerable alteration since they were originally built.

The siting of cookhouses in the centre of a camp where adequate drainage was practically impossible has already been mentioned. This was the least of the problems. The standard construction was too small, badly ventilated, had insufficient, if any, stores and preparation rooms, no servery and an inadequate water supply. It was impossible to prepare food properly in the very warm smoky atmosphere of the main kitchen and cooks could not, therefore, be blamed for doing most of the preparation outside despite the risks of fly and dust contamination.

The general policy was to have large numbers of small cookhouses on stations. At Ambala with a strength of just over a thousand there were twenty different messes; at Chiringa there were twenty-four—five for officers, three for N.C.Os., seven for airmen and nine for Indians. At this station there were also five different canteen kitchens. This multitude of small messes made supervision more difficult, caused extra problems in the distribution of rations, and aggravated the persistent shortage of European cooks. This subject will be mentioned again when discussing staffing problems, but quite apart from that aspect, the provision of a few moderately large cookhouses rather than numerous small ones is an essential for efficient hygiene control of food preparation, particularly in tropical countries where the risks of food-borne infection are so great.

#### COOKING STOVES

The usual type of stove fitted was the Indian *chula*, which was a charcoal-burning open grate. As charcoal was scarce and coal or wood had to be used instead, these, not surprisingly, never worked well. The heat was intense and the volumes of smoke rapidly filled the usual badly ventilated kitchen so that it became completely uninhabitable. Numerous unofficial modifications were tried by different units with little success. Many gave up and during the dry weather did their cooking on open fires outside the mess. (See Plate LXIV.) The most successful modification was perfected in No. 221 Group: an opening in the cookhouse wall was continued into the kitchen between two parallel walls 4 ft. high; half way up these walls iron bars were inserted between them to hold the fuel; finally, a quarter inch cast iron plate was placed across the top of the walls as a heating surface. Alternatively, forty-gallon drums on their side could be used as ovens. Long chimneys

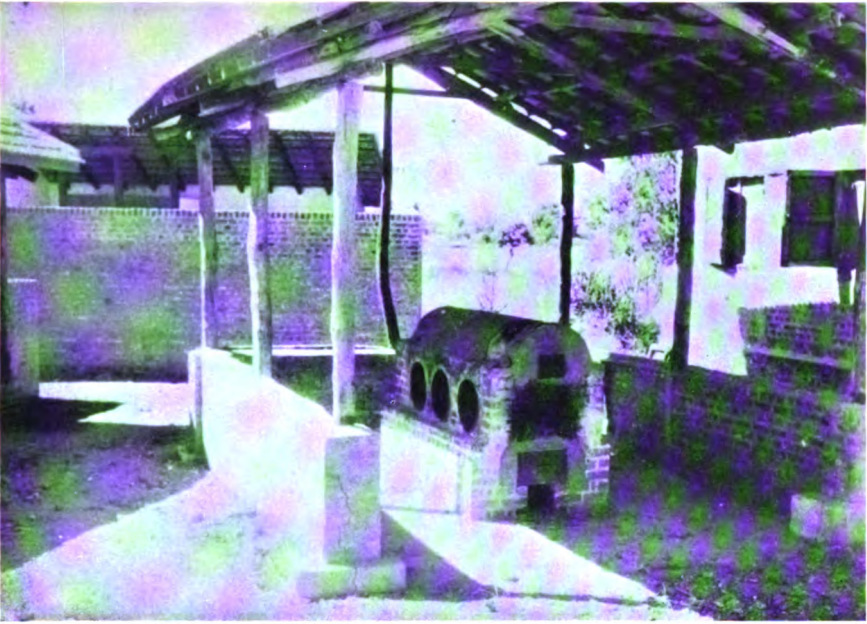


PLATE LXIV: Open-air oven. Building in background is a native latrine



PLATE LXV: Tanjore 1943. Airmen's showers and ablutions. Water drawn by bucket from 800 gallon static tank. Note obvious dust and mosquito hazard from uncovered tank





were erected at either end to increase the draught and to draw off the smoke. The advantages of this type were that the smoke was drawn away outside the kitchen, the fire was stoked from the outside, wood could be used in long lengths and the temperature in the kitchen, although still high, was not unbearable. At a few stations, particularly in the base areas, stoves were converted as oil burners with success but, probably because of shortage of oil, this method was not generally adopted.

#### WASHING UP

The thorough cleaning of plates, mugs and cutlery after a meal received scant attention. In the forward areas some form of boiler was improvised by units but at the base stations very little was done. Where some kind of dish washer was eventually provided it was usually primitive, too small and did not keep the water hot until the end of the meal. A simple and efficient system was improvised by some units from forty-gallon drums split lengthwise, the water being heated by wood or oil-water flash fires. These worked very well if there were enough of them and provided that the fire was kept alight until the end of the meal. It was important to have a series of tanks in line so that the first retained most of the grease and the last kept fairly clean as a rinse.\*

It was the exception rather than the rule to find any rest or wash room for the cookhouse staff. Where a room had been provided in the original plans, it was frequently misappropriated as a preparation room or store, as these essential rooms were also usually insufficient in number. The necessity for staff accommodation will be discussed later.

#### FLY-PROOFING

This was often grossly inadequate. P.W.D. and M.E.S. tended to fly-proof the obvious places such as doors and windows and to forget the smaller gaps at the eaves and at the drain outlets. This often resulted in the kitchen becoming a fly-trap. In the forward areas where kitchens were temporary structures in the open air a satisfactory fly-proof preparation room could be constructed from a number of old mosquito-nets slung from posts over an area of well-oiled ground; with keen personnel this proved remarkably effective.

When furniture was scarce in the early days of the war in the East, tables and benches were often made from bamboo; they proved very unhygienic, however, for it was impossible to clean them thoroughly and the food débris which collected between the bamboo strips soon formed a breeding ground for flies.

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\* See Chapter 10, 'The Liberation of Europe' under 'General Living Conditions—Washing up', page 497.



## BRITISH AND INDIAN COOKS

In the United Kingdom it was never necessary to employ large numbers of civilians in Service messes, but in India and Burma over 50 per cent. of the kitchen staffs were Indians. Many of these lived in insanitary surroundings and were thus often in contact with a number of infectious diseases and thus might become ambulant carriers.

War-time conditions made it difficult to carry out any large scale routine tests to detect those who were liable to infect food; in peacetime, with smaller numbers and with thorough supervision possible, such staffs were regularly employed in the Services and by all European civilians. These, of course, were trained Goanese or Mohammedan cooks or caste Hindus, no low caste Indians being knowingly employed in connexion with the preparation of food. R.A.F. personnel were, however, new to India and her ways and Indians—particularly Bengalis—were engaged in large numbers, and were often found to be most unsuitable for this kind of work, with which they claimed to be familiar. The self-styled cook was all too common and of a caste that would never have been employed by people with experience of India.

The establishments of R.A.F. units in the East always showed over half the kitchen staff as enrolled followers and, as a result, the overall establishment of British cooks was 50 per cent. less than for a similar total strength in any other theatre. Despite the employment of any Indian who would enrol as a cook, the establishment of Indian cooks was rarely filled. The large number of small messes on stations each required at least one British cook for supervision of the Indians and caused a wide dispersal of the available man-power. Sickness rates in the Command were at a level which meant that all trades were working well below establishment; this was felt acutely in the trade of cook and butcher where, as explained above, the establishment was already half the normal, and consequently the available British cooks had to work long hours, particularly in the mornings and evenings, and thus became less resistant to infectious diseases. The result was even longer hours and even higher sickness rates. The effect of this vicious circle on the quality of the food produced will be considered later.

The following are two examples of sickness rates among cooks. At Worli, near Bombay, where the station sick rate was well below average in early 1943 over a two month period, nine British cooks lost a total of thirty-five working days due to minor illness. No. 79 Squadron, in the first Arakan campaign in 1943, had seven British cooks; between January and May five of these were in hospital with malaria.

*Working Conditions.* With regard to cooks and cookhouses, the importance of regular hours and reasonable working conditions must be stressed. No matter how good the rations, if the cooks are overworked and uncomfortable the preparation will be poor. When cooks have to

work very long hours in primitive conditions it is essential that they have good ablution facilities near to the mess, and that a room be set aside where they may have their meals away from the odours of their work and where they may have a rest in comfort between meals. Unless the mess staff have regular times off duty, within a short period all food preparation will be done in the easiest way with the result that the menus will become monotonous and overloaded with fatty 'fries'. The outbreaks of steatorrhoea in Nos. 221 and 224 Groups in 1943-4 which caused so much discomfort and disability and were responsible for so much lost man-power, can be traced in part to faulty diet possibly due to this cause.

*Training of Cooks for Active Service Overseas.* This left much to be desired. Cooks arrived at operational units direct from the United Kingdom and had no idea how to work under field conditions. Squadron commanders reported that cooks were of little use until they had been two or three months in the country and had become used to working without gas or electric stoves and the armamentarium of a modern kitchen. Medical officers complained that cooks had no knowledge of the importance of their work in the prevention of disease, of the danger of the fly, and of the risks involved in the use of impure water. A three day course on these subjects either just before embarkation or just after disembarkation would have lowered the sickness rates, improved the quality of the food and changed for the better the average cook's attitude to his work. Schools were opened at Comilla and Secunderabad during 1943 but only a proportion of cooks attended and then only after some months in the Command.

#### RATION SUPPLY

Before 1942, the very small R.A.F. element of the Armed Forces in India received their supply of basic rations from R.I.A.S.C. depots and an allowance of six annas ( $6\frac{3}{4}$ d.) *per diem* for each airman to be spent in the local contractors' institute. This arrangement worked well when the Air Force had only a few stations, all near a large military cantonment, but by the end of 1942 it had broken down owing to factors discussed below and the standard of rations was deplorable. Changes were made, but not until 1945 did the supply and distribution of food reach even an adequate level.

As in other countries the cost of living in India rose sharply in the early days of the war and many basic foods were scarce, causing a steep rise in price. The ration allowance which had been fixed in peace-time was not raised, with the result that rations obtained in this way became less, and of poorer quality. There was a rapid increase in the numbers of stations, many in out of the way regions, petrol was scarce and the railway system overloaded, with consequent maldistribution of basic

essentials. There was no adequate organisation at G.H.Q. (I.) in the Q.M.G's. branch to cope with the rapid increase in strength of the Command and the R.I.A.S.C. had to expand in a short period to many times its previous size with untrained reinforcements. In November 1942, the position was so bad that the ration allowance was abolished and all ranks in the forward areas and other ranks in India were put on Field Service Scales supplied by the R.I.A.S.C. In the base areas officers still drew a ration allowance and messes bought the bulk of their supplies in the open market, a constant source of complaint. Unfortunately little could be done about the inexperience of the R.I.A.S.C. staff, who were often working in unsatisfactory quarters, and the general world shortages and transport difficulties created problems insoluble at that time. The new ration scale drawn up by G.H.Q. with little consultation with A.H.Q. was unsatisfactory in quantity, quality and variety.

An example of the transport troubles was the situation at Cuttack where Indian fresh meat was brought by rail in trucks which had previously been used to transport coal and which had only been superficially cleaned, the meat resting on thin rush matting on the waggon floor. From the railhead, owing to petrol shortage, the meat was carried in open bullock carts to the station! Gradually during 1943 the new supply officers of the R.I.A.S.C. gained experience, new depots and sub-depots were opened and more efficient transport arrangements were made, but the standard of rations still remained deplorable. There was continual dissatisfaction and complaint throughout India and steatorrhoea, traceable in part to poor rations, caused considerable disability in the forward areas. The position became so critical that the P.M.O. arranged for a team of nutrition experts from Air Ministry to tour the Command and report. Their report will be mentioned again in the next section on diet but certain major changes in the supply organisation were made as a result of their visit.

The main finding of the team was as follows: 'Undoubtedly the satisfactory feeding of British troops in India is not easy, for example, locally produced food is usually of poor quality and transport difficulties in this vast country are great. However, it would appear that the feeding of airmen is even worse here than might reasonably be expected, indeed the standard of airmen's feeding in India is in general the worst which has been encountered in the 19 countries where this has been studied.'

A R.A.F. supply branch was formed in December 1944 with a group captain working with Q.M.G's. branch, and all complaints and suggestions regarding supply and rations were passed to him for action with Q.M.G. Furthermore, at each Army Command there was a R.A.F. liaison officer to represent the R.A.F. viewpoint and to deal with complaints from the Groups responsible for the administrative services.

Many areas where troops were serving only produced a small quantity of Indian vegetables such as pumpkins, brinjals and gourds and no European type of vegetables. Wherever possible Government farms and piggeries were set up during 1944 to produce fresh food for the troops, but in many districts this was not possible owing to the climatic conditions prevailing.

The bulk of the rations issued to troops were received in large consignments of tins from overseas. This resulted in a supply problem to which there was no satisfactory solution. Ships had to be unloaded and turned round rapidly and port wharves cleared quickly, storage space was limited, labour was short and as a consequence bulk supplies became localised in areas. Thus in a large consignment of jams, several tons of tins of strawberry might go to Lahore, a similar quantity of gooseberry go to Calcutta and all the marmalade end up in Madras. The internal economy of India's transport system, already strained by the stress of war, prevented subsequent redistribution, with resultant complaints of monotony from Lahore, Calcutta and Madras. The establishment of R.A.F. supply liaison officers did a little to even out this maldistribution, but in most instances distance made the problem insoluble.

India was the main base for what was expected to be a very long campaign to recapture Malaya and the Netherlands East Indies and, therefore, large reserve stocks of Front Line ration packs had to be built up and maintained. This reserve required turnover and replacement as it approached warranty expiry with the result that large quantities of these tins were always being included in the ration issue. The constant changes resulting from improvement in the type of rations held in reserve for operations aggravated the position further. The original reserve was mainly American type K rations, a most uninspiring and monotonous selection. The British eight man 'compo' pack which superseded this was a great improvement and permitted more variety, but as a standard issue three times a week in base areas it soon became monotonous. Another difficulty was that each pack varied, within limits, in its contents, with the result that the issue for 300 men might contain 100 rations of three different main dishes. The proportions could never be determined until the rations were opened.

To summarise: a number of factors prevented an efficient organisation which could issue a varied diet with a sufficiency of fresh meat and vegetables to all units in this large Command. Certain of these factors, poor organisation, untrained and inefficient staff, poor and unsatisfactory stores and depots, lack of farms producing European type vegetables, unsatisfactory local transport arrangements, could be and were improved. Other factors, general world shortage, limited shipping space, overloaded internal transport systems both road and rail, necessity for

rapid clearance of ports, insufficient large base stores, the necessity for the regular turnover of reserves, extremes of climate which prevented the use of locally grown produce (associated with long distances from alternative sources), had to be accepted as insoluble in the existing circumstances. The P.M.O. and Command Catering Officer recommended in 1944 that two food transport squadrons be formed in the Command, but the executive, albeit reluctantly, could not agree because of the shortage of aircraft and aircrew. If these squadrons had been formed many of the problems listed above would have been at least partially solved. The resultant fall in the sickness rate and increased efficiency associated with raised morale would have done much to compensate for the diversion of aircraft and crews.

#### DIET

Mention has been made in the preceding paragraphs of the difficulties in supply of rations, but more must be said about the insufficiency of the diet as a whole and of certain items in particular. Even with a highly efficient supply organisation the diet would still have been unsatisfactory owing to poor quality issues, the lack of variety mentioned above and the very low standard of preparation.

The effect on food preparation and diet of long working hours and poor working conditions was mentioned when discussing cookhouse staff. This was aggravated by a general shortage of catering officers for qualified supervision and by the low standard required for the trade of cook and butcher. Most cooks had little interest in their work and the few who tried to vary the eternal 'fry' had insufficient experience to make the best of the rations. At Kolar in 1944 there were unanimous and frequent complaints from the airmen regarding their diet. A Warrant Officer (Catering) was posted to the station and within a few weeks and with no alteration in the issue the general opinion of the same airmen was that the station had 'the best grub in India'. The medical officer on this station reported that he had no idea that bully beef could be prepared in so many interesting and tasty ways.

Another reason for the frequency of fried food on the menu was that the scale issue for breakfast was so small that the addition of fried bread was necessary to make it appear more and to make the ration go further. This applied even to the revised and improved scale provided after October 1944. Complaints about the breakfasts were so numerous that in December of that year the P.M.O. sent a sample of the issue tins of American sausage to Air Ministry for test. A 2-lb. tin, the ration for ten men, was found on investigation to contain before cooking and sealing 31·82 oz. of sausage. When sealed ready for issue a quantity of fat separated out, the amount varying with the type of sausage. The analysis revealed that after the tin was opened, the sausage cooked and

the fat separated off, the average weight of sausage for consumption was between 18 and 19 oz. Notwithstanding repeated objections from the Medical Branch this principle that the uncooked weight of food should be used in determining scales was continued until the end of the war.

The original field service ration scale for India was completely revised in 1942, but the new scale was never satisfactory. The quantity was insufficient and the quality very poor. As a result of the Air Ministry Dietetic Commission's visit and the Munster Report\* in August 1944 a new and increased scale was laid down. On paper this was a great improvement but the problem of shortage remained. Alternatives were authorised, but too often these became the standard issue; furthermore, maximum not minimum standards were given in the instructions to Supply Officers. This subject was taken up by the Commander-in-Chief, and after a visit of the Command Catering Officer to Air Ministry and the War Office changes were made in December 1944. A new scale 25 per cent. better than the basic scale was laid down for forward areas and was well implemented except during advances when the rations often had to be cut for a period. Improvements to the basic scale were also made—the flour ration was doubled, bread rolls were issued, and there was a big increase in the variety of tinned vegetables and fruit available. A Standing Ration Committee was formed at G.H.Q.(I.) which met monthly and on which the R.A.F. had representatives.

One result of the small size of the R.A.F. in India before the war and its complete reliance on the Government of India and the Indian Army for all administrative services was that the special ration scales required by the R.A.F. during operations were not understood. Bomber squadrons were operating as far as Thailand, trips which lasted up to twenty-four hours; coastal squadrons were carrying out long distance reconnaissance patrols; and transport squadrons were away from base from dawn till after dusk with only short halts at forward or base airstrips. Yet the necessity for special flying rations for these crews could not be understood by G.H.Q. A constant battle had to be waged by Air Headquarters (the medical branch playing a prominent part) before adequate supplies were available for these squadrons. It was not until 1945 that special ration packs for aircrew on short and long flights were introduced to the ration scales with the addition of special supplies of confectionery and foodstuffs for very long flights.

The R.A.F. operating in all other countries except India supplied extra rations to small messes of under 100 but despite lengthy correspondence G.H.Q. refused to sanction this issue of supplementary rations.

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\* *Report by the Earl of Munster on the Welfare of Troops in India and South East Asia Commands 1944.* H.M.S.O. Cmd. 6578.

*Meat.* For the European, meat is the basis of his diet, but general world shortage, scarcity of shipping, lack of refrigeration plants and poor internal transport all prevented the issue of fresh meat of a good standard during 1942-3. Local meat only was available and this was generally of very poor quality, being frequently 50 per cent. skin and bone. The animals averaged ten years old when slaughtered and the supply was only sufficient for two or at the most three issues per week. In many areas, particularly east of the Brahmaputra, local supplies were so scarce that no issue could be made and the weekly supply had to be wholly in tins. Meat was beef, mutton or goat, but in the strict Hindu States, beef slaughtering was not permitted and airmen had to exist on an unvaried diet of mutton or bully. Few stations were as fortunate as Jodhpur where the Maharajah supplied chicken or fish from his own resources once each week to all messes!

By the end of 1944 main cold stores had been erected at the ports with subsidiary plants throughout the country near troop concentrations and sufficient good quality imported frozen meat was available for issue at least three times each week to a large proportion of the base troops. Some supplies were flown to the forward troops but insufficient use was made of air transport. Until 1944 the only tinned meat available was bully beef; this was of a very good quality but as the sole meat ration for many months it became monotonous, even when prepared in a variety of ways. Late in 1944 a large quantity of 'M. and V.' (meat and vegetable) was substituted for bully and small amounts of steak and kidney, 'Spam' and Irish stew, up to 6 per cent. of the ration, were imported.

Mention has been made of the diminished quantity of sausage in each ration after cooking. This was at the end of 1944 when the ration had been improved by the substitution of American canned sausages. Up to this time the issue for breakfast was locally tinned 'Soya Links'—sausages manufactured from soya flour and universally disliked, many airmen preferring to go hungry rather than eat them. The bacon ration, at that time four ounces for each man per week, was also tinned and was consistently fat streaky rashers, which meant that only a very small portion could be served at a meal.

*Fish.* Fresh fish, which would have been a welcome addition to the diet, was rarely available except near the large rivers and the sea; the local fish was tasteless and unless cooked with special sauces was not popular. Tinned fish on issue consisted entirely of sardines and herrings which added to the lack of variety because, as previously stated, distribution difficulties resulted in only one of these two being available in any district at the one time. Tinned fish had, however, a very high barter value with the Burmese, who were more than willing to trade goats for tinned fish.

*Eggs.* Indian eggs were very small but were usually readily available. In 1942 the issue was adequate but as the R.I.A.S.C. would not pay the same rate as the local contractors' institute, the market was cornered by them and the issue dropped to an average of  $2\frac{1}{2}$  per man per week. As the R.I.A.S.C. bought in an inferior market, up to 35 per cent. of issue eggs were bad. These eggs were replaced but this did not help the cooks who were liable to be short in their numbers cooked for any one meal. The fact that eggs were rarely supplied in the airmen's mess but that anyone could buy as many as he wanted from the canteen was a constant source of complaint.

*Fruit and Vegetables.* These items, essential for a balanced diet and an important source of vitamins, were inadequate in both quality and quantity in nearly all areas. Because of the climate the local season for vegetable growing was short, from April to June in most areas. Few European vegetables were produced, the main crop being pumpkins, marrows, brinjals and gourds, which were flavourless and unappetising to the European palate. Potatoes were always scarce and fresh greens unknown. There was a similar shortage of fresh fruit; oranges and bananas were plentiful from November until February over most of the sub-continent; pineapples and melons were in fair supply in certain areas, but again the season was short. Because of the world food and shipping situation little tinned fruit or vegetables could be imported and recourse had to be made to Indian tinned and dehydrated food which was of exceptionally poor quality. Potatoes and onions were dehydrated in such a way that on cooking they were quite unpalatable; the tins were mainly of poor locally grown peas and runner beans. The result was that over a large part of the year the diet consisted of the same poor potatoes and beans or potatoes and peas until everyone was heartily sick of them.

Unfortunately, the position was not greatly improved during the fresh vegetable season because owing to poor buying by the R.I.A.S.C., the same Indian type vegetable was supplied every day for some weeks—indeed, reports were common of the only issue for two months being mangoes\* or pumpkins. After the visit of the Dietetic Commission the establishment of Government farms in areas where troops were concentrated relieved the situation a little. The shipping situation had also improved and Indian tinned and dehydrated food was replaced by imported high quality alternatives, but the problem of distribution remained, so that troops everywhere complained of monotony and in certain areas very little fresh food could ever be issued. The Air Ministry dietetic team strongly recommended the issue of 2 oz. of fresh fruit juice to all troops in the theatre and one ounce was added to the new

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\* Mangoes are looked upon by many people as a luxury, but airmen were very conservative and often refused such delicacies.



ration scale produced in 1944, but very little was ever issued and despite the fact that the P.M.O. obtained the support of the D.G.M.S. the ration was never increased to what was considered a satisfactory level, nor was the existing scale issued except on rare occasions.

*Bread.* Local flour was issued but this was always adulterated with 25 per cent. *atta* which made it unpalatable to British troops.\* The flour was consistently musty and full of weevils and the issue bread baked from it in R.I.A.S.C. bakeries was unappetising, sodden and musty and did not keep if not used at once. The state of many of the bakeries left much to be desired, particularly those in the cantonment areas which had been established for years. For instance, the Station Administrative Officer and the Senior Medical Officer at New Delhi inspected the local bakery in 1943 as a result of numerous complaints about the bread. They found the building filthy and grossly fly infested. The comment of the official in charge was : 'I have been looking after this depot for the past twenty years and this is the first occasion I have had any such complaint.'

*Milk.* Tinned milk had to be used in the forward areas, but many base stations used local fresh milk which was supplied either by Government farms or by local contractors and was consistently contaminated and of poor quality. Where a local contractor supplied the milk, as at Jessore, it was collected by the contractor in goatskin or uncovered metal containers from numerous small farms and then heated over wood fires in large open flat pans. The opportunities for contamination can be imagined. The Indian Government Analyst in his report for 1943 stated that 75 per cent. of Bombay's milk supply was adulterated and that its average bacterial content was three times that of London's sewage effluent! This was general throughout the country yet not until October 1945 was 100 per cent. tinned milk on issue.

*Other Foods.* Custard powder and breakfast cereals were available in all contractors' canteens yet were never issued in the rations. During 1944 the Command Catering Officer and the P.M.O. took this matter up with the Q.M.G's. department at G.H.Q.(I.) but were informed that not enough of these commodities were imported to make their issue as rations practicable. When A.H.Q. pointed out that if all stock held by contractors were withdrawn it would allow at least one issue every fourteen to twenty-one days and would help to relieve the monotony of the diet, there was no reply.

The monotonous diet and general lack of taste in locally produced food made the flavouring and spicing of dishes with condiments and sauces important. The issue salt and mustard were Indian produce

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\* Air Ministry Annual Hygiene Report for 1943. (H.M.S.O.)

and barely usable, while vinegar and sauces, although they could be purchased in the canteen, were rarely issued in the rations. Despite repeated complaints no improvement was made and when a Command Supply Officer was established, one of his first actions was to arrange for the supply, through R.A.F. channels, of evaporated salt from the United Kingdom. At a later date he also arranged for a separate R.A.F. supply of mustard.

For the proper storage and preparation of food on a station a plentiful quantity of safe ice was an essential during the hot weather. Except on the cantonment stations this was rarely available until late in 1944, when static and mobile ice plants in some numbers were supplied to the R.I.A.S.C.

To summarise, the diet issued to the R.A.F. in 1942-3 was very poor, lacking in variety, quality and quantity. In 1944 the quality and quantity were improved in the base areas and this improvement gradually spread to the Burma Front; variety was more difficult to provide but it did improve to some extent by the end of the war.

To conclude this section, one of the most welcome higher executive decisions of the war must be recorded. From February until May 1944 some 80,000 troops of all ranks of the Army and Air Force were besieged in the Manipur plain round Imphal. All rations for this force had to be flown in by the transport squadrons, in addition to all the ammunition and technical stores. Food was short and extremely monotonous, consisting of the hated Soya Link sausages, bully beef and tinned sardines, with desiccated potato and onion as the only vegetable. Spirits and beer were unobtainable. When the Dimapur Road was eventually opened in June 1944, IV Corps and No. 221 Group, the controlling formations in the valley, were very insistent that the first convoys through should bring much needed supplies of ammunition. On the arrival of the first convoy of three-ton lorries the load was found to be sufficient fresh potatoes for an issue to all units in the area and one bottle of beer per man. The effect on morale was immense and well repaid any short delay in building up stocks of ammunition.

#### KITCHEN WASTE

Disposal of kitchen waste was by contract, burial or incineration, depending on local circumstances. The Indian contractor has already been described in the section on latrines and little requires to be added here. The system used at Cuttack for clearing bucket latrines, described under 'Conservancy—Latrines' (page 582), applied equally well to kitchen waste and was the most satisfactory. This system ensured that clean, serviceable bins were available each day and that there was minimum soiling of the ground round the cookhouses.

Incineration worked well when there was a competent operator and a serviceable incinerator, but the amount of fuel required—even more than for faeces disposal—was rarely available. Oil-water flash fires proved very suitable for swill burning.

Kitchen waste could be, and often was, buried in the same pits as faeces. The depth of pit did not vary but the length and breadth was altered according to the total quantity of kitchen and latrine waste to be buried each day. Pits should have a cubic capacity equal to one day's waste, for if they are left overnight unsealed at one end, swill will be dug up and scattered by scavenging natives, or dogs or other animals. For a similar reason each lorry load should be well covered and sealed immediately it is dumped.

A well-covered and well-drained swill area within easy access of each cookhouse, an essential in tropical countries, was often lacking on Indian stations and did not become standard until 1945. Apart from the soiling of ground by spillage during normal use, the ubiquitous piedog and jackal knocked over and scattered all the bins during the night. A compound which could be locked also lessened the possibility of refuse bins being 'raided' by scavenging natives. This was always liable to happen, but in Bengal during the famine of 1943 it became a major problem and on some stations a guard had to be put on the swill area during the day to prevent contamination all round the cookhouse.

Plenty of proper bins with tight fitting lids is another essential, but these were often not available in sufficient numbers and much avoidable fly breeding resulted; open leaking tins or even cardboard boxes were used and were always associated with an increased fly population.

In forward areas disposal was usually by burial, but to avoid much unnecessary digging a forty-gallon oil drum made into an incinerator was used to burn much of the combustible waste as soon as it left the kitchen. It was essential, for the reasons already stated, that the cookhouse staff should bury all the day's waste before going off duty.

Tins, of which there were always large numbers, were a potent source of fly and mosquito breeding, and it was made a rule in 1943 that all used tins should be burned and flattened before removal no matter what method of disposal was used.

Occasionally, kitchen waste was disposed of into Otway pits, but this misuse of the pits not only interfered with the normal liquefaction process but resulted in the pits filling so rapidly that new ones were continually being required—a great difficulty with the shortage of labour. At one radar and fighter control unit in Imphal, during the siege, two airmen were employed for three days in constructing a large and well fly-proofed Otway pit on the only suitable site near to the camp. This pit would have dealt with all the latrine waste from the unit for many months, but on the medical officer's routine visit, only seven days

after it was first used, it was found to be three-quarters full of kitchen waste including a large number of uncrushed seven pound tins. Labour had to be withdrawn from other essential work to construct another pit on far from suitable ground.

#### MORALE AND WELFARE

##### CANTEENS

In Ceylon the canteens were run by the N.A.A.F.I. and were neither better nor worse than in any other area. Sufficient has been said about N.A.A.F.I.'s part in the war and nothing need be added here.

In India, years of usage had firmly entrenched the Indian Canteen Contractors Board, an association of Indian Contractors who provided all canteen, tailoring, laundry, shoe repair and allied services to the Armed Forces. Though the existence of such an organisation assisted the smooth running of stations new and old it possessed the obvious disadvantage inherent in any organisation which has a virtual monopoly.

The services given varied very much from station to station, ranging from good to bad, and in all instances it was very necessary for careful supervision to be maintained; it was particularly important, where food was involved, to ensure that native employees did not adopt sanitary habits which would be dangerous to the entire camp. No equivalent of the N.A.A.F.I. 'break wagon' was used but each station had a number of '*char wallahs*' who carried round the sections a coke-heated bucket of tea and a large tin box containing assorted bread roll sandwiches and cakes. These wandering mobile canteens required very careful and continual surveillance.

Canteen stores, when available, were cornered by the contractors' association, but in 1942-3 especially they were very scarce, the essentials being unobtainable for several months at a time. At one period in 1943, for example, writing paper was virtually unobtainable throughout India; this may seem a trivial matter, but it was the cause of much domestic strife and acrimonious discussion with relatives at home when paper did become available and must therefore be regarded as having a considerable effect on morale. Later in the war the importance of ensuring adequate provision of such commodities was realised and the Welfare Branch took a hand in their distribution. It is stressed, however, that the supply of these stores should always receive careful attention in the planning of a campaign; the difference such planning makes to morale can be seen by comparing morale in West Africa with that during the invasion of Europe (*see* Chapters 7 and 10).

In the forward areas, apart from Church Army Canteens, which were to be found in some of the worst areas, units had to make their own arrangements for the supply of canteen stores; the success of such schemes varied with the efficiency and morale of the unit and depended

largely on what resources were available in the surrounding districts.

Beer was generally scarce except in the very few areas near an Indian brewery. The supply was rationed to a monthly issue from Service sources, which in the early days was usually two or three bottles per man. By 1945 this had risen to eight to ten bottles each, although not all units received this amount. The supply was drawn in bulk and issued to each man on the day of receipt, with the result that one day a month each unit had a large number of beer parties in billets and tents followed by a 'dry' spell for the rest of the month. The popularity of the teetotallers on such occasions can be imagined! Scotch whisky and English spirits were also rationed and were supplied from the same source once a month to each officer and senior N.C.O. Local spirits were available in most areas but were mostly quite undrinkable; certain brands of gin and rum could be consumed, suitably disguised, without too drastic consequences. Except in the area east of the Brahmaputra, mineral waters were readily available, but constant supervision of their manufacture was essential.

Confectionery and sweets were generally scarce and when available were highly priced and often inedible owing to the extreme heat and damp.

#### LAUNDRY

Each station had a *dhobi* provided by the contractor. The usual method of washing employed was to soak the clothes in a tank of dirty water and then to 'bash' some of the dirt out and some of the dirt in by beating them against a large stone. The fabric rapidly wore out, the clothes were never properly clean, gradually becoming grimmer and grimmer and, because they were never boiled or properly disinfected, these clothes did much to keep the incidence of skin diseases high. The provision of adequate Service-controlled laundries, mobile if necessary, would have saved much money in replacement of clothing and much wasted man-power due to chronic, debilitating dermatological conditions.\* The position of the hospitals was particularly bad in this respect, especially as huge quantities of linen were used in the nursing of such illnesses as malaria and dysentery.

#### WELFARE

On the original cantonment stations welfare arrangements were good, but the rapid expansion in 1942 saw the formation of many stations where, apart from the operational commitments, so much general administration required attention that welfare was neglected and very little was organised. The situation was appreciated by Air Headquarters

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\* See Section on 'Skin Conditions', page 689.

and in December, 1942 a Command Welfare Officer was established with assistants at Groups and the larger stations. Shortages of various kinds limited the work these officers could do, but gradually, at least on the base stations, conditions improved. Wireless sets (usually battery sets working from 6-volt car batteries and giving very poor service), in the ratio of one for every hundred men, and gramophones were distributed either at concession rates or on the lease-lend principle; sports equipment and indoor games were provided and books supplied to assist in forming station libraries. As electricity supplies were fitted cinemas were opened and Welfare obtained films, although unfortunately these were often very old. E.N.S.A. tours, concert parties and bands were sent on circuit to provide outside entertainment—although it was remarked that, whereas such shows abounded in the base areas, only a very few reached forward areas. A legal advice service was organised and, from June 1943, a monthly 'Welfare Bulletin' was published to keep the troops up to date on all welfare matters including mail, conditions of service, pay, and the thousand and one other subjects in which airmen found problems. Later, in conjunction with the Army, an excellent daily newspaper was published which was distributed by air and delivered with the rations even to the most advanced positions under fire from the enemy.

#### RECREATION

No matter how much or how little was provided by the official Welfare organisation, the off-duty recreation on a unit or station depended on the personnel of the unit. Where the officers were keen and took an interest in their airmen, and where the airmen themselves were resourceful, much could be and was done to make life more pleasant even in the worst surroundings.

An excellent illustration of what could be achieved is seen in the social activities of No. 89 Squadron. This squadron, a fighter unit of some 400 men, had the following societies which met at least once a week: Photographic, Art, Chess, Drama, Wireless and Debating societies for all ranks and three very enthusiastic St. Andrews, Tykes, and Welsh clubs limited to those on the squadron from Scotland, Yorkshire and Wales respectively. Tombola and whist were played twice a week and bridge once. Each week there was an inter-section quiz, calling for a very high standard of general knowledge, and this was attended by at least 80 per cent. of those off duty; the squadron quiz team, which challenged all and sundry, was unbeaten during two years. This squadron also had its own broadcasting station run by the signals section, which broadcast to all billets for an hour at midday and for five hours each evening. Programmes were planned and presented by the airmen themselves and consisted of rebroadcasts of radio

programmes, gramophone programmes ranging from classical concerts to variety, and 'live' talks by squadron personnel. The weekly 'Progress of the War' by the Intelligence Officer and 'Doctor's Delight' by the squadron M.O. were heard by most of the squadron regularly. In addition to these social activities, one of the squadron's officers, a solicitor in civilian life, was available to discuss legal problems as required and the medical officer was in his room for half an hour each evening to discuss personal problems of any kind.

#### MORALE

The factors affecting morale are very complex, but the situation in India and Burma from 1942 to 1945 gave some interesting pointers to their varying importance. Morale was generally very poor in 1942, it improved for a period in 1943, fell again later that year after the failure of the first Arakan campaign and rose again in 1944 as the Japanese were held and finally beaten. From 1943 on it was generally high in the forward areas, but often very poor in the more comfortable and safer base stations—a fact which has been recorded in nearly all campaign areas. The main factors which caused lowering of morale were poor leadership, operational failure, boredom and high sickness rates; living conditions and discomfort had little effect unless associated with two or more of these causes. Personal factors also had less effect than would have been expected or than has been stated by some without experience in the theatre. Poor mail service, bad food and domestic worries about those at home did not appreciably affect the general standard unless one of the above major defects was also present.

Airmen of No. 89 Squadron, mentioned under the previous heading, had no time to be bored, their leadership was good and their morale was always above that of other squadrons sharing similar conditions on the same station. It is interesting to note that this squadron's sickness rate was half that of other squadrons in the same area. Drigh Road and Karangi Creek were two stations on the outskirts of Karachi with similar climatic and working conditions: the accommodation at Drigh Road was worse than that at Karangi Creek, but a medical officer who served at both in 1944 reported that morale was far higher on the former station than on the latter. Little interest was taken in the airmen by the officers at Karangi Creek and there was little or no organised recreation. The same medical officer a few months later joined No. 184 Wing on operations in much worse living and working conditions but found morale far higher than anywhere in the base areas.

In a perverse way the fact that the Forces in Burma had little publicity at home and were fighting in appalling conditions eventually raised morale as the troops acquired a pride in their success without 'ballyhoo' or advertisement.

The rise in morale in 1944 was probably caused more by operational success, better leadership, and lowered sickness rates than by any of the improvements in rates of pay, home leave, mail services and other welfare matters, which followed the visit of the Munster Committee.\*

#### LEAVE

Adequate leave facilities in the North West Hill Stations were provided for the few airmen in India before the war, but the great increase in strengths and the move to new areas in the East and South made these quite insufficient in war-time, even if the transport system had been capable of carrying large numbers of personnel to these hill stations. During 1943 further hill depots were opened, giving accommodation for 220 officers and 2,300 airmen at Lower Topa, Solan, Chakrata and Shillong. It was planned that all personnel would spend two or three weeks of the hot season at the nearest depot, where abundant recreational facilities were provided in an equable climate, but shortage of rolling stock made this plan impracticable and the dreadful travelling conditions, to be discussed later, on the way to and from the hills undid much of the good done by the change. During the next few years the accommodation at the hill depots was increased and a proportion of all ranks spent fourteen days in more pleasant surroundings.

Apart from their function as leave depots, these hill stations served a useful purpose in providing a centre to which convalescents and the chronic sick not requiring immediate invaliding could be sent for leave and further treatment. For example, in the summer of 1944 at Shillong, where 300-400 airmen arrived each week from the Bengal-Assam area, the daily sick parade averaged 120, of whom about 60 required specialist investigation or treatment either as out-patients or in hospital. An average of between ten and fifteen patients were invalided each week.

Leave hostels and hotels were opened by the welfare organisations in the large cities, but high prices put them beyond the reach of most airmen. In the country districts and to a lesser extent in the towns local British residents opened their homes to Servicemen on leave and many officers and airmen spent refreshing weekends or longer in home-like surroundings.

#### RAIL TRAVEL

Apart from the leave parties mentioned above very large numbers of troops had to be moved all over the sub-continent on arrival in the Command, on routine posting, on movement of units and before repatriation. Air travel was impracticable except for the few, roads were bad, petrol short and vehicles scarce, with the result that much of this movement had to be done on the country's network of railways. The

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\* See footnote on page 607.



available passenger rolling stock was sufficient for the normal peace-time traffic but there was no reserve to cover the great war-time increase in passengers. The standard first and second class carriages on Indian railways were equivalent to the older third class carriage at home, but there was little or no reserve of these. The third class carriages were provided with narrow wooden benches only and it was these that had to be used for the bulk of the trooping. The railway system was overloaded with the movement of supplies and ammunition on top of the routine civilian services and, as troop movements were given a low priority, journeys were slow and tedious—No. 79 Squadron took six days to travel 350 miles in 1943, and this was not exceptional. This mode of travelling frequently exposed passengers to infection with malaria, for the gross overcrowding even of special troop trains—sometimes as many as 50 men, with all their kit, to a carriage suitable for a third of that number—did not permit of the use of mosquito nets, and trains often stopped for several hours at night in highly malarious districts. Men slept where they could find space, a favourite spot being a small ledge at each end of the carriage about two feet from the roof, meant for carrying baggage!

Indian cleaning, never very efficient, was made worse by scarcity of sweepers and trains were often filthy. The latrines, which were of the native squat type, had to be cleaned as soon as a train was taken over as they were always fouled.

The provision of rations was difficult and was very unsatisfactory until late in the war. The R.I.A.S.C. provided bulk rations at the station of departure and the Movements Section arranged for boiling water, bread, fresh fruit and ice to be picked up at stations along the route. Unfortunately no troop train was ever on time and these rations were either dumped on filthy platforms or arrived after the train had left. The limited numbers of kitchen cars were usually reserved for civilian trains. Water was always scarce and the water points *en route* suspect, so that a Horrocks test kit was an essential for all troop train medical officers; fortunately boiling water was available from the engine and experience soon showed that it was advisable to brew up tea at all stops to prevent troops drinking unpurified water or Indian drinks. In 1944 a Warrant Officer (Catering) was established at Movement Control, Bombay, with the responsibility for the rationing of troop trains leaving Bombay and this resulted in a considerable improvement in supplies. Bombay, the main entry port, was of particular importance in this respect as large train loads of troops newly arrived in India left for the Burma frontier, a ten to fourteen day journey, each week.

Often the medical officer appointed to such trains was himself new to the country. The results of such a policy can be seen from the following account written by a medical officer whose first job after arriving in

Bombay from the United Kingdom was that of M.O. to a troop train making the transcontinental journey to Calcutta:

'On arriving at the platform, and after making the acquaintance of the Officer-in-Charge, Troop Train, also newly arrived in India, it was discovered that no arrangements had been made for medical facilities on the train, other than the provision of a very sketchy medical kit; evidently the usual method was to take over one compartment and write "M.I. Room" on the carriage side with chalk. No water testing apparatus was supplied, but it would have meant holding up the train to procure one, so we had to proceed without this vital piece of equipment. It was soon apparent that the train was so crowded that men would find it impossible to lie down at night, for even when seated no elbow room was available—in fact, the whole was reminiscent of a London suburban train in the rush hour.

'At Poona the railway gauge became narrower, necessitating a change of trains. The train allocated to us had the same number of carriages as before but they were not so wide; we (the C.O. and myself) therefore refused to accept the train (it was the custom for the C.O. to take train, carriages and appurtenances thereof "on charge") and said we would not move from the refreshment room until one extra carriage had been added and the train cleaned, for it was indescribably dirty. After an hour's argument the C.O.'s demands were met, the men crammed in and the train started at a very leisurely pace which it maintained for the whole journey—a total of 8 days.

'A quantity of stores had been loaded at Bombay, mainly tinned and quite unsuitable for the climate and difficult to prepare in the confined space of the galley on a train. Tea was brewed from boiling water obtained from the engine at the very numerous halts. At these halts it was possible to obtain fresh fruit and even ice cream from enterprising natives, indeed a treat for men straight from the austere rationing at home. Ice was, in theory, to be obtained together with drinking water at stops *en route*, but it was usually a melting mess wrapped in sacking lying on the platform; the origin of the water supply was impossible to check, though Indian officials stated that "it is good, Saah".'

(A warning against eating ices at railway stations, the source of which was not above suspicion, was included in Air Ministry Pamphlet 160, September 1943 and illustrated by the cartoon reproduced in Figure 4 overleaf.)

'The carriages were equipped with net panels which could be pulled up at night as protection against mosquitoes but with very few exceptions these were found to be completely unserviceable.

'After the third day the first cases of diarrhoea were reported; this trickle of patients rapidly became a stream and all medicaments that

might have had any possible beneficial effect were used up, until my position had become analogous to the plumber without his tools.

'On arrival, nearly half the train load of troops were suffering from diarrhoea and heat effects after an eight day journey under conditions that would have tried seasoned troops, let alone men straight from the



FIG. 4. 'Ices are particularly dangerous.'

United Kingdom. A large number had to be admitted to No. 9 R.A.F. General Hospital, to which I had been posted, and my embarrassment can be imagined when I saw rows of men for whose welfare I had been responsible lying in the ward over which I had been appointed medical officer!

The two main lessons from the above are obvious. The commanding officer allowed men to purchase fruit, much of which was soft skinned, from native sources—an act courting disaster—and he permitted the use of water of doubtful origin. Most of the blame, however, must be placed on the authorities for allowing such a responsible task to be undertaken by two officers newly arrived in the country.

It was not until mid-1944 that the executive realised the importance of attaching to all troop trains a medical officer with experience of the country. Even then, little action was taken to ensure that this was, in fact, done.

If conditions were bad on the Service-run troop trains they were much worse for small parties of airmen travelling on the civilian trains. Officers could travel in the first class compartments and feed fairly well on the way, although they were out of pocket at the end of the journey, as the subsistence allowance was grossly insufficient. Airmen were not so fortunate. They travelled in a lower class and meals *en route* cost 2 rupees each, a minimum of 6 rupees a day, but their allowance was only 3 rupees 8 annas. Couriers while carrying letters or stores were given 6 rupees 8 annas, but reverted to the lower rate for

the return journey unless they picked up new letters. From 1944-5, Air Headquarters fought a losing battle with the Government of India Finance Department in an attempt to get this allowance raised to an adequate level; in 1944 the road travel allowance was raised to 4 rupees 8 annas, still totally inadequate, but the rail rate was never raised. The cost of this 'economy' in terms of non-effectiveness through sickness was immense, for malaria or dysentery, either amoebic or bacillary, were the natural *sequelae* to any such journey.

#### CLOTHING

In 1943, with the very great increase in numbers in the Command, the question of clothing and heat effects was studied in more detail. In February, the Chief Defence Officer at A.H.Q. requested permission for the R.A.F. Regiment to wear Australian type felt hats with wide brims in place of topees. He claimed that there was little difference in weight and that the hat did not interfere with the aiming of a rifle as the topee did; he also claimed that the felt hat was more comfortable in the jungle. After some argument this was agreed.

In the forward areas airmen were wearing shirts and shorts without all the 'extras' that the regulations laid down and many were working without hats or in forage caps. A committee was formed at A.H.Q. to consider the whole subject of clothing and reported their findings, which are summarised here:

- (a) The use of topees was entirely conventional and there was no evidence that they were necessary; at the same time, without a topee the effect of glare must be borne in mind.
- (b) Troops were more comfortable in open shirts and shorts and the actinic effect of the sun's rays was probably prophylactic against prickly heat and other skin conditions. Between dusk and sunrise, however, the prevention of mosquito bites must be considered of first importance.
- (c) Troops newly arrived in the Command needed to become acclimatised to the fierce sun.
- (d) It was stressed that the U.S.A.A.F. left the matter of clothing worn in India to the good sense of their men, with no apparent ill effects.

The committee also made the following recommendations:

- (a) The wearing of hats should be made optional except for parades and similar duties; tinted glasses to be issued to all those working in the open.
- (b) Shirts and shorts could be worn, if desired, between dawn and dusk.
- (c) A careful watch should be kept on all new arrivals with regard to (a) and (b) to ensure that these measures were adopted gradually.
- (d) As conditions varied so greatly from place to place throughout the Command, area regulations on clothing should be decided in consultation with the local Senior Medical Officer.

These recommendations were incorporated in new dress regulations.

By mid-1944 the usual dress was shorts with or without shirt or bush shirt during the day and slacks and long sleeved shirts at night. The topee had disappeared from the Service. The head was covered (if a hat was worn) by a forage cap or service dress hat. The R.A.F. Regiment and a few personnel in the forward areas wore felt bush hats. Unfortunately, although 33,500 pairs of tinted glasses had been provisioned, very few were available and many of those that were issued were of inferior quality.

Problems were arising in the operational areas however. Conditions beyond a man's control might prevent him changing into slacks at dusk and in any event slacks were more satisfactory than shorts for daytime wear in the jungle or in scrub. The Army forbade shorts beyond the Brahmaputra but the R.A.F. allowed them to be worn except in a few restricted areas where scrub typhus was endemic. In August 1944, the War Office and Air Ministry prepared and accepted a standard type of light-weight battledress in jungle green for the use of all operational troops in this theatre. The issue of bush hats was authorised for all ranks in the Bengal-Burma area.

#### WORKING CONDITIONS AND THE WEATHER

The conditions under which airmen had to work in repairing and servicing aircraft in the open inevitably exposed them to very high temperatures, and in cockpit and fuselage temperatures between 140° and 160° F. were not uncommon. The provision of shade was difficult and cumbersome and attempts were therefore made to find some method of lowering the temperature inside the aircraft. In 1942-3 when electrical generators were in short supply, canvas wind ducts, as employed on ships, were used with limited success to force air through damp *khus-khus* screens. Later small, mobile, imported air conditioning machines were supplied and the Research and Development Unit at Cawnpore devised a simple mobile unit driven by a petrol motor which could be produced locally; however, neither of these two forms of apparatus was ever available except in very small numbers. In Burma the temperature was lower than in India, but in the hot season the dust arising from the forward emergency strips proved most unpleasant; shade was usually impossible to provide during servicing and in the monsoon all personnel worked under very trying conditions.

## Health of the Command

### SAMPLE STATISTICS

The story of preventive medicine in the Command told in the preceding paragraphs will have prepared the reader for the high incidence of disease which is recorded below, but it is paradoxical that many medical officers arriving in this theatre reported that sick parades were smaller and hospital admissions fewer than on stations on which they had served in the United Kingdom. This was true. The sub-continent was large, with great variations in climate and in the prevalence of endemic disease. The Service population was, in theory at least, selected, for every individual had been passed as fit for service in the Tropics. Many of the diseases which were responsible for the hospital admissions showed a seasonal incidence and were rare at other periods of the year. When considering specific diseases it will be possible in some instances to discuss and illustrate this difference. In general it can be stated that a large part of the disability due to disease in the theatre was preventable, as is illustrated by the outstanding drop in the sick incidence for 1945 resulting from action taken following the production of the 1943 and 1944 figures. Much more was possible and it is from the consideration of the high incidence of certain diseases in the Command that important lessons can be learnt which will assist in lessening the risks of disability due to those and other diseases in any future campaign in tropical and semi-tropical countries. The fact that there were 423,756 R.A.F. admissions to hospital between 1942 and 1945 of whom 244,501 were off duty for over 48 hours, and that 12,187 officers and airmen had to be invalided to the United Kingdom in the same period, requires no comment regarding wastage of man-power.

The country was large and communications slow. Letters frequently took three to four weeks by local mail. Many hospital admissions were transferred from hospital to hospital with changes in diagnosis which were not notified. A man might be admitted with one disease and contract another before discharge. The Army, who provided the bulk of the hospitals, used a simpler and less complete method of recording disabilities and rarely used the R.A.F. system in the correct manner. The great increase in strength of the Command found the Medical Statistical Section understaffed and therefore unable to keep accurate records. For all these reasons the statistics recorded below and throughout this narrative are not wholly reliable; they are usually under rather than over estimates, but they give a reasonably accurate picture of the health of the Command throughout the war years. Tables I and II show the admission rates from 1938-1945:

## R.A.F. MEDICAL SERVICES

TABLE I  
R.A.F. Admissions 1938-1945

Year	Total admissions	Average strength	Rate per 1,000
1938	1,456	2,079	700·6
1939	1,576	1,974	793·3
1940	1,631	2,055	793·6
1941	2,380	2,881	826·1
1942	38,787	24,425	1,587·9
1943	98,192	67,718	1,450·0
1944	140,147	96,228	1,456·4
1945	146,630	120,388	1,218·0

TABLE II  
R.A.F. Admissions over 48 hours. 1938-1945

Year	Admissions over 48 hrs.	Average strength	Rate per 1,000	Rate per 1,000 disease only*	Mortality per cent.
1938	865	2,079	416·2	Not available	—
1939	971	1,974	491·9	„	—
1940	1,072	2,055	520·7	„	—
1941	1,615	2,881	560·5	503·6	0·14
1942	23,575	24,425	965·1	882·5	0·57
1943	64,900	67,718	958·4	896·1	0·28
1944	81,268	96,228	844·5	749·9	0·23
1945	74,758	120,388	621·0	564·2	0·21

\* Trauma incidence details are shown in Table IV.

The rise in the admission rate between 1938 and 1941 reflects the expansion of the R.A.F. at home during those years and may have been caused by the replacement of experienced airmen required in the United Kingdom as instructors by recruits new to Service life. In 1942, however, the war in the Far East began and there was a rapid and large increase in the strength of the Command. The lack of planning and other difficulties resulting from this increase have already been described in previous sections; the consequences to the health of the R.A.F. are shown in these two tables. The rate of hospital or S.S.Q. admission nearly doubled and the figure of 882·5 admissions for over 48 hours due to disease in every 1,000 strength speaks for itself.

During 1943, while the hygiene of some base stations improved, the pace of the war on the Burma frontier was quickening and new stations were being opened in that area. There was an appreciable diminution in the total sickness from the high level of the previous year but the incidence was still shockingly high at 1,450·0 per 1,000. The incidence of admissions due to disease for over 48 hours was little changed, the minor increase of 13·6 per 1,000 being well within the bounds of chance. The rate started to fall thereafter and by 1945 the

action taken by the executive to improve measures of prevention and the increased experience of all ranks in personal precautions really began to show, the admission rate for disease falling to just above the 1941 level. It is likely that if the war had continued another year this improvement would have been maintained and the admission rate would have fallen to below the peace-time average. Figure 5 is a histogram showing the alteration in admission rate over these years.

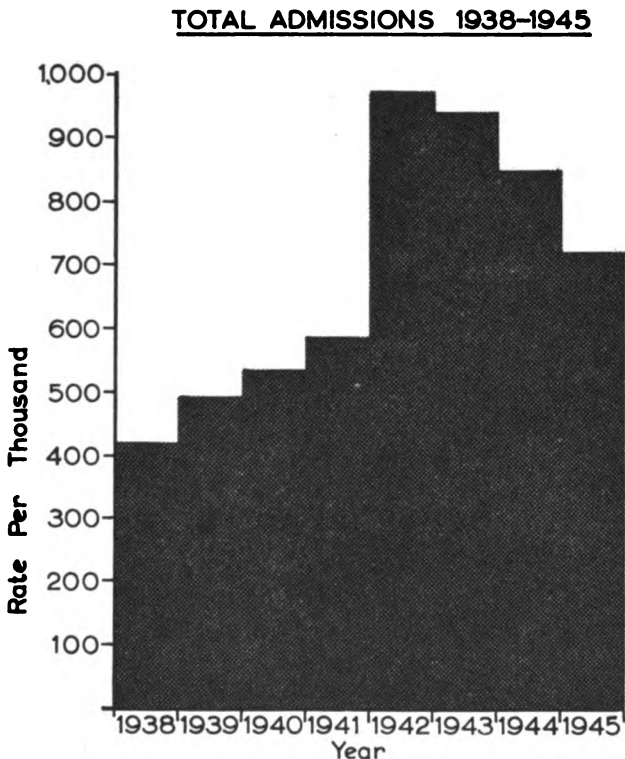


FIG. 5. Total admissions per 1,000 per annum for the years 1938-45 (see Table II, column 4).

The effects of disease as compared with trauma in raising the casualty rates in this theatre are demonstrated by Tables III and IV. With the outbreak of hostilities, necessitating a great increase in flying in all weathers, a speed up in flying training and large numbers of ground crew working at all hours in unusual surroundings, the incidence of trauma would be expected to rise steeply. In 1942 this did happen, the rate per 1,000 rising from 56.92 in 1941 to 82.56. The proportion of the total admissions to hospital for longer than 48 hours caused by trauma, however, fell from 10.1 per cent to 8.9 per cent. Great as was



the increase in the incidence of trauma the incidence of disease rose even more.

TABLE III

*Admissions over 48 hours. Percentages due to Injury and Disease 1941-1945*

Year	1941	1942	1943	1944	1945
Injury	10.1	8.9	6.5	11.2	9.2
Disease	89.9	91.1	93.5	88.8	90.8

TABLE IV

*Admissions and Incidence per 1,000 strength—Trauma 1941-1945*

Year	Admissions	Strength	Rate per 1,000	Deaths	Percentage of mortality
1941	164	2,881	56.92	11	6.5
1942	2,017	24,425	82.58	219	10.9
1943	4,222	67,718	62.30	327	7.9
1944	9,102	96,228	94.59	526	5.8
1945	6,840	120,388	56.80	571	8.3

For the R.A.F. 1943 was mainly a 'holding' year while squadrons re-equipped, and both air and ground operations were minimal. This inactivity is reflected in the incidence of trauma as a cause of disability which fell to 62.3 per 1,000 though still above the peace-time figure in 1941 of 56.92 per 1,000. The proportion of admissions over 48 hours caused by trauma fell to 6.5 per cent. It should be noted, however, that the 1941 incidence related to a small force living in peace-time conditions on a few stations with either a S.S.Q. or a military hospital in the cantonment, and it is certain that many of the patients who were admitted during that year were suffering from minor traumatic complaints which would not, during the latter years, have been considered to require hospital or S.S.Q. treatment. The incidence of 56.92 per 1,000 recorded for 1941 is, therefore, not strictly comparable to the later figures and a truer comparative incidence for that year would probably be between 30 and 40 per 1,000.

In 1944 operational activity greatly increased and a large proportion of the R.A.F. in the Command were stationed in the jungle forward areas; as a consequence the incidence of trauma rose sharply to 94.59 per 1,000. By this stage of the war preventive measures were having an

effect on the disease rates but the proportion of total admissions over 48 hours caused by disease was still 88·8 per cent. By the spring of 1945 the Japanese Air Force had practically disappeared from the skies over Burma and, until the end of the war that summer, air activity was limited to support for our troops mopping up the remnants of the Japanese Army and transport of personnel and stores. This diminished activity is reflected in the trauma incidence which fell to 56·8 per 1,000, less than 10 per cent. of the total casualties.

TABLE V

*Incidence per 1,000—Certain Diseases—1941—1945*

Disease	1941	1942	1943	1944	1945
Malaria . . .	26·0	94·3	145·8	123·3	31·6
Dysentery . . .	32·2	64·4	60·5	67·4	43·8
Infective hepatitis	12·8	21·3	37·5	30·8	17·0
V.D. . . . .	18·3	42·7	41·5	31·6	34·6
Injuries . . .	56·9	82·6	62·3	94·6	56·8
All admissions .	560·5	965·1	958·4	844·5	621·0

Individual diseases will be discussed more fully later, but Table V shows the rise and fall in incidence of the main causes of hospital admission. The results of intensive anti-mosquito action and of increased malaria discipline are obvious. The anti-dysentery work showed results but more slowly. As would be expected the venereal disease rate, which rose steeply and then began to fall, rose again with the cessation of hostilities and consequent garrison duty in reoccupied countries. Simple calculation will show that malaria, dysentery and infective hepatitis were responsible in 1943 and 1944 for over 25 per cent. of all admissions over 48 hours. It should be stressed that the dysentery figures only include those patients with amoebic, bacillary or clinical dysentery and do not include the large number of men treated in hospital or S.S.Q. for gastro-enteritis or diarrhoea.

The crude death rates for the Command over the years 1941 to 1945, given in Table VI, show a very sharp rise in 1942 from 4·52 to 14·08. The rate was halved in 1943, stayed at the same level in 1944 and fell again in 1945 to 5·92 per 1,000. The great increase in incidence of sickness requiring more than 48 hours in hospital during 1942 and the commencement of active operations in the air and on the ground gives some explanation of the sharp rise, but this is not the whole answer, as the sickness rate did not fall to any appreciable extent in 1943. Operations in undeveloped country, a hospital service which could not

TABLE VI  
*Crude Death Rate per 1,000—1941-1945*

Year	Strength	Deaths	Rate per 1,000
1941	2,881	13	4·52
1942	24,425	344	14·08
1943	67,718	500	7·38
1944	96,228	693	7·20
1945	120,388	713	5·92

TABLE VII  
*Breakdown of Crude Death Rate into Certain Groups—1941-1945*

Cause of death	1941	1942	1943	1944	1945
Effects of acute infection	0·35	1·92	1·64	0·87	0·53
	(1)	(47)	(111)	(84)	(64)
All other diseases . . .	0·35	3·19	0·91	0·86	0·65
	(1)	(78)	(62)	(83)	(78)
Trauma . . . . .	3·82	8·97	4·83	5·47	4·74
	(11)	(219)	(327)	(526)	(571)
All causes . . . . .	4·52	14·08	7·38	7·20	5·92
	(13)	(344)	(500)	(693)	(713)

Note: Figures in brackets under the rates show the actual numbers of deaths in each group.

TABLE VIII  
*Crude Death Rates for Certain Diseases 1941-1944*

Cause of death	1941	1942	1943	1944	1945
Malaria . . . . .	0·00	0·69	0·32	0·19	Not available
Dysentery group . . . . .	0·00	0·45	0·37	0·06	
Enteric group . . . . .	0·00	0·53	0·35	0·14	
Poliomyelitis and polio-encephalitis	0·00	0·04	0·17	0·20	
Smallpox . . . . .	0·35	0·04	0·20	0·10	
Other infectious diseases . . .	0·00	0·17	0·23	0·18	
All acute infections . . . . .	0·35	1·92	1·64	0·87	

increase rapidly enough to keep pace with the expansion and a very limited evacuation service to the United Kingdom were more important factors. Table VII, which shows the breakdown of the crude rate per 1,000 into acute infections, other diseases and trauma, demonstrates the relative importance of those factors more clearly. The death rate from trauma rose very sharply in 1942 from 3·82 to 8·97 per 1,000 as would be expected with the start of intensive operations, but the fact that the rate is still much higher than in 1944, when operational activity of all kinds reached a maximum, indicates the absence of efficient and adequate early treatment. The incidence of traumatic casualties in 1942 was 82·58 per 1,000 and the traumatic death rate 8·97 per 1,000, while the similar rates in 1944 were 94·59 per 1,000 and 5·47 per 1,000 respectively. This fall from 10·9 per cent. to 5·8 per cent. mortality (Table IV) is highly suggestive. That other factors were at work is shown by the traumatic mortality rates for 1941, 1943 and 1945 which were 6·5 per cent., 7·9 per cent. and 8·3 per cent. respectively. When the mortality rate for admissions due to disease is considered the trend is more obvious: 0·14 per cent. in 1941 rose rapidly in 1942 to 0·57 per cent., fell again sharply in 1943 to 0·28 per cent. and more gradually in 1944 to 0·23 per cent. and in 1945 to 0·21 per cent. The beginning of a better organised invalid evacuation service late in 1943, replacing the previous limited hospital ship service when very few patients were transferred, was responsible for some diminution in the death rate recorded over the later years, in that certain of the more seriously ill patients did not die in the Command but at sea or in the United Kingdom, but the numbers involved, which are not known, must have been comparatively few. The great increase in deaths due to acute infections was almost entirely due to three diseases, malaria, dysentery and enteric (Table VIII). The success of the measures against these diseases, which are discussed later, is reflected in the fall of the death rate for acute infections from 1942 to the end of the war. The outstanding point in the rates for disease other than acute infection is the very high rate for 1942. It is in this group that the majority of the patients who died in India due to lack of transfer facilities to the United Kingdom are recorded. The very high mortality from heat effects in 1942, to be discussed later, was responsible for 0·7 in every 1,000 deaths, over a quarter of the total for all other diseases (22 out of 78). It should be noted that the rates recorded here do not include those missing or missing believed killed, figures which would affect the total rates and the casualty rates but not those due to disease.

#### INVALIDING

As already mentioned, the transfer of invalids from the Command did not commence on any scale until 1943 and even then, because of shipping

shortages, and administrative chaos throughout the Command, there was nearly always a considerable delay between the date of the medical board and the eventual date of embarkation. Energetic action by the P.M.O. overcame the administrative delays and the opening of the Mediterranean and increases in shipping available overcame the shortage of berths with the result that, from the beginning of 1944, there was less delay between the decision to invalid out of the Command and the date of leaving. Table IX shows the numbers and incidence of invalids over the four years. While considering these figures it should be remembered that because of the factors mentioned above many patients were invalided in 1942 or 1943 but did not leave the Command until 1943 or 1944. Further, as more men became available in 1944 and 1945, invaliding was approved earlier in the course of a disease and for conditions which would have resulted in posting to selected areas rather than invaliding in the earlier years. Table XI, which shows the invaliding rates for certain groups of diseases, clearly demonstrates this fact.

TABLE IX  
*Incidence per 1,000 Strength. Invalidings ex Command—*  
1942-1945

Year	Average strength	Invalidings	Rate per 1,000 per year
1942	24,425	306	12.5
1943	67,718	1,143	16.9
1944	96,228	3,156	32.8
1945	120,388	5,460	45.3

An accurate breakdown of the causes of invaliding before July 1943 is not available and Tables X and XI, which show this breakdown firstly in actual numbers and then as a rate per thousand strength, are, therefore, incomplete; nevertheless, as they contain details of 9,466 of the 10,065 invalidings these tables give a useful index of the main conditions responsible. For reasons already given there tended to be a time lag between the onset of a disease necessitating repatriation and the actual embarkation, and there is therefore some under-estimation of the effects of certain groups in the early years and over-estimation in 1945. The more important of the groups of diseases mentioned will be discussed in more detail in later sections, but certain general conclusions can be drawn from these tables.

TABLE X  
*Invalidings by Certain Groups of Disease*  
*July 1943 to December 1945*

Disease group	1943 July- December	1944	1945	Totals	Per cent. totals
Gastro-intestinal system .	171	750	897	1,818	19·2
(a) Amoebic . . .	71	288	274	633	6·7
(b) Sprue . . .	56	247	220	523	5·5
(c) Other G.I.S. . .	44	215	403	662	7·0
Functional mentals . .	154	562	1,007	1,723	18·2
Skin diseases . . .	57	320	710	1,087	11·5
Respiratory . . .	133	356	497	986	10·4
E.N.T. conditions . .	67	228	344	639	6·7
Eye disorders . . .	20	70	415	505	5·3
Trauma . . .	26	140	285	451	4·8
Genito-urinary . . .	25	100	251	376	4·0
Organic nervous system .	43	124	172	339	3·6
Malaria . . .	10	128	94	232	2·4
Rheumatic infection .	—	108	108	216	2·3
Cardio-vascular system .	2	77	110	189	2·0
Heat effects . . .	5	15	19	39	0·4
All others . . .	137	178	551	866	9·2
Totals	850	3,156	5,460	9,466	100·0

With the exception of amoebic dysentery and sprue, 6·7 per cent. and 5·5 per cent. of the total respectively, the main causes of invaliding were not disabilities due to service in the Tropics but constitutional defects present on arrival in the Command, albeit aggravated by conditions of climate and surroundings in India. Nearly one in five, or 18·2 per cent. of all invalids suffered from functional mental disorders, 11·5 per cent. had dermatological complaints, many of which were present before arrival in the East, 10·4 per cent. were respiratory diseases of which chronic bronchitis and/or asthma made up the majority, and 6·7 per cent. were E.N.T. conditions, chronic suppurative otitis media predominating. All these disabilities were present to a greater or lesser extent before the patient arrived in the Command and many could have been diagnosed as liable to break down by stricter medical examination before overseas posting. A proportion would have

TABLE XI

*Incidence per 1,000 Strength—Invalidings by Groups of Disease—July 1943—December 1945*

Disease group	1943 July— December	1944	1945
Gastro-intestinal system .	5·05	7·79	7·45
(a) Amoebic . . . . .	2·09	2·99	2·28
(b) Sprue . . . . .	1·65	2·59	1·83
(c) Other G.I.S. . . . .	1·31	2·21	3·34
Functional mentals . . . . .	4·55	5·84	8·36
Skin diseases . . . . .	1·70	3·33	5·90
Respiratory system . . . . .	3·93	3·70	4·13
E.N.T. conditions . . . . .	1·98	2·37	2·86
Eye disorders . . . . .	0·59	0·73	3·45
Trauma . . . . .	0·77	1·45	2·37
Genito-urinary . . . . .	0·74	1·04	2·08
Organic nervous system . . . . .	1·27	1·27	1·43
Malaria . . . . .	0·29	1·33	0·78
Rheumatic infection . . . . .	—	1·12	0·90
Cardio-vascular system . . . . .	0·06	0·80	0·90
Heat effects . . . . .	0·15	0·15	0·17
All others . . . . .	4·02	1·87	4·56
Totals	25·10	32·79	45·34

been fit for service in a temperate climate without risk of breakdown, others were certain to break down with any excessive strain or extreme of climate. In time of war, when drafts have to be cleared for overseas in large numbers, often at short notice and by overworked medical officers, it is understandable that many of the examinations should be cursory. It is essential that all medical officers serving at home in any future emergency should have sufficient knowledge of conditions in overseas commands to be able to assess whether some mild disease or previous history of disease is likely to 'flare up' and necessitate a man's invaliding if he is sent to these areas; he should also know the more common causes of invaliding. Chronic infected ears, even if quiescent, chronic skin conditions and respiratory disease might well be an absolute bar to service in a hot climate, while any history of temperamental instability should contra-indicate posting to an operational zone far

from home. Miniature chest X-rays should be compulsory before embarkation to eliminate as far as possible undiagnosed tuberculosis. Further reference will be made to these points when discussing certain groups of disease. The explanation of the great rise in the rate of invaliding for eye disorders in 1945 was an Air Ministry instruction in the spring of that year to the effect that all personnel with monocular vision were to be invalided to the home establishment.

All invalids travelled by sea, either on hospital ship or more usually under the care of the S.M.O. on a troopship, until July 1944 when the Air Priorities Board agreed to accept up to eight invalids each month from all Services for evacuation by air. Patients were to be restricted to those who required urgent treatment which could be provided better in the United Kingdom than in India. In January 1945, a transit pool for all three Services was set up at Mauripur, from which the S.M.O. of that station could call forward invalids on a non-priority basis to fill vacant seats on any Service aircraft leaving that terminal for the United Kingdom. The numbers evacuated under this scheme varied from day to day and were restricted to those not requiring medical attention on the journey. The vast majority continued to be evacuated by sea up to the end of the war.

#### WOMEN'S AUXILIARY AIR FORCE

Members of the W.A.A.F. did not arrive in the Command until the end of 1944, when they were accommodated in specially constructed compounds at the main base centres, New Delhi, Bombay and Ceylon. Little experience was gained in the few short months before the end of the war regarding any particular medical problems raised by the arrival of these women.\* Four women medical officers arrived in the Command to make W.A.A.F. medical care their particular interest. In the light of the limited sickness figures available from the small numbers involved, it appears that while the total sickness rate was high, this was mainly caused by minor disabilities, and the general hospital admission rate was little above the R.A.F. figure. Apart from an epidemic of mild impetigo at Colombo during the summer of 1945 there were no reports of any outbreaks of disease different from the R.A.F. in the same areas. Where of interest the W.A.A.F. sickness figures for 1945 have been added to the tables in the following sections.

### PRINCIPAL DISEASES

#### MALARIA

As in all theatres of the war in tropical countries, malaria was the chief cause of non-effectiveness until it was brought under control by preventive measures, as is shown in Table V. The death rate is low when

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\* See R.A.F. Volume I, page 452.



the disease is adequately treated and it was not a common cause of invaliding (see Table X). But in the absence of fully implemented preventive measures there is no greater menace to armies in the field in malarious surroundings. History provides many examples of its disastrous effects.

Table XII gives the admissions and deaths in numbers and in rates per 1,000 per annum for each year of the campaign. These figures show the high prevalence of the disease in the absence of adequate preventive measures as in the years 1942-4. The results achieved when anti-malaria discipline was more fully established are seen from the figures for 1945.

TABLE XII

*Malaria*

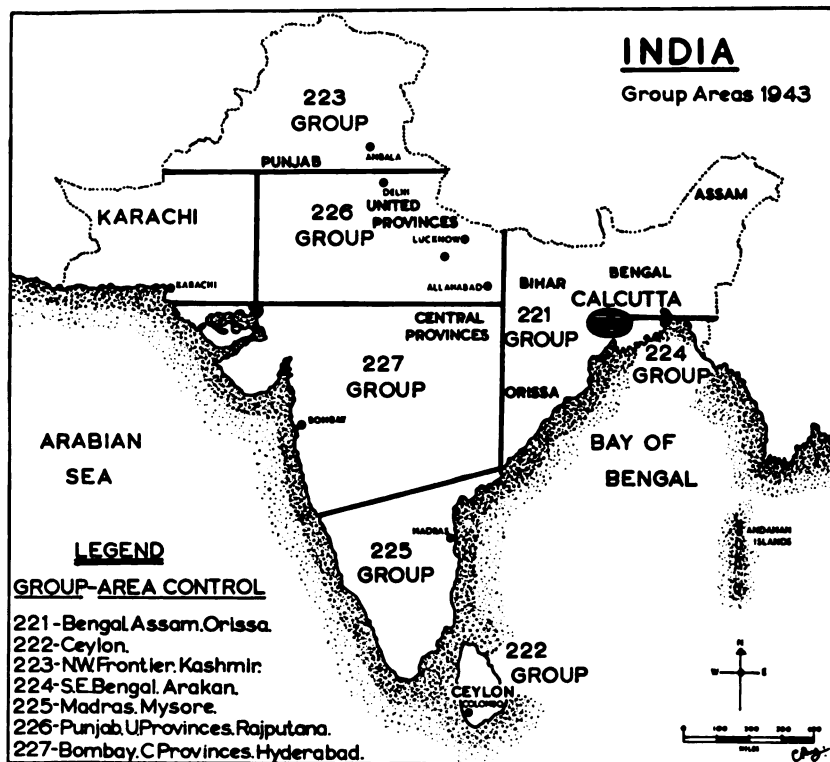
*Admissions, Admission Rate per 1,000 Deaths, Crude Death Rate—1941-1945*

Year	Strength	Admissions	Admission rate per 1,000	Deaths	Death rate per 1,000
1941	2,881	75	26.0	Nil	Nil
1942	24,425	2,303	94.3	17	0.69
1943	67,718	9,868	145.8	22	0.32
1944	96,228	11,865	123.3	19	0.19
1945	120,388	3,804	31.6	Not available	Not available
W.A.A.F. 1945	1,351	16	11.8	Nil	0.00

Much has already been written about malaria in this volume, particularly in Chapter 7, West Africa, and therefore, although this disease was responsible for so much of the sickness in the Command, it is only considered here in relation to the specific problems arising in India and Burma. Methods of treatment, which followed a similar pattern in all theatres, will not be described here and details of anti-malaria measures will only be discussed when they differ from those in West Africa, to which narrative reference should be made for more technical details of both prevention and treatment.

With the exception of a few small areas the disease was endemic but changes in climate and topography had a considerable influence on the numbers, varieties and breeding habits of the mosquitoes and on these differences depended the proportion of malaria in the civilian inhabitants and the variety of mosquito responsible for its transmission. A study of the histograms in Fig. 6, Malaria Rates by Groups, 1943,

taken in conjunction with Map 2, will show how the R.A.F. incidence varied from one area to another, and even within quite small areas. For example, No. 222 Group's administrative activities covered



MAP 2. India. Group Area Control, 1943.

- |     |        |                                       |
|-----|--------|---------------------------------------|
| 221 | Group. | Bengal-Assam-Orissa.                  |
| 222 | „      | Ceylon.                               |
| 223 | „      | North West Frontier. Kashmir.         |
| 224 | „      | S.E. Bengal. Arakan.                  |
| 225 | „      | Madras. Mysore.                       |
| 226 | „      | Punjab. United Provinces. Rajputana.  |
| 227 | „      | Bombay. Central Provinces. Hyderabad. |

the whole of Ceylon which could be divided into three zones: the south-west quadrant was very wet and malaria was practically non-existent; north and east of this was an intermediate zone with a small incidence; the remainder of the island was dry but in the early months of the year *A. culicifacies* bred in large numbers and the malaria rate was high, although the cases were nearly all from the same five stations in this zone. The incidence was highest in the provinces of Assam, Bengal and Orissa, where the disease was universally endemic. In these

Provinces two species of anopheline were mainly responsible as vectors: in the plains *A. philippinensis* which bred in numbers after the monsoon; in the hills *A. minimus* which bred, particularly at the lower altitudes, all the year round. In the low hill areas in South-east Bengal and in the

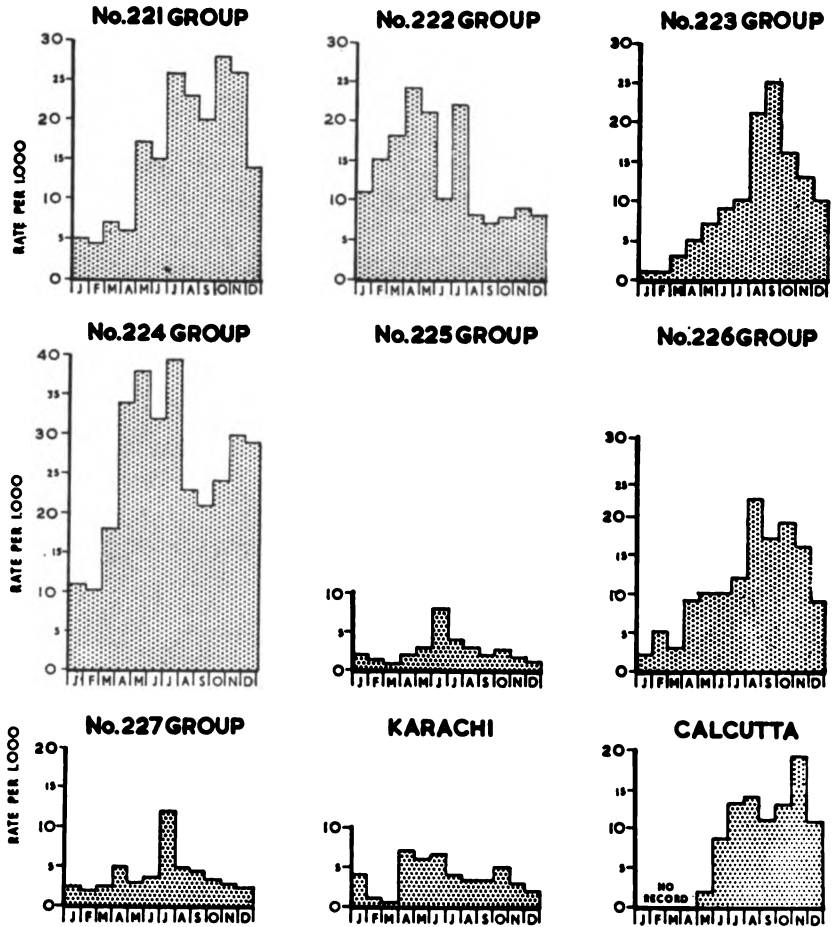


FIG. 6. Malaria rates by Groups, 1943.

Arakan both mosquitoes were found breeding in numbers. As the histogram indicates, the incidence in the remaining Groups was lower although still relatively high in a belt across the centre of the country and smaller in the south and in the north-west. The vector varied from place to place in these Groups, no species predominating.

Prior to 1942 the few R.A.F. stations in India were long established and had efficient anti-malaria schemes. The errors in siting new stations during 1942 have already been discussed; the failure to obtain

medical advice before constructing these camps was responsible for much of the great increase in malaria during that year. Stations were built close to and often inter-mixed with Indian villages, where malaria was hyperendemic, with no attempt to determine and control the vector; in fact, the policy of wide dispersal and of building among trees and shrubs made control practically impossible. On the plains of Bengal the ground was low lying, intensely cultivated and liable to flooding during the monsoon. The few sites where the ground level was slightly higher were all occupied by native villages, yet it was in this area that many operational stations had to be sited and constructed at top speed, often being occupied before completion and lacking anti-malaria plans, labour or stores. The size of the problem on these stations can be gauged when it is reported that the spleen rate in the surrounding villages was consistently high, sometimes reaching 70 or 80 per cent. and occasionally 90 per cent.

The P.M.O's. department at A.H.Q. was aware of the problem and had prepared sufficient anti-malaria pack-ups for all new stations. Unfortunately one result of the divorce of the P.M.O. from A.H.Q. until 1942 was that his staff had little knowledge of the Administrative Staff's plan and did not know until the last minute when stations were being opened. Pack-ups were then despatched immediately, but such was the disruption and delay on the railway system that it was usually three or four months before the stores arrived at their destination. This delay was aggravated by the civil disturbances in the autumn of 1942 when armed escorts had to be provided for all stores sent by rail.

#### ANTI-MALARIA COMMITTEES

Another of the P.M.O's. answers to the problem was outlined in an Air Force Order (India), issued in July 1942, which instructed all station commanders to form an Anti-Malaria Committee consisting of the station commander himself as President, the officer in medical charge, the senior equipment officer, the District Civil Officer, the civilian Medical Officer of Health, and any other officer or civilian who might be involved in any plans the committee might make or who might assist in any way. This committee was to meet at the discretion of the C.O., but the order laid down that it must be convened (i) when a station opened, (ii) one month prior to the commencement of the malaria season to consider the proposed schemes, (iii) six weeks to two months after the start of the season to review the plans and remedy defects and (iv) two months after the end of the season to review the last season and to plan for the next year. A copy of the minutes of all meetings of the committee were to be sent to the P.M.O. and to the Group S.M.Os. for information.

The formation of these committees clarified the position and plans were made to prevent the recurrence of such a high incidence on stations in 1943, but it was one thing to make plans and quite another to carry them out. The first difficulty was the recruitment of the required labour force. Except in the cantonments local labour was scarce and in Bengal and Assam, for example, where labour was available, it was liable to disappear at the first sign of enemy action. The solution, as for other duties on which civilians were employed, was to form a corps of enrolled followers who would fill established posts on stations and who could be posted from unit to unit as conditions required; accordingly each station had a certain number of enrolled followers for anti-malaria work. Later, when labour was even more scarce, some of these followers were transferred to Group establishment, so that the S.M.O. had still more freedom to move them as necessary.

#### VILLAGE CLEARANCE SCHEMES

In July 1942, the P.M.O. proposed that villages within the bounds of or contiguous to R.A.F. stations should be evacuated if efficient anti-mosquito and anti-dysentery control was to be achieved.

The cartoon reproduced in Fig. 7 below is extracted from the Air Ministry Pamphlet 160 previously referred to:



FIG. 7. Flies breeding in manure and rubbish, also dust and dirty hands may contaminate food with the germs of dysentery, etc.

After consideration at a very high level it was decided that such action would antagonise Indian opinion at a time when Congress was organising a civil disobedience campaign; that it would be impossible to protect stations against arson on the part of disgruntled villagers roused by Congress agitators; that the presence of villages improved the camouflage of operational stations; that the villagers formed a useful

source of casual labour; and finally that the cost of compensation would be more than the financial situation would permit.

After prolonged discussion between A.H.Q., the Finance Department, the War Department, the Political Department and the Provincial Governments it was decided in October 1942, to institute a complicated scheme of anti-mosquito and sanitary work in selected villages near R.A.F. stations. Villages were to be selected in consultation between the R.A.F. and local Public Health Departments, the work was to be carried out by the Provincial Governments and the Political Department for the Indian States and it was hoped to enlist the co-operation of the villagers. The R.A.F. were to have powers of inspection. The total cost was to be borne by the Government of India who agreed that up to Rupees 6,000 (£450) might be spent each year on each airfield or station in rural areas. In special instances sanction would be given to exceed this sum if a satisfactory case was presented.

By April 1943, it was apparent that the scheme was not working as envisaged and with the near approach of the malaria season practically nothing had been done to improve the sanitation of the villages in question. There were two main reasons for this unsatisfactory state of affairs: firstly, the provinces had prepared elaborate and extravagant schemes disproportionate to the size of the problem and irrespective of the proximity of the villages to the R.A.F. stations; secondly, where work had been started, the provinces were unable, owing to world shortages, to obtain sufficient anti-mosquito stores.

A further high level conference considered the problem in detail before the end of that month. One suggestion made was that mobile anti-malaria and hygiene units, similar to those established by the Army, should be formed, but this proposal was turned down for several reasons. It was eventually agreed that the existing scheme must continue, but that the R.A.F. would appoint a Deputy Senior Medical Officer (Malaria) to each Group Headquarters who would agree with the local M.O.H. which villages required action under the system, approve the Provincial Government's proposed plans and review the work as it was being done. The War Department agreed to provide stores, but not equipment, where difficulty was experienced in obtaining the necessary material through civilian channels. In May 1943, Deputy S.M.O. posts were established at all Group H.Qs. in the rank of squadron leader, and two or three S.N.C.Os., according to the size of the Group, were established to assist each officer appointed. These S.N.C.Os. were attached to Army Anti-Malaria Units for training before the end of May.

Soon after their appointment the D.S.M.Os. met at A.H.Q. and decided that, whether or not the existing scheme could be made to work, there were certain villages within the perimeter of R.A.F. stations, as shown in Plate LVIII, or adjoining domestic areas, which

could only be considered safe if they were evacuated. By the end of May, five of the worst villages in Bengal, all having spleen rates of over 90 per cent., had been reported by A.H.Q. to the Central Government War Department, with the request that evacuation of these villages be approved.

Over the next six months many political and financial objections were raised and demands were made for complete sickness returns before the proposal was turned down with the suggestion that existing arrangements be given a further trial. The P.M.O. took the Deputy Secretary of the War Department to the five stations during December 1943, when the promise of at least partial evacuation was given. The Government of Bengal then raised objections and not until after the end of the 1944 malaria season was this partial evacuation carried out, nearly 18 months after the recommendation was first forwarded! Several small hamlets and the worst parts of other villages were finally agreed for evacuation, but never to the extent required.

By mid-1943, the U.S.A.A.F. had taken over a number of R.A.F. stations and constructed others, but their energetic action to clear the surroundings of their camps had had severe administrative repercussions. In June 1943, the Central Government proposed that the control of anti-mosquito work on U.S.A.A.F. stations should be an additional responsibility of the D.S.M.Os. Despite the P.M.O's insistence that he had no powers of inspection in these areas and that whereas the Americans had an elaborate, well-trained staff for such work he had a very small, partially trained staff who already had too large an area to supervise, it was not until the end of August 1943, that it was accepted that the U.S.A.A.F. would deal direct with the Civil and Army authorities regarding mosquito and sanitary control around their units.

After three months, at the end of July 1943, the P.M.O. reviewed the working of the amended proposals and found that little practical progress had been made. The Provincial Governments had engaged large staffs and prepared wide schemes, but these had been forwarded to the Central Government for approval without consultation with the D.S.M.Os. and without their approval. The P.M.O. introduced therefore, a Notification *Pro forma* and a Scheme Summary which were to be used for all proposals and which had a section for completion by the appropriate Group headquarters before transmission to New Delhi.

The end of the 1943 malaria season showed the results of all this planning. The incidence per 1,000 of malaria admissions had risen from 94.3 in 1942 to 145.8 and the rate in the worst groups (Nos. 221 and 224 covering Bengal-Assam and Orissa) was 209.2 per 1,000. Very little work had been done in the villages, there had been no evacuation and the elaborate system proposed had developed into a

three-cornered wrangle between the Central and Provincial Governments and the R.A.F. with the War Department arguing with all three. Schemes for many stations had not yet been agreed with the D.S.M.O., and although a large number of elaborate and expensive schemes had been forwarded to the Central Government, often covering four or five sheets of foolscap, they were rarely on the official forms and gave no indication that the D.S.M.O. had seen or even asked for them. Where schemes had been approved by the R.A.F. and the Finance Department it was often discovered that the cost of the stores obtained from the Army, often a third of the total, had not been included in the 6,000 rupees allowed. Eventually it had to be agreed that these stores, and in many instances the necessary equipment, would be provided by the Service.

In the late months of 1943, it was obvious that there was no possibility of this cumbersome and complicated organisation doing any effective work on the scale required and authority was requested for the formation of a R.A.F. anti-malaria organisation. After some months of consideration this was agreed and a new post of Deputy Principal Medical Officer (Malaria) was established on the P.M.O's. staff. In May 1944, a lieutenant colonel from the Indian Medical Service (I.M.S.) was seconded to this appointment with the honorary rank of wing commander and the task of organising and training personnel for the required duties was started, but it was too late to have much influence on the incidence of the disease in that year. One of the first actions of the new D.P.M.O. (Mal.) was to request a large increase in the anti-mosquito control establishment and after appearing in person before the committee he was granted 40 additional airmen, 3 civilian officers, 200 civilian inspectors of various grades, 3,000 labourers and 1,420 enrolled followers. These additional men were added to Group establishments in the proportions he considered necessary after consideration of the 1943 and early 1944 malaria incidence.

#### FORMATION OF ANTI-MALARIA CONTROL UNITS

In May 1944, authority was also received for the formation of 2 type 'A' and 6 type 'B' R.A.F. Anti-Malaria Control Units (A.M.C.U.s.). The two type A units, one each for Nos. 221 and 224 Groups, were commanded by a medical officer and were trained in mosquito surveying as well as mosquito control for work with the advancing air forces. The type B units were smaller, with a warrant officer in charge, and were trained in mosquito control only. Several months were required to train the necessary officers and airmen for these units and they were not operational until the end of the year when both the type A units were allocated to the Third Tactical Air Force with 4 of the type B, and the remaining type B allocated to Nos. 222 and 227 Groups. In



January 1945, a further 2 type A and 6 type B A.M.C.U.s. were authorised, but owing to difficulty in obtaining trained personnel these additional units were still not available when the war ended.

When the first of the A.M.C.U.s. became available in December 1944, and with the increased organisation of the station anti-mosquito sections (discussed in later paragraphs), the Provincial Governments were notified that all schemes prepared under the existing system for the anti-mosquito and hygiene control of villages near R.A.F. stations were to be considered obsolescent and that existing arrangements were to be taken over by A.H.Q. as soon as possible.

The following table, comparing the malaria incidence for 1944 with that in 1943, shows how little progress had actually been made in anti-malaria control:

TABLE XIII  
*Malaria, 1943-1945 by Areas*

Area	Rate per 1,000 per annum		
	1943	1944	1945
Base Air Force* . . .	72.4	62.9	32.1
No. 222 Group . . .	158.2	72.9	} 30.8
Nos. 221 and 224 Groups	269.2	267.5	
B.H.Q. Calcutta . . .	105.5	103.6	
Whole Command . . .	145.8	123.3	31.6

\* Nos. 223, 225, 226 and 227 Groups and Karachi.

Apart from No. 222 Group (Ceylon) which is discussed in the following paragraphs, there was no appreciable fall in the incidence. The 10 per 1,000 drop in the Base Air Force was disappointingly small considering that the majority of stations had been in use for two years; an improvement in the rate on stations in the Calcutta area was offset by large numbers in transit and on leave from forward areas who reported sick in the city; the insignificant fall in the incidence of the disease in the operational groups (Nos. 221 and 224) in the forward areas was an indication of the great increase in active operations, the insufficient use of suppressive mepacrine and the poor general malaria discipline.

#### MALARIA IN CEYLON

The fall in incidence in Ceylon (No. 222 Group) from 158.2 per 1,000 in 1943 to 72.9 per 1,000 in 1944 is of particular interest as it demonstrates what could be done to reduce the malaria rate; for this reason a brief account of the situation there will be of value.

The problem in Ceylon was very different from that in India. As the table above shows, in 1943 No. 222 Group had an incidence of malaria second only to the Bengal-Assam Groups (Nos. 221 and 224), but, as stated at the beginning of this section, this high rate was practically confined to the five stations in the dry zone in the north-east. Of these camps, China Bay was sited on open ground, but with no native dwellings within the perimeter; the other four stations were sited in the depths of thick jungle so dense that to stray from the tracks by even a few yards could result in hours of wandering. The local spleen rate in this area was over 90 per cent. but the villages were some distance from the domestic areas of the stations. The principal breeding grounds were large tanks, but fortunately bad drainage was not a major problem.

The main requirement was the clearance of the dense jungle around the immediate perimeter of the stations and efficient oiling of any pools in the vicinity. Labour was the problem, local labour being scarce and lazy, and enrolled followers in such short supply in India that none could be spared. A.H.Q. decided that the necessary labour force should be added to No. 222 Group establishment, as had been done in the Indian Groups, but the Air Officer Commanding protested strongly that this would relieve Station Commanders of much of their anti-malaria responsibility. A visit from the P.M.O. in November 1943, when the whole problem of malaria control was discussed, resulted in the A.O.C. taking a personal interest in malaria prevention. The establishment was added to No. 222 Group pool and the labour found from a variety of sources, with the result that thanks to high level co-operation a great deal was done to protect the worst stations before the onset of the malaria season. While malaria was still a cause of hospital admission in Ceylon during 1945, it rarely assumed epidemic proportions and the incidence again fell to less than half the 1944 figure.

#### LESSONS LEARNT FROM R.A.F. STATION, CHITTAGONG

Brief reference has been made to the difficulties of obtaining sufficient labour to carry out projected anti-malaria work, and an indication given of the problems which arose on the question of payment for mosquito control. Nevertheless, that finance and labour made little difference to the malaria rates unless associated with expert knowledge was demonstrated by the story of malaria at R.A.F. Station, Chittagong in 1943 and 1944, illustrated in the histograms in Fig. 8, page 645.

As stated earlier, the species of anopheline responsible for spreading the disease varied from station to station. The breeding habits of the mosquitoes also varied and unless an accurate survey had been carried out on the surrounds of a station to determine which of the many local mosquitoes were the vectors and what the breeding habits of these vectors were, much money and time could be wasted on work which

made little difference to the numbers of infected mosquitoes in the locality. Until late in 1944 the R.A.F. had practically nobody trained or available to undertake the necessary surveys and stations had to rely on reports prepared by the local D.A.D.H. (Mal.), who already had his time fully occupied in preparing reports for Army formations.

The position at R.A.F. Station, Chittagong was typical of the consequences resulting from this lack of R.A.F. experts. The station was constructed in 1942 on a peninsula about seven miles long and two broad jutting into the estuary of the Karnaphuli River; it was sited close to a densely populated area where the spleen rate was on the average 75 per cent. The land, although raised on the actual airfield site, was nowhere higher than three feet above the tidal flats and marshes and was covered by numerous tanks, pools and borrow pits. Vegetation was profuse and practically uncontrolled. Breeding grounds were available for every type of local mosquito with the exception of *A. minimus*, and both salt and fresh water breeders such as *A. sundiacus*, *A. philippinensis*, and *A. vagus* were very common.

Until December 1943, the malaria gang consisted of two *tindals* and thirty boys under an Indian supervisor at a cost of about 1,200 rupees each month. This gang was totally inadequate and the grant was increased to 2,400 rupees in January 1944 which allowed the gang to be increased to 4 *tindals* and 65 Lascars, although this was still well below the numbers needed. The garrison engineer, on his own authority, supplied 500 Lascars who cleared the denser jungle within the camp bounds and when this was finished left 100 of them permanently at the disposal of the medical officer in charge for use as a labour gang to be employed on any major hygiene or anti-mosquito scheme. These men were used to clear and oil all tanks and pools around the domestic site. In March 1944, an American squadron arrived on the station with abundant anti-mosquito material and authority to spend practically unlimited funds. A further 150 Lascars were engaged at once and by the end of the month another 100 which permitted the area of control to be extended to half a mile around each of the widely dispersed domestic sites.

In all about 1,000 gallons of oil and 400 gallons of kerosene were used each week to cover between 3,000 and 4,000 borrow pits, 500-600 tanks and innumerable ponds and pools. The total quantity of such material used between March and September 1944 was 12,868 gallons Malariol, 2,388 gallons kerosene, 300 gallons crude oil, 91 gallons pyrethrum and 5,758 bottles of anti-mosquito repellent for use by night and dawn workers. Apart from the 91 gallons of pyrethrum, used to spray each billet between 1800 and 1900 hours each day, 1,000 gallons of a 1 : 20 pyrethrum mixture were issued to sections for use by the men themselves.

In spite of this vast expenditure of money and stores, however, the malaria rate, as the histograms in Fig. 8 indicate, rose during 1944 to a higher level than in 1943. No malaria survey had been done and the medical officer in charge, instead of concentrating on the control of the local vector, which had not even been determined, was working empirically on tackling mosquito control in general, a huge task which could not be done efficiently in the circumstances.

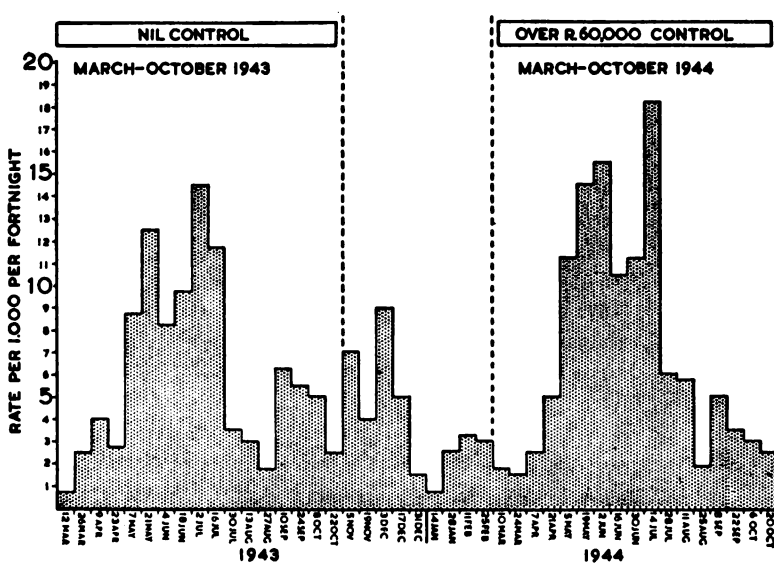


FIG. 8. Malaria incidence, R.A.F. Station, Chittagong. 1943-4.

An example of the difference in results when survey was completed before control was planned can be taken from Kanchrapara in Bengal. This station was on the Hoogli, about thirty miles north of Calcutta, in a densely populated area surrounded by numerous static water tanks, ditches, drains and paddy fields, and having a large lake with marshy sides at one corner of the domestic site. Mosquitoes were very common and catches included many different varieties of anophelines. The malaria incidence in 1944 was 167 per 1,000 per annum. The cost of adequate control of all mosquito breeding in the area would have been prohibitive but in the autumn of 1944 the station medical officer attended a long course on mosquito control which enabled him on his return to determine that the vector in this area was *A. philippinensis*, which bred only in water containing certain vegetation and in particular around human habitations and in marshy ground. It did not breed in ditches or drains nor on paddy fields. As a result, control was concentrated on the vector's breeding grounds and habitat, the other

mosquitoes being ignored. D.D.T. was introduced during that year but other stations in the Group which were also using it did not show the spectacular fall in incidence recorded at Kanchrapara from 167 per 1,000 in 1944 to 37 per 1,000 in 1945. While D.D.T. had a considerable influence on the lowered incidence, the fact that it was used only against the vector increased its value considerably.

Lack of co-ordination between the different Services and with civilian companies wasted much valuable anti-mosquito work. For example, after some fifty miles of ditches and pits had been cleared and trenches dug around one forward airfield at some considerable cost, an Army engineering unit arrived to work on the airstrip just at the start of the 1944 malaria season. Despite numerous protests this unit proceeded to block the channelled trenches with debris from their work, with the result that numerous excellent breeding sites were formed in an area where breeding should have been at a minimum. The lamentable story of anti-mosquito work at Chittagong during 1944 has already been related, but this was not improved when the Burma Oil Company took over a section of the station which they refused to allow the station's anti-malaria gangs to touch and in which they proceeded to dig numerous borrow pits and tanks and to set up a coolie camp for over 1,000 Indians.

#### EQUIPMENT AND SUPPLIES FOR ANTI-MALARIA WORK

In 1942-3, all equipment and stores were scarce and those available were distributed by the Army. When the D.P.M.O. (Mal.) was appointed in May 1944 the supply of all types of anti-mosquito and sanitation stores was chaotic. The Army medical officers who controlled their distribution had little knowledge of the differing requirements of various stations and, rightly or wrongly, many units complained that they were not receiving a fair share. As soon as he was appointed the D.P.M.O. (Mal.) requested that all such stores for use by the R.A.F. be issued in bulk to A.H.Q. whence they would be distributed in the proportions he considered necessary through R.A.F. Equipment Branch channels. This request was refused at first, but was agreed in July 1944 for anti-malaria stores, and for equipment and sanitary stores later in the year.

#### PUMPS

Practically the only pumps available were of Indian manufacture and were hand-driven, which was most unsatisfactory as the bulk of R.A.F. accommodation was *basha* huts. The hand pumps had insufficient power to provide a high concentration of insecticide in this type of building before the mosquitoes escaped into the thatch or through the numerous open spaces in the walls. Large numbers of men were required to spray rooms regularly which meant more airmen supervisors if the work was

to be efficiently done. Moreover, the Indian made hand pump was easily broken and leaked from every seam within a short time. What was required was some form of sprayer with a high penetrating power which would give a high concentration in a few seconds. No insecticide was wasted with such a pump and one airman and one enrolled follower could spray the complete domestic accommodation for a camp of 300 in about an hour.

This requirement was appreciated by the P.M.O. in 1942 and as the Army had no such sprayers available the civilian market in India was approached without success. The All India Institute of Public Health and Hygiene in Calcutta did produce one good spray, but the pump was badly designed and was perpetually breaking down. In October 1942, an order for 100 power sprays from the United States was approved. A further 190 were ordered in January 1943 from the same source, but owing to shipping difficulties the first delivery of ten did not arrive until May 1943. These pumps were sent to the ten worst stations in Ceylon and Bengal. No further pumps were delivered until February 1944 when another 150 were received. In the interval stations were requested to improvise some form of power spray from local resources, which was done with varying success. Kanchrapara, a Maintenance Unit, used a De Villiers motor driven paint spray which proved very successful; other units used dope sprays or M.T. washing sprays powered by motor or foot pumps of every conceivable kind. The difficulty was that many of these improvisations could only be used when they were not required for their primary purpose.

#### INSECTICIDES, D.D.T. AND SPRAYING

D.D.T. was not available in 1942 and 1943 and the insecticides and larvicides which were issued had to be used with economy. Paraffin was rationed to the civilian population.

The first general issue supplies of D.D.T. were received in the Command in October 1944 and were issued to Third Tactical Air Force and No. 222 Group where the need was greatest. By the start of the 1945 malaria season the supply was sufficient to permit issue to all units. In May 1944 a conference was held at A.H.Q. to consider trials on the use of D.D.T. by spray from aircraft. Preliminary tests on drop-let size and spread were completed in June and the first station area to be sprayed was Cuttack, a hyperendemic area in Orissa, to be followed by Jessore, in Bengal, where there had been 411 admissions from a strength of 1,500 in the year ending June 30, 1944. Later the trials were extended to Imphal in the forward areas where the problem of control of newly recaptured ground was causing concern. These trials were encouraging and in March 1945 three Liberators were converted and based at Digri in Bengal to continue them on a larger

scale during the 1945 season. In June 1945 it was decided that this form of control had proved its worth, particularly in newly captured territory and in rough country, and three Indian Hurricane Squadrons were converted for the air spraying of D.D.T.

#### MOSQUITO NETTING AND PERSONAL PROTECTION

Mosquito netting\* for the proofing of buildings was to all intents and purposes unobtainable for R.A.F. stations and very few buildings were mosquito-proofed. Where possible, when buildings were used at night by duty personnel, some type of protection was improvised by the suspension of a specially prepared large mosquito net from a bamboo frame. This was suitable for telephonists and other signals airmen, but many night workers had duties which did not permit this form of protection and prevention in such instances had to be left to good personal anti-mosquito discipline. The importance of this form of protection was stressed by events at Chittagong during 1944. At this station an American and a R.A.F. squadron were sharing similar accommodation and doing similar operational duties. The American *bashas* were efficiently enclosed by mosquito netting, the R.A.F. had none. When the Americans first arrived their anti-malaria discipline was bad while that of the R.A.F. squadron, which had a keen C.O., was consistently good. At first the U.S.A.A.F. had a malaria incidence well above that of the R.A.F. but within a month they had learnt by experience, the anti-mosquito discipline became very strict and the malaria incidence fell to well below that of the R.A.F. squadron. It was thus only when the discipline of both squadrons became high, that the effect of mosquito-proofing on malaria incidence became apparent.

Measures for personal protection caused concern from several aspects. The original issue anti-mosquito cream available in 1942 was greasy and uncomfortable to use, with the result that it was unpopular and was often not used when it was required. The U.S.A.A.F. oil and the later new and improved British creams suffered because of this original unpopularity and until the end of the war the use of repellents was never up to the standard required. Mosquito nets were scarce in 1942 and there was little reserve after the large numbers of new arrivals had been equipped, but the supply position improved by 1943, although there were never unlimited numbers available. When the rapid build up in numbers was foreseen early in 1942, A.H.Q. instructed all stations to hold in their equipment sections a 10 per cent. establishment reserve of such nets. Later in the same year it was found that many men were travelling across India without nets to join their first station, often a journey of from ten days to a fortnight. It was then agreed that a

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\* See Chapter 7, page 351, West Africa.

mosquito net would be issued at the reception station to all new arrivals and held on their personal charge until repatriation. Excess stocks were withdrawn and stations authorised to hold only a small stock for maintenance replacements. Further reference will be made to mosquito nets in the section on anti-malaria precautions while travelling.

Slacks and long sleeves between dusk and dawn had been the regulation dress for many years all over India, but with many officers and airmen wearing shoes this did not give efficient protection to the ankles. Boots and puttees were not standard dress in the R.A.F. and could not be made so, as many airmen were required to clamber over relatively fragile aircraft as part of their duties—work frequently being done at dusk and dawn when malaria-bearing mosquitoes were liable to be feeding. In August 1942, the P.M.O. requested authority for the issue of mosquito boots to all ranks in Assam, Ceylon and certain other named areas where the risk was great, but this was refused. The question was raised again in November 1942, when the P.M.O. pointed out that ankle boots could not be worn by many airmen while at work. He also referred the Government of India to the position in the Middle East where mosquito boots were on issue to all ranks despite the fact that the incidence of malaria there was much less than in this theatre. The request was again refused. In February 1943, while regulations were being prepared for the coming malaria season, the Senior Personnel Staff Officer at A.H.Q. refused to issue orders regarding the compulsory wearing of ankle boots, stating that he could not sign orders which he was certain would not be obeyed. This strengthened the P.M.O's. hand and at the end of that month it was agreed that 60,000 pairs of mosquito boots should be ordered for the R.A.F. on condition that a report on their use was prepared in October 1943, when it would be decided whether issue in 1944 would be justified.

This was a step forward, but difficulty now arose over who was to wear the boots when these were available. Sanction for a general issue was refused and it was proposed that they be reserved for aircrew, but that aircrew in Ceylon be excluded; officers everywhere and airmen aircrew in Bengal Command would hold the boots on personal charge. Despite the P.M.O's. protests that Ceylon had a higher malaria incidence than most of India and his pointing out that aircrew on duty had flying boots whereas ground crews had not and that there was little point in protecting aircrew if there were no airmen left to service their aircraft, the ruling stood. The position became so critical that in October 1943, Air Ministry were signalled direct requesting overriding authority for the free issue of mosquito boots to all ranks of the South East Asia Air Force irrespective of trade or locality. Finally in December 1943 Air Ministry sanctioned the addition of mosquito boots to the clothing scales for the R.A.F. in S.E.A.C. and general issue began.



## SUPPRESSIVE TREATMENT

Prior to 1942, suppressive treatment against malaria had not been required to any extent, but in August of that year, when squadrons began to operate in highly malarious areas, the P.M.O. in consultation with the A.D.H. (Mal.) at G.H.Q. authorised the issue of 5 grains of quinine daily to all ranks in units in Assam and certain other selected areas. Medical officers were advised to watch for signs of altitude intolerance in aircrew. This issue was stopped in October 1942, and little evidence was collected either for or against its use. By the end of that year mepacrine had become available and as the malaria season started in January in Ceylon medical officers of squadrons in that island were advised to hold stocks of the drug, which was to be issued to aircrew in a dosage of two tablets, 0.2 grammes, twice weekly if active operations started. This issue was not required as active operations did not break out. During the malaria season in India in 1943, sufficient mepacrine was not available for both therapeutic requirements and general suppressive issue. All that could be spared after stocks had been reserved for treatment was sufficient to provide suppressive doses for the wireless and radar posts in the highly malarious jungle of the Burma border and the worst districts of Assam and Bengal. These issues were made by the unit medical officer who kept a register of those protected. In September 1943, this protection was extended to the small numbers of officers and airmen who travelled regularly between New Delhi and the forward areas as couriers, on accident investigation, intelligence or similar duties.

There was still insufficient mepacrine in 1944 for general issue although stocks had considerably improved. All operational units in areas where the malaria rate was at all high and stations where epidemics broke out were issued with the drug for suppression, the dosage agreed being 0.2 grammes daily for seven days and 0.1 grammes daily thereafter. Quinine was still used as the suppressive drug for aircrew but trials were started in Calcutta to determine whether mepacrine had any adverse effects on flying efficiency; as a result quinine was replaced by mepacrine for all ranks and trades. (*See West Africa*, page 348.)

Stocks of mepacrine were sufficient by 1945 for all requirements but it was decided that while suppressive treatment would be compulsory for all operational units those in the base areas would only take it when the D.P.M.O. (Mal.) decided that it was needed at their station or because of the nature of their duties. This decision was responsible for considerable correspondence between the Director-General of Medical Services at Air Ministry and the P.M.O. in A.C.S.E.A. All R.A.F. personnel leaving the United Kingdom for S.E.A.C. were started on suppressive mepacrine on Air Ministry instructions, but on arrival in India both at Bombay and at their first unit they were told

that this was unnecessary or that mepacrine was not available, with the result that they stopped taking the drug. Questions were then asked in the United Kingdom about the waste of valuable drugs which this occasioned.

Eventually, the misunderstandings and errors were straightened out and thereafter personnel were told, before leaving home, the reasons for the immediate commencement of mepacrine prophylaxis and were warned that they must not stop taking the drug until they finally arrived at a permanent station where the drug was not used for suppression. At the same time, the reception depots in India were instructed to issue the drug to all new arrivals and to make certain that they continued suppressive treatment until posted. Finally, all stations were notified that personnel in transit would probably be taking mepacrine and that facilities were to be available for them to continue with the drug while in the camp.

Until the later months of 1945, owing to poor malaria discipline and to much adverse, non-official propaganda and lack of positive high level information on the subject, the results of suppressive treatment were disappointing. The drug and suppressive treatment were new to most of the station medical officers and many of the latter did not improve matters by making ill-informed dogmatic statements either for or against the treatment. Personnel were not warned that it was essential to keep the concentration of the drug in the body above a certain level, that about one in every thousand men did not absorb or retain the drug in sufficient concentration to suppress the disease and that B.T. parasites were not necessarily killed by the drug, which must be continued for a time after leaving the malarious area. A further difficulty was the yellow discoloration of the skin which resulted, in a proportion of men, after a period on mepacrine. This 'jaundice' was the subject of a whispering campaign to the effect that it made a man permanently sterile, a rumour which caused concern not only to the simpler minded but also to many intelligent officers and airmen and was responsible for much neglect in the regular use of the drug when ordered.

#### ANTI-MALARIA PROPAGANDA

In 1942 and the first half of 1943 anti-malaria propaganda was limited to routine talks by the medical officers, which were never well attended and which were given in most instances by officers new to the Command who had no practical knowledge of the subject, and a few unconvincing posters which were two to three years old and too familiar to make any impression. There were a limited number of pamphlets available, but these had been written for the Army and had little psychological appeal to the R.A.F. However, in the summer of 1943 a mass of historical, geographical, and statistical information on malaria

was gathered by the P.M.O's. staff and forwarded to the Directorate of Public Relations with a request for posters and pamphlets to be prepared on the subject to suit R.A.F. needs. After some discussion and disagreement with the Finance Department it was agreed that this propaganda was not a problem common to all Services and the production of specific R.A.F. posters and pamphlets was approved. Two different posters and six different pamphlets were immediately put into production and 5,000 each of the posters and 50,000 of the pamphlets were ready for issue in February 1944. Five of the pamphlets were semi-humorous in content with many flying metaphors and much R.A.F. slang in the text. They were illustrated by multi-coloured cartoons. The sixth pamphlet was a letter from the Air Officer Commanding-in-Chief to all officers on malaria discipline (*see also* 'Executive Co-operation'). To follow up this campaign, an anti-malaria poster competition for stations, then for Groups and then for the Command as a whole, was initiated in the spring of 1944; this was introduced in a letter from the Air Officer in charge of Administration to all commanding officers asking for their co-operation. Arrangements were made for the best of the entries submitted to be printed for general issue.

One form of propaganda which was neglected was the cinema. A few film strips were used in certain areas but no routine general showing of any anti-malaria instructional films was attempted. Air Ministry did enquire at the start of 1945 how many instructional films on medical subjects, including malaria prevention, the Command would require, but there was delay in replying and films had not been received in any numbers by the end of the war. The S.M.O. Karachi borrowed certain films from the local Burma Oil Company offices in 1944 and reported that the interest in malaria and its prevention increased a hundredfold after he had arranged for their showing as part of the normal evening cinema programmes on his stations.

#### TRAINING FOR ANTI-MALARIA WORK

Until late in 1944, the R.A.F. had no school, nor indeed any qualified instructors, for the training of medical and other officers and airmen in mosquito control. Officers had attended the Malaria Institute of India at Old Delhi and airmen the All India Institute of Tropical Medicine at Calcutta, but the numbers which could be accepted for training by these schools were small and totally inadequate to meet the requirement. For example only 27 medical officers completed courses in 1943 at Old Delhi. The new D.P.M.O. (Mal.) requested authority to form a school in June 1944, but not until December was a formation order issued and the first courses did not meet until January 1945. This school, No. 3 R.A.F. School of Hygiene, was situated at Ranchi and consisted of both a malaria and a hygiene wing. Courses were planned

and personnel trained for type A and type B, A.M.C. Units and for station anti-mosquito duties. It was planned to have courses combining anti-mosquito control and sanitation for administrative officers, but it was found impossible to relieve these officers from their duties for a sufficient time and no such courses were run.

#### EXECUTIVE CO-OPERATION

Until the 1945 malaria season it was a common complaint from all medical officers that they had little support from the executive in maintaining a high level of malaria discipline. With notable exceptions this was only too true from the highest level down to junior aircrew.\* Much of a medical officer's propaganda and precept was spoiled by the sight of a senior staff officer from Command or Group strolling around the station after dark in shorts and a short-sleeved shirt. This is a constantly recurring theme in medical officers' reports.

Except on squadrons with a keen C.O. the malaria rate among aircrew was far above that for the ground staff. At A.H.Q. New Delhi in September and October 1943, out of 400 officers living in mess, 51 were admitted to hospital or S.S.Q. with malaria, a far higher proportion than among the airmen in the same area. No. 84 Squadron at Khumbirgram, in five months in 1944, had 80 malaria admissions of which one third were officers and a further one third airman aircrew. No ground duties officers were admitted. Such figures could be repeated again and again from many hospitals, stations and units.

The foundations of this disinterest and failure to comply with anti-mosquito regulations were laid in peace-time when A.H.Q. and all R.A.F. stations were well-controlled and when most senior officers spent the malaria season in the hills where the disease was very rare. The attitude of mind was thus engendered that malaria was a disease which required little consideration. The effect on airmen of officers refusing to allow their rooms to be sprayed with insecticide as they did not like the smell of kerosene, or of the anti-mosquito squad being chased out of the officers' mess compound because certain senior officers were disturbed by the noise of the machine, can well be imagined. These were not rare but constantly recurring instances of the difficulties with which medical officers were faced. The P.M.O's. Department found this lack of support from officers difficult to counter. In July 1943, the Air Officer in charge of Administration reminded all commanding officers of their responsibility for the health of their men, but in many instances this made little difference because the officers considered that they knew more about tropical conditions than medical officers only recently arrived from the United Kingdom. The pamphlet

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\* See Chapter 7: 'West Africa—Malaria', page 346.

issued in February 1944 (*see* 'Anti-Malaria Propaganda') signed by the A.O.C. in C. and sent to all officers, was of more value and was followed up in July by the letter below:

From : Headquarters, Air Command, South East Asia.

To: Officers Commanding,

All R.A.F. Units, Air Command, South East Asia.

Date: July 15, 1944

Ref: PMO/1587/58A

MALARIA—MAN-POWER

During 1943 approximately 200,000 Service days were lost in the Air Command due to malaria, of which 18,000 days were lost by aircrews. These figures alone represent a very grave waste of manpower, but in addition there is the incalculable loss due to interference with operations and training and due to the lowering of morale and efficiency of those who have become chronic relapsing cases.

There is thus a vital need for concerted, properly controlled and really effective preventive measures.

2. All Commanding Officers are reminded that, as laid down in King's Regulations R.A.F. para. 44, they are directly responsible for the practical application of all measures for the prevention of disease in the unit under their command. The prevention and control of malaria is not primarily a medical matter, although the Medical and Works services have essential advisory responsibilities.

3. A great deal of malaria has been caused unnecessarily as a result of failure to appreciate properly the local malaria problems, to assess the factors that constitute the malaria hazards, or to devise plans to overcome these hazards.

Much malaria has resulted from failure to take personal precautions against mosquito bites. Gross neglect in this respect can at any time be seen on railways. Neglect occurs also at R.A.F. Stations and Camps in the proper use of mosquito nets, correct clothing and anti-mosquito cream.

4. Even in highly malarious areas the incidence of malaria can be substantially reduced; but this can only be achieved by the strictest anti-malaria discipline.

I must insist that Commanders take a personal interest in this matter of enforcing anti-malaria discipline.

They must see that their officers set a good example, and finally ensure that stern disciplinary action is taken against all ranks who are found needlessly exposing themselves to infection.

(Sgd.) R. E. C. PEIRSE,  
Air Chief Marshal,  
Allied Air Commander-in-Chief,  
SOUTH EAST ASIA.

In fairness, however, it must be stated here that even when officers did give full support, working and living conditions often made discipline difficult to maintain, as two brief examples will show:

- (i) Dawn patrols and 'readiness' meant that many men had to dress, wash and shave when mosquitoes were feeding briskly.
- (ii) Sleep was made difficult in the very hot, humid weather when a mosquito net killed the slightest breeze.

These were among the commoner problems to be considered in addition to the difficulties caused by bad siting. Fig. 9 is taken from Air Ministry Pamphlet 160 already referred to.

The high incidence of malaria during the remainder of 1944, which was paralleled in the other Services, showed that much still required to be done to make anti-malaria discipline effective and early in 1945 the Supreme Commander, Allied Forces, sent a letter to all his Commanders-in-Chief on the subject. Eventually A.C.S.E.A. Administrative Order 51 of 1945 stated that the C.O. of a formation was responsible for the observance of all anti-mosquito and anti-malaria measures (which were detailed in the order) and that neglect of them would be treated as a serious offence. The general standard of anti-malaria discipline improved considerably during 1945.

#### ANTI-MALARIA PRECAUTIONS WHILE TRAVELLING

Many men were infected with malaria while travelling either to the Command or within the Command. Aircraft were ferried to India in 1942-3 by way of West Africa and later by the Middle East. Particularly in the early days the route followed led through highly malarious country and in September 1943, at Karachi, where the journey ended, 30 per cent. of all crews arriving were admitted to hospital with subtertian malaria soon after arrival. Investigation revealed that crews were not briefed on the risks before leaving the United Kingdom, that they had no knowledge of the necessary clothing precautions, that some travelled with no long sleeved shirts or light weight slacks in their kit, and that many had started taking suppressive quinine without being aware of the necessity for continuing the drug regularly throughout the journey. Reports also revealed that crews, who were not issued with a personal mosquito net, often found only nets torn and in holes or no nets at all at staging posts in malarious regions *en route*. Insecticide and repellents were often unobtainable. This unsatisfactory state of affairs was taken up with Air Ministry and the position improved in subsequent years, but as late as the beginning of 1944 crews were still arriving at Karachi improperly briefed and without slacks for evening wear.

In 1944-5 aircraft, especially transport aircraft, on occasions could not return to base at night either because of weather or for operational reasons. The crews of such aircraft would sleep in their plane without

nets and usually without repellents. They also frequently missed their daily dose of mepacrine. This was one reason for a high incidence among aircrew at Abyad in 1945.

Travel within the Command was also responsible for many malaria infections. For instance, No. 3 Hill Depot, Shillong, was in a malaria-free zone, but 38 men were admitted from leave parties with primary malaria during 1942; these men had all been travelling by rail for several days through a region where malaria was hyperendemic and many spent the night before arrival, without any form of protection, at the railhead at Gauhati where the disease was rampant. This story could be repeated again and again.

Travel in India was a succession of journeys from transit camp to transit camp many of which had little anti-malaria control and where discipline was slack. As mentioned earlier troop trains had a low priority and would often spend many hours at night standing in stations surrounded by the lowest type of Indian dwellings. Although all personnel travelling by train should have used mosquito nets at night, this was virtually impossible because of overcrowding, even if nets were available. It was essential that they should have an abundant supply of insecticide and repellent and that anti-malaria discipline be first class; when suppressive mepacrine became common it was necessary to carry sufficient tablets for the length of the journey plus an adequate reserve.

A further problem arising from the malaria risk when travelling is discussed in the following paragraph.

#### TREATMENT

Until the formation of R.A.F. mobile field hospitals in the Command especially in the forward areas where there were few S.S.Qs., many patients were treated in quarters, as the Army hospital organisation was a chain of evacuation back to the base areas. In the section on hospitals, reference is made to the risks involved, under the Army system, of a patient becoming re-infected with malaria on the way back to his unit after treatment and this is borne out by a report from No. 136 Squadron in the Arakan in 1943 of the routine 'travels' for men admitted to hospital with uncomplicated malaria. According to this report, the patient would be admitted to the C.C.S. at Cox's Bazaar and transferred the same day or next morning to the British Military Hospital, Chittagong by road; two days later he would be transferred by rail to B.M.H. Comilla and after a further four days again transferred by rail to B.M.H. Dacca. After a few days in this hospital, if the temperature was normal, the patient would be discharged cured and start back to his unit, often a fourteen days' journey, usually with the few clothes and the little equipment which had been sent to hospital with him. The risks of re-infection on

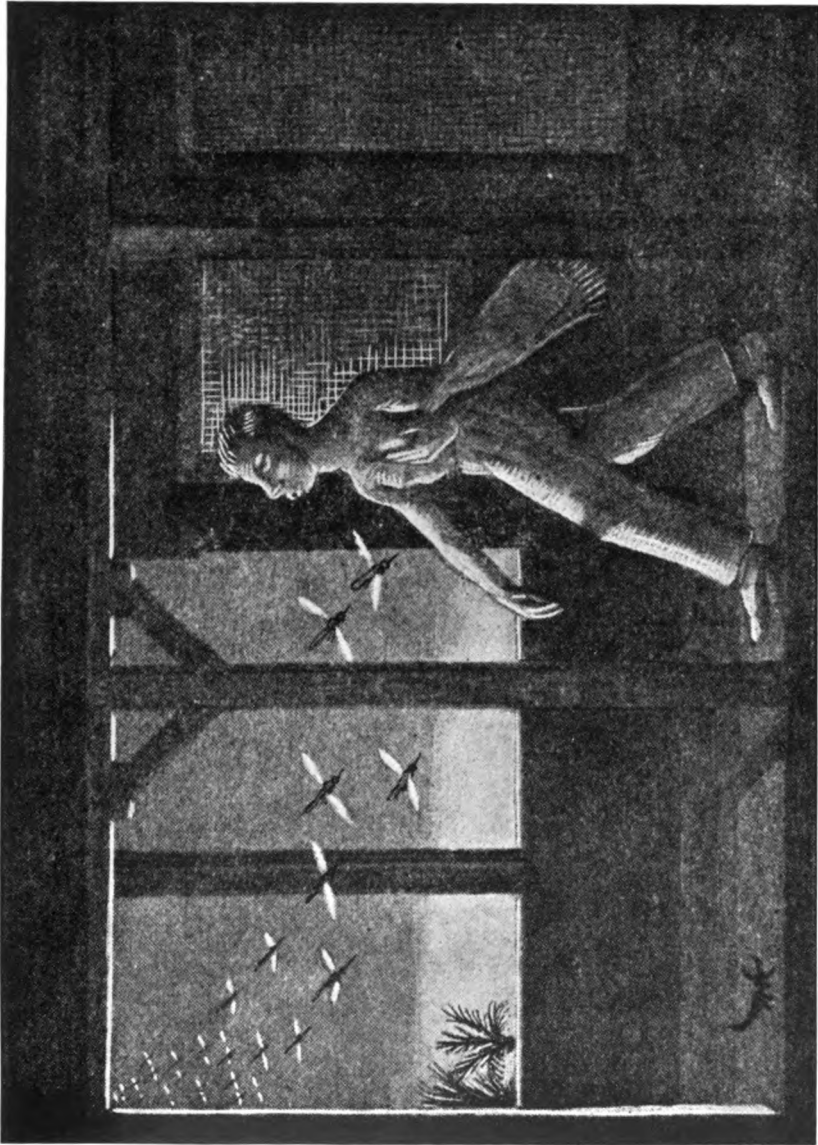


FIG. 9. 'The Dawn Patrol'





this long journey were great, even if the infection had been eradicated, which it often had not, because during transfers medical attendance was often minimal and treatment sketchy, with many missed doses.

When the malaria rate was high, as it was in much of the forward area during 1942 and 1943, if a unit was to be kept operational, the time factor alone made treatment on the squadron essential. If a man was admitted to hospital, he was away from his work for a minimum period of four weeks, if treated in quarters an uncomplicated case would be back at work in 12 days or less. It was impossible to diagnose the disease on anything but clinical grounds on these operational units and the following criteria were laid down regarding hospital admission for patients with fever:

A man must be admitted

- (i) if he showed any signs of mental or cerebral involvement, however slight;
- (ii) if the temperature was above 105° F. or even 104° F. for anything over an hour or so;
- (iii) if there was no reaction to quinine within 48 hours; and finally
- (iv) if there was any evidence of any other complication whatsoever.

Many patients presented the classical signs and symptoms, but medical officers soon recognised that the absence of this typical picture did not exclude malaria. In the forward areas where a microscope was rarely available,\* any patient with pyrexia, no matter how mild, and no other obvious cause, had to be treated as clinical malaria. It was important that cerebral malaria be considered immediately on the onset of any acute mental upset. Most medical officers were misled on at least one occasion, until corrected by some more experienced colleague, when confronted by an apparent acute mania.

A common condition met by medical officers on sick parade was the man who reported complaining of general lassitude and of feeling unwell. There was a characteristic headache, frontal or retro-orbital in site, which was worse in the afternoons and which exhibited periodic improvement and relapse. On examination there might be little evidence of disease. Occasionally mucosal pallor was found; a few had periods of low grade fever in the evenings; about 50 per cent. had slight splenomegaly, but many had no signs of disease whatsoever with the result that they were labelled neurotic or scroungers by the doctor who had not met the condition before. Careful questioning would elicit a history, often some years before, of an attack of fever since arrival in the Command which had been diagnosed as dengue, sandfly fever or

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\* See also Chapter 7: West Africa, pages 335 and 344.

merely labelled P.U.O. Occasionally there was a previous history of malaria. Repeated blood slides revealed malaria parasites in about three cases in ten, but all responded rapidly to a routine course of malaria treatment.

This syndrome was relatively common in all parts of the Command during the war, but as it is rarely mentioned in the text books, two typical histories from the records of No. 24 M.F.H. during 1945 are included here:

- (a) A corporal, admitted in July 1945 for investigation of frontal headaches, was afebrile and had no abnormal signs except a slightly palpable spleen. He had a history of subtertian malaria in 1942, treated in hospital, and of no illnesses since. In spite of eight negative blood slides, he was given a routine mepacrine course with complete relief of the headaches.
- (b) A L.A.C. with two years' service in the Command, but no history of disability, was admitted in the same month complaining of frontal headache starting after lunch and reaching a maximum in the evenings. The only abnormal finding in this instance was a temperature of between 99° F. and 99·4° F. each evening. Again eight blood slides were negative, but there was complete relief from symptoms after a routine mepacrine course.

No consideration has been or could be given to the relapse rate, for the risks of re-infection, particularly in those returning to unit after hospital treatment, were so great that it was impossible to determine which were relapses and which re-infections. The man who had frequent attacks and the patient who did not immediately respond to the routine treatment were given quinine and/or mepacrine in varying dosage depending on their response and on the physician in charge of the ward.

## GASTRO-INTESTINAL DISEASES

### DYSENTERY GROUP

As would be expected from the standard of hygiene on the majority of stations in the Command, the dysentery group of diseases was high in the list of causes of hospital admission. The figures given in the table below tell only part of the story, for the many personnel admitted for a few days with some form of enteritis are not included, nor are the unknown, but certainly large, numbers who were either treated as out-patients or failed to report when suffering from mild attacks.

Some idea of the disability caused by these diarrhoea diseases and the disruption of efficiency which resulted can be judged by the sickness figures for No. 607 Squadron in Imphal from April to June 1944. This squadron of single seater fighters had a strength of around 125 and during the period mentioned recorded 67 patients with acute

TABLE XIV  
*Admissions and Incidence per 1,000 Strength  
 Dysentery Group\*. 1941-1945*

Year	Strength	Admissions	Rate per 1,000
1941	2,881	83	32.2
1942	24,425	1,577	64.4
1943	67,718	4,101	60.5
1944	96,228	6,485	67.4
1945	120,388	5,276	43.8
W.A.A.F. 1945	1,351	49	36.3

\* Amoebic, bacillary and clinical.

enteritis, 18 with steatorrhoea, 5 with bacillary dysentery and one with amoebic dysentery; a total of 91 admissions. While higher than the average this rate was not unusual and could be repeated for other units between 1942 and 1944. Almost all the forms of diarrhoea met were essentially preventable, but the problem was not tackled in the energetic spirit that malaria roused, with the result that there was no improvement in incidence until 1945, when the general issue of D.D.T. which provided a relatively simple method of general control lowered the rate per 1,000. Much more was possible and the 1945 rate of 43.8 per 1,000 could have been considerably lower if the medical branch had obtained the support it should have been given. The apparent lowering in the incidence in 1943 can be explained by the laws of chance, there being no significant difference from the 1942 and 1944 rates.

#### DIARRHOEA

The causation of the symptom, diarrhoea, can be divided into three classes, non-infective, infective and those of doubtful aetiology. The vast majority were infective but a word must be written about the other two before considering this group in more detail.

Patients with non-infective diarrhoea were very rare, only the occasional man with lienteric diarrhoea or diarrhoea with a purely functional basis truly falling into this class. It was the custom to blame diarrhoea in India among British troops on numerous vague circumstances, such as 'change of water'—'change of climate'—'change of diet'—'sleeping under a fan'—'sleeping without a towel over the abdomen'—'too much fruit'—'too little fruit' etc. etc. There may have been some justification for some of these excuses in that it is possible that a change in the non-pathogenic fauna and flora of the intestinal tract occasioned

by purely physical or chemical adjustments might cause transient bowel irritation but the vast majority were purely infective. Some of these 'local' diarrhoeas had become sufficiently notorious to acquire nicknames like 'Delhi belly' or 'Gippy tummy' (as described in other chapters). The infective nature of the diarrhoea could be demonstrated in the case of new arrivals. No. 110 Squadron, for example, received a large draft of airmen, half of whom were sent to one site and the other half to another about a mile away, but having common milk, water and ration supplies and equally exposed to dust. In the first fortnight after their arrival 16 from one half were admitted with diarrhoea compared with two from the other site.

Considerable numbers of patients in the Bengal-Assam area were admitted with a chronic diarrhoea of doubtful aetiology. This disease, variously called para-sprue, chronic infective non-specific enteritis, hill diarrhoea, steatorrhoea or 'Imphal' gut, which on occasion developed into classical sprue, will be discussed in the section on sprue.

#### INFECTIVE DIARRHOEA

The infective diarrhoeas included cholera, enteric, bacillary and amoebic dysentery, and infective enteritis, all with a common method of spread. Cholera and enteric are dealt with separately, but the other three are discussed in this section.

The fundamental method of entry of the micro-organisms responsible for the infective diarrhoeas is through the mouth either by contaminated water or by contaminated food. Sufficient has been written in the section on water supplies in India to confirm that a station rarely had an absolutely safe supply and that even when a domestic supply was safe, through ignorance or wilful laziness unpurified water was used by R.A.F. personnel or their servants for drinking, washing-up, cooking, or for cleaning teeth. Many of the patients with bowel disease were infected in this way and little had been done in 1945 to lower the incidence from this source.

Food might be contaminated at source, by flies or by fingers during preparation or serving but there is little doubt that the last two were the main methods. Not until December 1944 was an Anti-Dysentery Committee set up under the chairmanship of the deputy Air Officer in charge of Administration (A.O.A.) and not until 1945 were any really effective propaganda measures against food infection initiated. The necessity for employing native food-handlers has already been discussed, but it must be stated here that dysentery, particularly amoebic dysentery, could not have been eliminated as a source of disability unless all Indian labour had been removed from cookhouses preparing food for R.A.F. personnel. Owing to shortage of laboratories, the R.A.F. employed Indians on food-handling without a stool test, but the U.S.A.A.F. in

the same area were insisting on a 'Khan' test and several negative stool tests and as a result were discarding 75 per cent. of applicants for employment. Many of the U.S.A.A.F. rejects immediately obtained work for the R.A.F. It was not only the Indian employed as a cook, however, who spread infection, for all cookhouses swarmed with Indians—bearers, sweepers, their relatives, and others—who were willing, and often permitted, to handle food both in preparation and serving, not as official employees but in exchange for food scraps.

Bacterial infections occurred in all grades of severity, from the mild non-specific enteritis to the severe, fatal bacillary dysentery, but accurate diagnosis without extensive laboratory aids was impossible. A severe non-specific enteritis in a debilitated man was often a much more serious illness than a mild bacillary infection in the fit airman; both non-specific enteritis and bacillary dysentery were self-limiting in the latter and cleared in a few days, especially if assisted by a saline purge or a dose of castor-oil associated with a low residue diet; with heavy infections of a virulent strain or in a debilitated, tired man more extensive therapy was required. Sulphapyridine, sulphathiazole and sulphaguanidine were all employed by different physicians who each were certain that their own particular choice was the more effective in limiting the period spent in hospital and in preventing relapses. Several physicians in charge of medical divisions carried out small controlled trials early in 1944 to settle the dispute, notably the medical specialist at No. 62 M.F.H., with results which showed that there was little difference between the three, except that sulphapyridine was more liable to cause unpleasant nausea and vomiting. By 1945 sulphaguanidine was available in quantity and became the more commonly used drug.

It was essential for the more seriously ill patients to remain in bed for the duration of treatment and for action to be taken to improve their nutrition and in many instances to stabilise their body fluid levels. As might be expected, the incidence of bacillary dysentery and non-specific enteritis was higher in the forward areas than in the base stations. Sanitation and messing facilities were of necessity more primitive in these zones, but it was of great importance if operational effort was to be maintained at a maximum level that non-effectiveness be kept to a minimum. For this reason the P.M.O. agreed under protest, that the unit medical officer in the forward areas be permitted to treat patients reporting sick with diarrhoea with a standard course\* of sulphaguanidine, only admitting the patient to hospital if the response was not immediate. This treatment certainly permitted many men to return to full duty, including flying, within a few days, but undoubtedly

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\* Minimum total dosage 60 grammes—maximum 150.

many patients with concurrent amoebic dysentery were denied treatment until later in the course of their infection owing to the masking of their symptoms by this course of sulphaguanidine.

#### AMOEBIC DYSENTERY

The figures given in the section on invaliding (Table X) indicate the size of the problem set by this disease. From July 1943 until the end of the war 633 men were invalided following amoebic infection, by far the highest number for a tropical condition and the largest from any disease group where there was no predisposing factor. Amoebic infection was responsible for 6·7 per cent. of all invalids during this period, a poor record for a disease which was essentially preventable.

TABLE XV  
*Admissions and Incidence per 1,000 strength  
Amoebic Dysentery—1941-1945*

Year	Strength	Admissions	Rate per 1,000
1941	2,881	5	1·7
1942	24,425	414	16·9
1943	67,718	1,626	24·0
1944	96,228	2,500	25·9
1945	120,388	1,650	13·7

NOTE: This table includes only primary amoebic dysentery and does not include relapses or amoebiasis.

Amoebic dysentery is endemic in India and Burma, with a consequent high incidence of cyst-carriers among the civilian population; without doubt the principal source of infection in European troops was from cyst-carrying food-handlers. The proportion of amoebic to bacillary dysentery varied throughout the Command, being 5:95 in the front line, 20:80 in the forward areas, 50:50 in the base areas and 70:30 in Ceylon; but closer study of the statistics reveals that, in fact, the incidence of amoebic dysentery was practically constant between the various areas and that the difference in proportion was caused purely by the great difference in bacillary infection in the different zones.

As already mentioned, the U.S.A.A.F. did not employ Indians on food-handling unless they had three fresh stools negative for amoebic cysts; this standard did not eliminate all carriers of the disease, but it did limit the risk. Comparison of the U.S.A.A.F. and R.A.F. admission rates for acute amoebic dysentery in Bengal-Assam, where the American admissions were less than half the R.A.F. rates at corresponding

periods, suggests that Indian food-handlers were responsible for much of the infection of R.A.F. personnel. The fact that R.A.F. figures for the whole Command show the officer incidence to have been nearly double that for airmen supports this suggestion, for each officer had his individual Indian bearer who served all his food and in some instances prepared it; officers' cookhouses in general were small and insanitary and were staffed almost entirely by Indians; and officers' messes tended to buy more local produce, especially fresh vegetables and fruit, which was then served by unsupervised Indians. The reasons for the higher officer morbidity were therefore obvious and the fact that these reasons remained unchanged until the end of the war although the figures and facts were passed to the executive in 1944 and earlier shows more than anything else the attitude of most officers in the Command to preventive medicine.

Amoebic dysentery presented in two different ways. Many patients presented with an acute diarrhoea of two or three days' duration, the stools containing much blood and mucus, which could only be differentiated from an acute bacillary infection by the microscopic examination of a fresh stool. It was this form of the infection which was so liable to be masked by the uncontrolled use of sulphaguanidine which controlled the acute attack without eliminating the amoebae. A large number of patients, however, were only admitted to hospital and diagnosed as suffering from amoebic dysentery after a long period of vague abdominal upsets, with minor attacks of diarrhoea followed by periods of constipation which were accepted by the individual as perfectly normal in India. Such patients usually had severe loss of weight, were markedly debilitated and were much more difficult to cure, being liable to relapse or to develop chronic amoebiasis. Six months or longer was a not unusual history when the patient was eventually admitted because of debility or in an acute exacerbation.

There was considerable variation in treatment of acute amoebic dysentery in the first few years of the war in the East and not until 1945, with the appointment of the physician at No. 9 R.A.F. General Hospital as Consultant in Medicine, was a uniform treatment used in all R.A.F. hospitals which gave satisfactory results (*see* Fig. 10).

Shortages of drugs, in particular emetine bismuth iodide, made satisfactory treatment with a low relapse rate impossible. No. 60 M.F.H. in Imphal during 1944 was unable to obtain any supplies of this drug from Army medical stores for over three months; when the drug became available supplies were sufficient for only six weeks and when stocks again ran out the drug was unobtainable for some further months. The results of varying treatments published in late 1943 and 1944 by different physicians were admitted by these specialists later to have painted too favourable a picture, for lack of sigmoidoscopes and insufficient follow



up due to postings and unit movements meant that many relapses were not recorded.

The standard treatment which was found to give the best results was spread over thirty days. For the first six days the patient received a subcutaneous injection of one grain of emetine hydrochloride at 2200 hours, after which he was strictly confined to bed for eight hours.

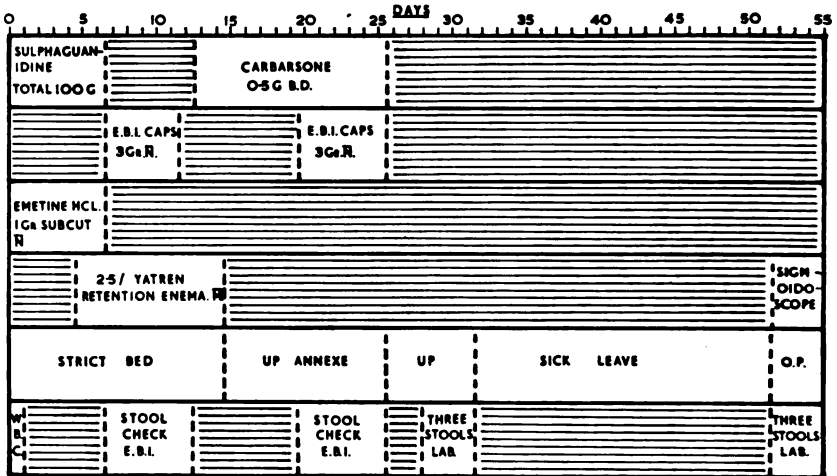


FIG. 10. Chart showing routine treatment for amoebic dysentery.

Over the same six days he was receiving a 100 g. course of sulphaguanidine. From the seventh to the twelfth day emetine bismuth iodide was given in a dose of three grains at 2200 hours on an empty stomach and in association with one grain of phenobarbitone taken at 2100 hours. After a seven day rest this course was repeated from the twentieth to the twenty-fifth day. It was stressed that the stools should be examined each day during E.B.I. therapy to confirm that the drug was not passing through the gut unchanged. A 2½ per cent. Yatren retention enema was given at 1000 hours from the fifth to the fourteenth day following a saline rectal wash-out.

The technique of these enemata was all important. Fifteen to twenty minutes after the wash-out 8–10 fl. oz. of the Yatren solution was given through a rubber tube inserted not more than 4 in. beyond the anus with the patient lying on his left side; the administration had to be slow, taking not less than ten minutes. Thereafter, for periods of fifteen minutes the patient lay on his left side, his back, in the knee-elbow position, and finally his right side. Lastly, lying on his back, he massaged the abdomen in the direction sigmoid to caecum for five minutes. After this exercise he was expected to retain the enema for as long as possible and at least 6–8 hours. From the fourteenth to the twenty-fifth day

carbarsone was exhibited twice daily in 0.5 g. doses. After this prolonged and complicated course the patient had a two-day rest and then fresh stool examinations for three successive mornings. If negative and symptom free he was then sent on three weeks' sick leave to a hill depot or convalescent centre after which he returned for three further stool examinations and a sigmoidoscopic examination.

This sigmoidoscopy was the most useful examination in detecting the quiescent infection and the fact that only No. 60 M.F.H. had a sigmoidoscope until the spring of 1945 was responsible for the discharge to duty of many patients who relapsed within a few weeks. The sigmoidoscope at No. 60 M.F.H. was made by the hospital dental officer, who had a mechanical turn of mind, from old aircraft scrap and electrical fittings.

Until 1945, there was no set standard for invaliding amoebic patients, decisions varying from hospital to hospital and from medical board to medical board. In 1945 however, the newly appointed Consultant in Medicine laid down that the following should be invalidated to the home establishment forthwith:

- (i) any man admitted with a third attack whether relapse or re-infection and no matter over what period;
- (ii) any patient with a severe second attack and any debility;
- (iii) any patient who did not give a satisfactory response to the standard course detailed above;
- (iv) any patient with amoebiasis.

#### SPRUE AND STEATORRHOEA

Classical sprue, that tropical disease of doubtful origin and aetiology but characteristic signs and symptoms, was responsible for a small but steady disability rate, particularly noticeable in 1944 and 1945. A considerable number of cases seen, however, though not classical sprue, exhibited much in common with that disease and the patient was usually labelled as having para-sprue, hill diarrhoea, chronic enteritis or chronic dysentery, although in 1945 the appellation 'sprue syndrome' was most commonly used. The main areas from which these cases were drawn were, in 1943, Bengal-Assam and, later in the campaign, Burma. This protean disability was usually confined to operational units and particularly those which had been for some time on short rations, the patients often having a history of malaria or dysentery. Records from squadrons operating in the Arakan show the following details to have been fairly constant: no difference in incidence between officers and airmen or ground and aircrew; early morning diarrhoea, the first call to stool being particularly urgent; a typical stool of porridge-like consistence, yellow-grey, bulky and offensive and containing undigested meat fibres; blood or mucus usually absent.

Almost all patients complained of minor dyspeptic symptoms—flatulence, ‘acid in the throat’, heartburn, ‘distended stomach’ and belching ‘bad eggs’ being the commonest. Anorexia was common, but not universal, as some had normal appetites. There was a general dislike of fatty foods. Loss of weight was a constant complaint which is well borne out by the records of No. 136 Squadron, the figures below representing the loss over the six months prior to investigation:

<i>Weight Loss</i>	<i>Number of Patients</i>
More than 2 stones . . .	8
1-2 stones . . .	27
Less than 1 stone . . .	16
No loss . . .	5

Certain other physical signs require mention. Most patients were pale, thin and undernourished and about 80 per cent. were of the asthenic type; temperatures were usually normal though a mild evening pyrexia sometimes occurred; all complained of sore tongue and some exhibited ulceration of the mucous membrane; the abdomen was usually distended but painless and no palpable mass was to be found.

From a study of the histories of these patients it is almost certain that unsuitable diet, excess of fatty foods and vitamin deficiency either in the food or in absorption were the main factors in the production of the syndrome. Constitutional factors also played a part, as the asthenic, overworked and debilitated man was most likely to develop the syndrome; this last factor was responsible for some confusion, as patients with untreated amoebic or chronic bacillary dysentery were liable to develop the syndrome as a complication.

Treatment varied from hospital to hospital, the one constant factor being a fat free diet with large doses of vitamin B complex usually in the form of Marmite or Vegamite. Nicotinic acid and sulpha drugs were tried with varying success. Response was invariably slow and relapses common even after a couple of years’ apparent cure, while any dietary or alcoholic indiscretion was often followed by a few days’ abdominal discomfort with pale bulky stools. Treatment always demanded removal to a base area and if the patient was not invalided a very considerable period of non-effectiveness usually ensued.

#### ENTERIC GROUP

Table XVI shows the statistics regarding the enteric group in the Command during the war years. The annual incidence was made up by several small epidemics of 10 to 20 cases in individual stations and a number of sporadic cases, usually on return from a long train journey or a visit to one of the cities; the vast majority occurred in the base areas, as can be seen from the breakdown of the 1945 admissions. Improved hygiene and greater understanding by all ranks of the risks

of infection resulted in a gradual fall in the incidence from 1942 to 1945, the general improvement in 1945 being even greater than the table indicates as nearly 50 per cent. of the admissions during that year could be traced to an infection in the canteen at the Base Reception Depot, Worli.

In spite of thorough investigation the primary source of infection could rarely be traced, but as the disease was endemic and the carrier rate high in the native population this is not surprising. Undoubtedly

TABLE XVI

*Admissions, Admission Rate, Deaths, Crude Death Rate, Case Mortality. Enteric Group. 1941-1945*

Year	Strength	Cases	Rate per 1,000	Deaths	Death rate per 1,000	Case mortality
1941	2,881	Nil	Nil	Nil	0.00	00.0
1942	24,425	44	1.66	13	0.53	29.0
1943	67,718	92	1.36	24	0.35	28.0
1944	96,228	104	1.08	13	0.13	12.5
1945	120,388	105	0.87	Not available		
W.A.A.F. 1945	1,351	4	2.96	Nil	Nil	Nil

## BREAKDOWN BY AREAS 1945

Area	Strength	Cases	Rate per 1,000	Deaths	Death rate per 1,000	Case mortality
India	69,542	91	1.31	Not available		
A.C.S.E.A.	50,846	14	0.27	Not available		

the house fly was responsible for spreading some of the minor epidemics. For example at Jalahalli, a wireless unit near Bangalore, in 1943 there were 18 cases during September; water and milk supplies, all food-handlers and the canteens were carefully checked with negative results, but at that time the messes were very ineffectively fly-proofed and typhoid was epidemic in several of the surrounding native villages.

Typhoid and paratyphoid A, in about equal proportions, were the main types encountered, but a few cases of paratyphoid B were also reported. The type, however, was of little importance as the symptoms, mortality and incidence of complications varied little between the two main groups. Some idea of the complications encountered can be seen from the report on 22 admissions to No. 9 R.A.F. General Hospital, Calcutta, during the summer of 1945: ten were typhoid, nine paratyphoid A and three paratyphoid B; there was one death (below the

average for the Command), two intestinal haemorrhages, one broncho-pneumonia, one infected parotitis, one left-sided thrombo-phlebitis and one generalised alopecia.

Practically all of the admissions during 1942 were new arrivals from the United Kingdom and doubts were cast on the efficiency of the British T.A.B. vaccine against Indian strains. Despite the denial of this theory by the highest authority it was decided in December of that year that all new arrivals in the Command, irrespective of their inoculation state, should be given 0.5 c.c. of Kasauli T.A.B. vaccine at their reception station. This re-inoculation, however, was so unpopular and so time-consuming that it was stopped, with no adverse results, when support was given to the experts' views (on the efficiency of the British T.A.B.) by the inoculation records, reproduced below, of those admitted with enteric fever, towards the end of 1943, in Bengal and at Jalahalli:

TABLE XVII  
*Inoculation Record of R.A.F. Enteric Admissions.*  
*Bengal—1943*

Inoculation state	Patients	Deaths
Protected with Kasauli T.A.B. .	24	4
Protected with British T.A.B. .	20	4
Refused inoculation . . .	2	1
No available records . . .	7	—
Totals	53	9

TABLE XVIII  
*Inoculation Record of R.A.F. Enteric Admissions.*  
*Jalahalli—1943*

Inoculation state	Patients	Deaths
Protected with Kasauli T.A.B. .	7	2
Protected with British T.A.B. .	3	—
One month overdue British T.A.B.	3	1
No available records . . .	5	1
Totals	18	4

#### CHOLERA

Despite the fact that cholera was endemic in Bengal where large numbers of troops were concentrated from 1942 to 1945, the statistics

indicate that the disease never presented a serious problem. During 1943, four cases occurred among patients under treatment for sprue at 47 B.G.H. Calcutta. There was a small epidemic in Calcutta in the spring of 1945; six cases occurred, all officers, traceable to the officers' transit accommodation at the Grand Hotel. All the other cases were sporadic and in no instance was the original source of infection confirmed. The majority were airmen who had just finished a train journey across the country and most of those who could be questioned admitted that they had eaten ice cream or bought mineral waters from an unauthorised native dealer. The very low incidence reflects great credit on the station medical staffs, as many stations had major epidemics among coolies employed by the Works Department.

TABLE XIX

*Admissions, Admission Rate, Deaths, Crude Death Rate, Case Mortality. Cholera. 1941-1945*

Year	Strength	Cases	Rate per 1,000	Deaths	Death rate per 1,000	Case mortality per cent.
1941	2,881	Nil	Nil	Nil	0.00	0.00
1942	24,425	3	0.12	Nil	0.00	0.00
1943	67,718	9	0.13	5	0.07	56.0
1944	96,228	7	0.07	1	0.01	14.3
1945	120,388	11	0.09	Not available		

The four cases in 47 B.G.H. who were also suffering from sprue all died, as did three of the six officers from the Grand Hotel in 1945, but otherwise the mortality rate was not so high as would be expected. Treatment was routine and no advances were made in this field. The only observation of value made by the physicians who treated the small number of cases was that the survivors of the Grand Hotel outbreak required respectively 35, 80 and 81 pints of intravenous saline before this therapy could be stopped, and that those who died were long overdue for re-inoculation.

Early in 1943, when large numbers of airmen were moving into the endemic areas of Bengal and when outbreaks were starting in the contractors' coolie camps, it was decided that all ranks serving in Bengal should be protected every three months by anti-cholera inoculations. This was started in May 1943 and within a month, the immunisation of all ranks employed on escort duty in any part of the sub-continent was added. In October the Officer Commanding the Laboratory at Kasauli, which prepared the vaccine, reported that the demand was

exceeding the supply and that if the requirement was maintained or increased alternative sources outside India would have to be found. At a high level inter-Service conference it was then decided that routine immunisation would be reserved for the escorts who ran the greatest risk and among whom the majority of the cases were to be found. This injection was to be repeated at six-monthly, not three-monthly, intervals. When civilian or Service cases occurred near a R.A.F. station the local S.M.O. was to decide whether all ranks should receive protection or not.

#### VENEREAL DISEASES

##### THE PROBLEM

The V.D. rate before 1942, when the R.A.F. in India was limited to a few cantonment stations in the north-west, was never great and these diseases were not a major cause of non-effectiveness. The small proportion of airmen concerned, often infected by local prostitutes, were usually among those of the older, regular personnel who were promiscuous by habit and inclination. With the great increase in strength from 1942 onwards and men serving all over the sub-continent, particularly at the great sea ports, the incidence rose rapidly and continued high until the end of the war and after. There was a fall in incidence in the later part of 1944 and early 1945, although even then the rate was nearly double that in peace-time, but with the reoccupation of territory and the ending of the war the incidence again rose sharply. The age incidence showed a significant drop, the bulk of those infected being in their late teens and early twenties.

TABLE XX  
*Annual Incidence of Venereal Disease. 1941-1945*

Year	Strength	Patients	Rate per 1,000
1941	2,881	53	18·3
1942	24,425	1,043	42·7
1943	67,718	2,822	41·5
1944	96,228	3,038	31·6
1945	120,388	4,170	34·6
W.A.A.F. 1945	1,251	1	0·8

The relative importance of all the factors contributing to this high V.D. rate is difficult to ascertain, although a large increase was inevitable when the R.A.F. expanded and men had to serve in areas where the

infection rate in the civilian population was between 30 and 40 per cent. and where there was little organised civilian treatment—Calcutta, for instance, had no civil clinics until 1944.

Prostitution was rife and started at an early age. Calcutta was estimated to have between 30,000 and 40,000 prostitutes, but equally important was the large number of willing amateurs, frequently Anglo-Indians, to be found in towns of any size. In the great cities most of the prostitutes inhabited a well defined brothel area which could be controlled to some extent, but there were also many street-walkers and neither in town nor country was the profession a closed shop. Many women were willing to earn an extra few rupees and families could always find some younger daughter to increase the father's income. Away from the towns these young girls were one of the major problems for they frequented R.A.F. stations and required constant control. The local rates were four annas to the enrolled follower and one rupee to the airman. It made little difference to point out to the men that the better types of Indian women would not even talk to British Servicemen, and that the women and girls whom they found so easy to pick up were the dregs of the population and practically certain to be infected with at least one of the venereal diseases.

Certain Anglo-Indian girls were also difficult to control. Many were more akin to European women in appearance, they were naturally more promiscuous, and their main aim in life was to find a British husband who would take them back 'home' to England. While all brothel areas were 'Out of Bounds' they were difficult to control with a limited Service Police establishment, covering, as they often did, a fairly large and warren-like area. Where the civilian police were co-operative much could be done to prevent their use, but unfortunately, this co-operation was not always forthcoming. In Lahore the brothel area was in the old walled city and the civil police were most helpful—for example, any taxi or tonga driver guilty of taking a Serviceman to a brothel had his licence permanently removed. The infection rate at R.A.F. Station, Lahore, was well below the Group average. In Calcutta the very large brothel area had many entrances, the Service police had no legal right of entry and beyond the half-hearted closing of a few of the worst houses early in 1945, the civilian authorities gave little help. In Bombay, most airmen's introduction to the Command, certain sections of the brothel area, while out of bounds, had a certain social tone, as houses like one in Grant Road were used by some officers, not always the juniors, as a club. The example thus set for the airmen, and the difficulties added to the duties of the Provost Branch are obvious.

War psychology with its slackening of moral standards was certainly an important factor. Uncertainty about the future, the prospect of three or four years away from home in a country they disliked, the break-up



of family ties and the absence of decent female society varied in importance with the individual. The sharp rise in 1942 was at first blamed on the poor living and working conditions allied to a lack of welfare and recreation facilities on stations but the rate did not fall appreciably as these improved. It is probable that poor living conditions only increased the incidence when associated with other factors.

#### PROPAGANDA

Throughout the whole period propaganda and instruction regarding the risks of the diseases were poor. During 1942 there were insufficient medical officers to give regular lectures to all personnel and where they were given they frequently became too routine. No sense of urgency was roused by a talk given by a doctor with little experience of lecturing, often ill-prepared, and only attended by a few airmen rounded up from sections where they could be spared. Admittedly, the subject was difficult to present, most medical officers finding it hard to avoid either over-emotional appeals or bald medical statements. Lectures could develop rapidly into bawdy variety-turns. Unfortunately, large numbers of men were infected while under the influence of Indian spirits, notoriously potent, and any lectures, no matter how good, which the airman might have heard, were soon forgotten.

The use of posters and pamphlets for propaganda was neglected. None was available in September 1943 when the P.M.O's. staff prepared several drafts for approval and printing. Only one design of poster had been approved and printed by the spring of 1945. Prudery, disagreement on design and text, refusal to release sufficient paper, all contributed to this delay. The comparison between this one poster produced after 18 months and the rapid printing in the winter of 1943-4 of numerous anti-malaria pamphlets and posters gives some indication of the attitude of higher authority to the high incidence of venereal disease. This is surprising when it is remembered that each man under treatment for syphilis had to attend for 30 or 40 injections, usually at a hospital some distance from his unit, and that each such visit meant at least one day away from his normal duties. The cinema was used to some extent for propaganda, two Army films and an American Army film being shown in all stations at intervals during 1944-5.

#### EARLY TREATMENT ROOMS

Such rooms were rarely used and were useless in preventing the development of infection, as with few exceptions they were dark, badly lit, badly equipped lumber rooms with either no running water or only cold-water taps. Many stations, indeed, had no such room at all. The standard E.T. packet\* was of little use. Most patients claimed to have used it and there seems little doubt that many did, but with little effect.

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\* See footnote, page 673.

By 1945 a small number of American E.T. packets\* of an improved design were issued in the worst areas. In the large cities a number of combined Services E.T. rooms staffed by nursing orderlies were available in the city centre, an arrangement which could have been carried out on a much larger scale. For example, when Rangoon was reoccupied, the incidence of venereal disease was very high, but one factor in lowering this rate was the opening of eight E.T. rooms staffed all night by a nursing orderly and situated near each station guardroom or centrally for groups of units billeted in civilian houses; there was also a central E.T. room in the town and two central Army rooms which airmen could use.

#### CONDOMS

In 1942 the P.M.O. requested authority to issue condoms free on request to personnel in No. 222 Group (Ceylon) where the incidence was high to observe whether this would have any effect on the rate.

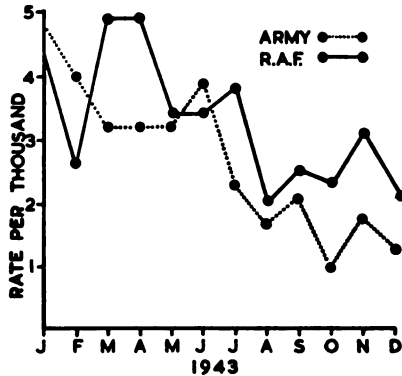


FIG. 11. Graph showing venereal disease rate. Army and R.A.F. Ceylon 1943.

Authority was granted and issue started in March 1943. There was a well-marked drop in the rate per 1,000 of venereal disease in the second half of that year, which would appear at first sight to indicate that the free issue of condoms had a definite effect; but there was an even greater fall in incidence for the Army (*see* Fig. 11) which had no free issue of condoms, although a limited number could be bought by soldiers from the Regimental Fund. Further investigation reveals that other changes took place during 1943 in Ceylon. Propaganda was considerably

\* *Standard (English) E.T. Packet.*  
 Light paper envelope containing:  
 One tube of calomel ointment with pin for perforation.  
 Small piece of cotton wool.  
 Small pledget of soap.  
 Instructions for use.

*American E.T. Packet.*  
 Heavy wax envelope containing:  
 One tube of calomel ointment with pin for perforation.  
 Generous pledget of soap.  
 Gauze tissue.  
 Gauze bag with drawstrings.  
 Instructions for use.

improved by a keen S.M.O. and station commanders were impressed by his advice and gave full co-operation. Living and welfare arrangements were greatly improved. The Government of Ceylon, then a Crown Colony, passed an Act making V.D. notification and treatment compulsory for civilians and the civil police gave the Service police full co-operation in brothel control. Nevertheless, in spite of the uncertain results of this trial the free issue of condoms was extended to No. 225 Group in the spring and to all Groups in the Command in September of 1944.

Fig. 12 shows as histograms the relative incidence of V.D. in the Groups for the years 1943-4 and bears out much of what has already been stated. The large, virtually garrison, towns, such as Calcutta and Bombay, had continually high incidences; No. 225 Group, which contained many areas where the living conditions were particularly bad, shows a not unexpected high incidence and even though conditions were improved in 1944 it was not until free condoms were issued that any marked drop was noted. Of interest are the chasms in the histograms of Nos. 221 and 224 Groups which coincide with periods of intense operational activity. The low figures for Karachi are inexplicable as this area possessed most of the factors considered to predispose to a high incidence. In general, improvement can be seen in all areas in 1944 when the combined efforts to reduce the incidence were beginning to have effect.

TABLE XXI

*Breakdown of R.A.F. Venereal Disease Incidence. 1945  
A.C.S.E.A. Base and Operational Areas*

Area	Strength	Patients	Rate per 1,000
Base . . .	69,542	2,033	29.2
Operational .	50,846	2,137	42.0
Totals	120,388	4,170	34.6

The higher incidence of the disease in the operational Groups has a rational explanation when it is considered that airmen arrived in Burma, Malaya, Siam and Indo-China, after long periods of fierce and relentless fighting in the jungles and plains of Burma, to find bright lights and very attractive women, and with the thought that the war was over and demobilisation, however slowly, approaching. Unfortunately, during the three and a half years of Japanese occupation the disease had spread unchecked among civilians in these countries, who had no facilities whatever for treatment. This increase had been foreseen by the P.M.O.'s staff in 1943 when the problem was considered in detail.

Controlled brothels were impossible in India for political reasons and had not been considered in the sub-continent, but it was felt they might be an answer to the problem in the operational zones where

**VENEREAL DISEASE RATE BY GROUPS 1943-1944.**

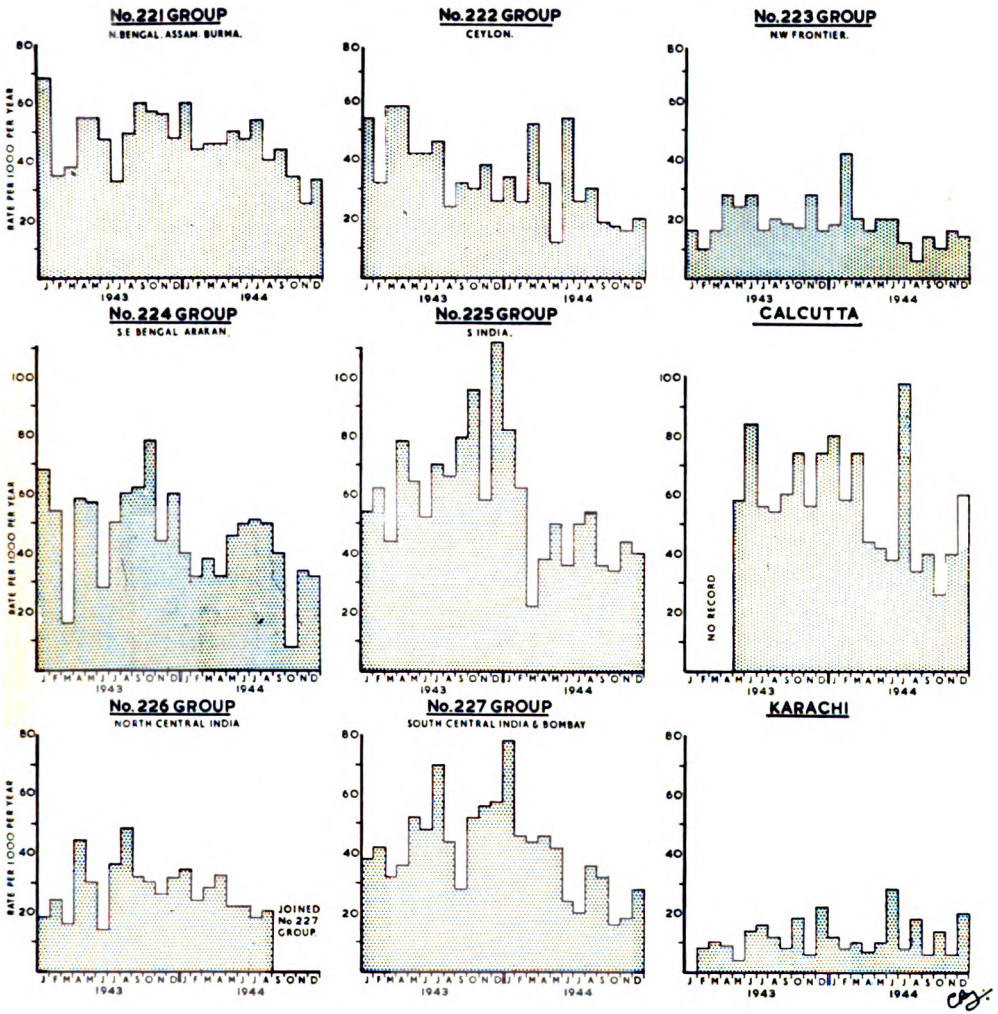


FIG. 12. Venereal disease rate by Groups. 1943-4.

military law was in force. After consideration at a very high level and an examination of the results following such organisation in the Middle East, this proposal was abandoned and it was decided to rely on strict provost control in conjunction with severe disciplinary action against offenders. Condoms were to be a free issue and easily available, while

well-equipped early treatment rooms were to be organised on an inter-Service basis in all reoccupied areas. While this plan did not prevent the rate from rising, once the organisation started to function efficiently it did prevent the incidence from getting out of hand. The P.M.O.'s staff certainly could have done no more for, as they pointed out, the problem was more of discipline and moral welfare than of medicine.

#### MEDICAL CARE

The diagnosis, treatment and recording of venereal disease in the Command was unsatisfactory throughout the whole period under review. Until R.A.F. hospitals were established in 1944, all diagnosis and treatment of these diseases were an Army responsibility, and in the main remained so until the end of the war, as only a very few of the small number of R.A.F. hospitals which were eventually opened had Special Treatment Centres. Doctors fully trained in venereology were scarce and many S.T.Cs. had to be run by medical officers whose only experience was a short four-week course at some other hospital. These officers were competent to deal with the uncomplicated case but any unusual symptoms, clinical signs or responses to treatment were beyond their capabilities. It is difficult to understand the policy behind the posting of an officer in 1944, who had been a civilian specialist in venereology before the war, from one of the R.A.F. hospitals at home where he had been running the S.T.C., to be medical officer in charge of a station in Bengal where he had no official duties regarding his speciality. At his own request this squadron leader was permitted to spend two mornings each week at a S.T.C. in Calcutta where he worked under Army officers who frequently had had much less experience in venereology.

Army S.T.Cs. were so overcrowded that in June 1943, the Military Directorate in New Delhi issued instructions that in operational areas there would be no evacuation to a S.T.C. of patients with early acute gonorrhoea or urethritis, but that they would be treated in the nearest field ambulance, casualty clearing station or hospital—a course liable to result in the missing of many cases of dual pathology. In July of that year A.H.Q. agreed that where the distance from hospital was great and conditions in the S.S.Q. satisfactory R.A.F. patients, except those with syphilis or venereal sore, might be treated on their unit; if the patient was not cured by the fifth morning he had to be transferred to hospital.

This was introduced at first in No. 222 Group and as it appeared to be working satisfactorily by the end of the year authority was extended to certain specified stations in other groups. These stations did not include that at which the squadron leader mentioned in the last paragraph was the medical officer.

## DIFFICULTIES ENCOUNTERED

Gonorrhoea continued to be treated in S.T.Cs. by sulphapyridine until mid-1944, despite its replacement in Britain and America in 1941-2 by newer and more efficient drugs of the same group. The excuse given that 'large stocks must be used up' was hard to accept. A flourishing black market in sulpha drugs developed in many Indian towns for the private treatment of venereal disease (*see* Chapter 7: West Africa, page 371). Fortunately the price asked was far beyond the pocket of an airman and self-treatment by Servicemen was not common, but the local prostitutes, self-treated with small doses, developed sulphonamide-resistant strains of gonococci which made treatment of the airmen they infected difficult. Shillong, the hill depot for the forward areas, was one of several towns in which this problem was acute by the middle of 1944. The introduction of penicillin in that year helped to counter the risk, but it produced other problems. In M.F.Hs. which included a S.T.C. this department was controlled by the physician who was also responsible for all the general medicine and who had little time to spare for extra duties. Some M.F.Hs. in the forward areas had no P.M.R.A.F. nursing sisters and in any event sisters did not normally work in the S.T.C., where nursing was done by male Special Treatment Orderlies. At that time penicillin was given by frequent injection, but orderlies were not permitted to give injections. Who was to give the treatment in the S.T.C.? Prudery and Service Regulations had produced the perfect checkmate!

It was in the diagnosis of syphilis that the inexperience of so many of the 'graded' venereologists caused most concern. It was a frequent complaint by unit medical officers that the disease was diagnosed in one of their patients on the flimsiest of evidence. Many S.T.Cs. did not examine the cerebro-spinal fluid in syphilitic patients and if the C.S.F. was examined the cell count was omitted. The cardio-vascular system was rarely investigated in cases of latent syphilis. There was a shortage of experienced pathologists and bacteriologists, and medical officers soon discovered which results could be trusted and which viewed with doubt. Dark ground microscopic examinations required an experience in determining the presence or absence of treponemata which many of those carrying out the test did not have, while blood examinations were frequently omitted before patients with acute gonorrhoea were discharged.

The introduction of penicillin for the treatment of early syphilis did not improve matters. All the old problems remained and, with the absence of the necessity to report for further injections, many patients treated with this drug were not followed up (*see* overleaf). Furthermore, there was little agreement as to dosage. Special Treatment Centres under the control of India Command (Army) were treating syphilis

with a total of 2 mega units, while patients in a neighbouring S.T.C. controlled by Allied Land Forces South East Asia were given 2.4 mega units. The medical officers of units near the great cities had to watch for personnel receiving treatment for syphilis from local doctors; at one unit in Calcutta an officer and an airman were discovered to have been paying large sums for totally inadequate treatment during the first six months of 1944.

One of the unit medical officer's greatest problems was to obtain accurate records of his venereal disease patients. No Central Syphilis Register was kept and the personal card carried by the airman was inadequate, in that it provided insufficient space for all the information required and because it was too flimsy to last the required year or more while being carried about by the man. The illegibility of these cards, however, was the least of the difficulties, for S.T.Cs., hospitals and laboratories either did not complete the cards accurately or did not send any reports on patients to the unit doctor. It was common for an airman to be told, when his blood was taken for W.R. or Kahn tests by a hospital, 'If it is positive we will let your M.O. know, if you hear nothing you will know there is nothing to worry about.' Considering the state of inter-unit mail in India this was a somewhat optimistic conclusion!

Reports on blood sent for examination by the unit M.O. were equally difficult to obtain, one unit having to wait a minimum of seven weeks for results and on occasion not receiving the result at all! The M.O. of this squadron eventually sent blood samples for examination to the nearest Civil District Laboratory, from which he received reports in from five to seven days.

To conclude, the following example, although admittedly extreme, demonstrates what could and did happen on occasion and illustrates the points made above about the difficulties and delays with which unit medical officers had to contend:

In November 1943, an airman arrived at No. — Squadron from R.A.F. Station, Allahabad on posting. He reported sick, stating that he was under treatment for syphilis which had been diagnosed in the B.M.H. at Allahabad ten weeks before and for which he had received nine injections. He had no personal treatment card and no notification had been received by the squadron from R.A.F. Station, Allahabad. A letter to R.A.F. Station, Allahabad with a copy to the B.M.H. in that town brought a reply from the unit that they had been trying unsuccessfully to obtain treatment cards from the hospital for two months. The hospital replied 'No Forms 478 or 1272 (Treatment and Notification Cards) were prepared for this patient. He suffers from syphilis. He has had three arsenic injections. His blood gave a positive W.R.' It will be noted that no reason was given for failure to raise the necessary forms, that no

dosage of arsenic was stated and that there was no information as to whether he was also receiving bismuth. The man himself, who should have known, stated that he had had nine injections, the hospital said three, but the fact that the R.A.F. Station had been attempting to obtain cards for two months seemed to confirm the airman's statement rather than the hospital's report. No reply was received to a second letter to the hospital requesting further information.

The medical section at R.A.F. Station, Allahabad, only a few miles from the hospital, does not come out of this correspondence much better than the hospital.

#### OTHER DISEASES

##### DENGUE FEVER AND OTHER SHORT TERM PYREXIAS

The incidence of patients on sick parade with a short term pyrexia was always high, as the table below shows:

TABLE XXII  
*Incidence of Short Term Pyrexias. 1941-1945*

Year	Strength	Admissions	Rate per 1,000
1941	2,881	92	31·8
1942	24,425	2,373	97·0
1943	67,718	3,349	49·3
1944	96,228	4,440	46·2
1945	120,388	2,810	23·3

These figures are, of necessity, only approximate, but they do illustrate the degree of infection and the sharp fall in incidence in 1943 as conditions stabilised and again in 1945 when the general use of D.D.T., mepacrine and other measures showed its dividend.

After elimination of malaria by the examination of several thick blood smears the eventual diagnosis varied, depending on the other signs and symptoms and more particularly on the experience of the unit medical officer. Dengue fever, phlebotomus fever, sandfly fever, three-day fever, seven-day fever or plain P.U.O. (minor) might all be used by different doctors to describe the same condition. A proportion of patients had influenza, but the vast majority had typical or, more usually, atypical dengue or phlebotomus fever. Even to the doctor experienced in tropical medicine, the differential diagnosis was difficult between these two fevers and the numerous atypical cases which occurred in the absence of an epidemic were beyond the clinical knowledge of most R.A.F. doctors to report correctly.



When epidemics did occur, as in July and August 1942 and 1943 in Calcutta, and in 1944 in Colombo, the diagnosis of dengue fever was never in doubt. These epidemics were of sudden onset and involved large numbers. A balloon squadron in July 1942 had 115 admissions with dengue from a strength of 272, and all other units in the city at that time had an average of 20 per cent. of their strength sick with the disease. In 1943, the incidence in the same city during July was 9·5 per 1,000 per week. In Colombo in one month in the summer of 1944 there were 302 admissions suffering from dengue, which was 17·3 per cent. of the local R.A.F. strength.

The disease particularly affected office workers and those working indoors near large centres of population. Breeding of the vector was common in the many tanks and casual collections of water in the cities. A.R.P. buckets, which blossomed in numbers after the early raids on Calcutta, were responsible for much breeding in that city.\* Although causing no deaths the disease produced a profound depression in many patients which necessitated prolonged convalescence, and had a considerable influence on operational efficiency.

#### INFECTIVE HEPATITIS†

TABLE XXIII

*Admissions and Incidence per 1,000—Infective Hepatitis.  
1941–1945*

Year	Strength	Admissions	Rate per 1,000
1941	2,881	37	12·8
1942	24,425	520	21·3
1943	67,718	2,543	37·5
1944	96,228	2,961	30·8
1945	120,388	2,076	17·2
W.A.A.F. 1945	1,351	14	10·4

Infective hepatitis assumed great importance during the war in the East as the figures in the above table indicate. The average period spent in hospital was 22 days and the debility following the infection was such that at least a further three weeks' convalescence was required before return to duty. This period of non-effectiveness is confirmed

\* Editorial Note: It is strange that the simple solution of introducing a piece of common rock salt into A.R.P. buckets was rarely, if ever, used.

† See also Chapter 3: Middle East Campaign, pages 101, 127 and 190.

by the Central Medical Board returns which show that officers and aircrew averaged between six and seven weeks on a limited medical category from the date of admission with infective jaundice (*see under* 'Treatment' at the end of this section). It is probable that the statistics given indicate only a proportion of the man-power wastage caused by the disease, as the vast majority of admissions had frank icterus and many mild cases never proceeded to this stage. Occasionally, cases of jaundice occurred following immunisation with yellow-fever vaccine and a small number of patients admitted with a diagnosis of infective hepatitis had a history of arsenic or bismuth injections; these, however, had little effect on the total incidence.

Lack of knowledge regarding the epidemiology of the disease made it difficult to decide on the steps required to control its spread, but many valuable observations were made by medical officers in the Command between 1942 and 1945. As in other theatres the incidence among native troops was much less than among Europeans, perhaps because of immunity conferred on the former by an attack of the disease in infancy.

The disease assumed epidemic proportions on several stations each year but many of the admissions were sporadic with no apparent connexion with other cases and often there was no concentration of admissions from any group of billets or any particular section of a camp.

The medical officer at one station during an epidemic reported that for each airman or officer who was admitted with infective hepatitis at least one other airman reported with anorexia and nausea. At this time he was testing the urine of all those reporting sick for bile pigments and a high proportion of these anorexial patients had traces of this abnormality which disappeared at the same time as the patients recovered their appetite, after a few days' rest in S.S.Q. with magnesium sulphate by mouth. Similar observations were made by medical officers on other units. From these findings it would appear that many such sub-clinical and ambulant cases were never diagnosed either during epidemics or as sporadic cases, and that carriers were responsible for infecting many of the admissions. Another interesting phenomenon confirmed by several medical officers was that officers and aircrew were more liable to infection than ground crew. Thus, at A.H.Q. New Delhi during 1943, of 64 admissions diagnosed as infective hepatitis, 32 were officers, yet the proportion of officers to airmen on the unit was two to five; at Karangi Creek between January and May 1943, 16 out of 17 admissions with the disease were aircrew, and at Gunjat, a flying training station, 90 per cent. of a small outbreak of 25 cases were aircrew.

No agreement was reached on the incubation period of the disease although it was confirmed that it was probably over 21 days and frequently considerably longer. For instance, during 1943 three

S.N.C.Os. were admitted from one sergeants' mess of 70 members; the interval between the first two admissions was 29 days and between the second and the third 34 days. In the same Group but on another station three patients had been sleeping in the same barrack block; in this case the intervals were 28 days and 31 days.

Sanitary conditions were bad in most stations in the Command, but it was noteworthy that the epidemics of infective hepatitis occurred in those where conditions were particularly adverse. Flies and dirt were always in excess when the admission rate rose. The incidence throughout the year was suggestive, there being a major peak between July and October, and a minor increase between January and March. At Cochin, where there was a large epidemic in 1944, the medical officer prepared graphs of the weekly incidence of infective hepatitis and of the dysentery group of diseases. There was a remarkable correlation between these graphs, but with a time lag of six weeks on the one for infective hepatitis. At New Delhi there was a significant drop in the incidence during June and July and it was noted that in the May and June of that year there was a considerable drop in the number of flies during a spell of extreme heat. At Allahabad an outbreak of 44 cases, including both medical officers, was noted as following a plague of flies.

Some support for the theory of undiagnosed infections conferring immunity was given by a second epidemic at Karangi Creek in the autumn of 1943. Seventeen admissions from an earlier epidemic at the beginning of the year had all been serving on one flying boat squadron. In May-June a second squadron flying the same aircraft arrived to share the station. During the autumn epidemic of 88 admissions, a number of the aircrew of this second squadron were infected but not one case occurred in the original squadron despite the fact that the majority of the crews had no history of infection and were sharing the same messes as the new squadron.

The observations on method of spread may be summarised as follows:

- (a) If the disease had been spread by droplets from the nasopharynx, more admissions would have been expected from the same barrack huts and a higher proportion of large flying boat crews, often together in an enclosed space for nearly 24 hours, would have infected one another.
- (b) If the disease had been waterborne, outbreaks would have been more explosive with a large number being admitted within a few days.
- (c) Insanitary conditions, in particular dirt and flies, were present when epidemics started.
- (d) It appears probable that there was a large number of missed and sub-clinical infections for each patient admitted to hospital with

frank jaundice, but it is difficult to say how much this affects the comment on droplet spread.

*Treatment.* From the diagnostic and prognostic angle, cases of infective hepatitis usually fell into one of four groups:

- (i) The sub-clinical patient, if diagnosed, had no icterus, his symptoms were mild and he was fit for duty after seven or eight days' bed rest.
- (ii) Another large group of patients who complained of anorexia and lassitude, but who had no pyrexia, developed jaundice after a few days; such admissions required 10 to 14 days' bed rest and were not usually fit for full duty in less than three weeks.
- (iii) The bulk of the admissions had a pyrexia of between 100°–102° F. and required nearer three weeks' bed rest and about three weeks' convalescence.
- (iv) A smaller group were gravely ill, showing signs of failure of liver function and on occasions pancreatitis. The few deaths reported all fell in this group, *post mortem* findings being acute hepatic atrophy; those who recovered required prolonged convalescence and were non-effective for three months or longer.

There was evidence of cardiac insufficiency in a high proportion of the last two groups when they appeared before a medical board at the end of their convalescent leave, but recovery from this complication appeared to be complete after a variable period of a few months. No. 62 M.F.H., Comilla, in 1944 reported that 7 out of 17 admissions with infective hepatitis treated during 1944 were admitted with M.T. malaria. Similar findings were reported by other hospitals and at first it was considered that these cases formed a separate clinical entity. With more experience, however, it was considered that it was more probable that they were the result of an infection with malaria in a man who was already suffering from sub-clinical hepatitis.

All patients were treated with a low fat/high carbohydrate diet and with abundant glucose. Most physicians gave ascorbic acid either 50 or 100 milligrams each day. Calcium lactate, ten grains thrice daily, was also a standby. Bed rest until the jaundice disappeared was an essential. When vomiting was severe on admission, insulin was used by some physicians for its relief.

#### SMALLPOX

It says much for the efficiency of the standard vaccine used in the Service that the large numbers of troops serving in a country where smallpox was endemic, and where contact might be made with many ambulant civilian cases, did not suffer any widespread epidemic of the disease. Two outbreaks in New Delhi of 12 and 40 cases respectively were the largest recorded, most of the other cases shown in Table XXIV overleaf occurring sporadically in the Calcutta and Chittagong areas:

TABLE XXIV  
*Smallpox Incidence. 1941-1945*

Year	Strength	No. of cases	Rate per 1,000	No. of deaths
1941	2,881	Nil	Nil	Nil
1942	24,425	1	0.04	1
1943	67,718	39	0.58	14
1944	96,228	53	0.55	10
1945	120,388	34	0.28	Not known

The severity of the disease varied from patient to patient, but the deaths were all from acute fulminating *variola major*. It was usually impossible to determine accurately the source of the infection.

Complete quarantine of contacts was impracticable under war-time conditions, so the routine adopted was to re-vaccinate all ranks and all followers whenever cases of smallpox occurred. Immediate contacts were checked daily at a special sick parade, and native employees were examined to eliminate the ambulant patient. Similar measures were taken when a patient admitted with undiagnosed fever developed smallpox rash; other patients were re-vaccinated and when they were discharged their M.O. was warned of the position. No fresh infections were reported as a result of this routine.

The re-vaccination of contacts, regardless of their vaccination state, was found to be advisable for two reasons. Firstly, because it was found that no reliance could be placed on the vaccination results recorded for individuals. Results of vaccination were, for some time, recorded in a man's pay book (issued to officers as well as airmen in A.C.S.E.A.) and on his medical history sheet (Form 48), but no international forms were in use. Either through overwork or through lack of interest, especially in the United Kingdom where smallpox was not a problem, medical officers often filled in the pay book and Form 48 immediately after vaccination, and the result might not be recorded—especially if the individual was posted before the result became apparent.\* In other cases, the wrong result was recorded, often because medical officers with little experience of vaccination took a reaction on a sensitive skin or an infected scratch to be a positive result; such personnel were, of course, completely unprotected. The second reason for the necessity for re-vaccination was that local lymph, containing toxins specific to the area, often gave a positive reaction whereas United Kingdom lymph

\* This difficulty was overcome by the introduction of the International Certificate. (See R.A.F. Volume II, Chapter 4, pages 408 and 414.)

was negative. Hence, though a man was vaccinated in the United Kingdom, it was wise, if not essential, to re-vaccinate him on arrival at his unit with locally prepared lymph. Local laboratories were fortunately able to deal with the Service demands and no shortage occurred.

#### POLIOMYELITIS AND POLIO-ENCEPHALITIS

Although there were under 100 cases of poliomyelitis and polio-encephalitis throughout the war years in A.C.S.E.A., the mortality rate from these conditions was, at least in 1943 and 1944, over 50 per cent. This can possibly be explained by a failure in diagnosis of the mild infection, but another definite factor was the scarcity of mechanical respirators and the long distances over rough roads to hospitals. No. 9 R.A.F. General Hospital had no respirator of even the simplest type until late in 1945; two poliomyelitis patients in whom the respiratory system was affected died earlier in that year on transfer from this hospital to an Army hospital. The difficulties of diagnosis can be demonstrated by a further example from No. 9 R.A.F. General Hospital: at the same time as one of the airmen who died of poliomyelitis was in the hospital another airman from the same station in Bengal was admitted and died of an encephalitis akin to St. Louis type 2. Six weeks later a third man was admitted with foot drop from the same station with a six weeks' history. It seems probable that these three airmen were all infected with the same virus.

#### TYPHUS

TABLE XXV

*Admissions, Rate per 1,000 and Deaths. Typhus Fever, 1942-1945*

Year	Strength	Admissions	Rate per 1,000	Deaths
1942	24,425	2	Nil	0
1943	67,718	12	0.08	4
1944	96,228	58	0.60	5
1945	120,388	15	0.12	Not known

No louse-borne typhus was recorded in the R.A.F., the total of 87 cases occurring sporadically and having fleas or ticks as the vector. Most of the admissions were from units on the North-West frontier but occasionally patients were admitted from other areas. At Yelahanka, near Bangalore, in 1943, two aircrew N.C.Os. were confirmed by agglutination tests to be suffering from the disease yet they were insistent that they had not been out of camp for several weeks. Good nursing was

recognised to be the main requirement for recovery, no drug being found of any value. The importance of not moving the patient after the early stages of the infection was stressed by all physicians who treated cases, and it was considered justifiable to nurse men in adverse surroundings rather than risk transfer to a well-equipped hospital.

Several cases of scrub typhus were recorded from the Meiktila area in 1945 among R.A.F. personnel. Control was effected by insistence on personnel wearing long trousers, boots and anklets when in localities known to be dangerous.

#### DIPHTHERIA

The incidence of this disease was never great—usually about 1 per 1,000. The majority of patients were admitted from minor epidemics on stations, and usually a symptom-free carrier was detected after bacteriological investigation. Rarely were the symptoms severe, the usual complaint being a mild sore throat with little constitutional upset. Complications were uncommon although some patients only reported sick after the development of mild foot drop or some other paralysis. Mention is made, when considering skin conditions, of the causative organism being detected in chronic dermatological infections.

#### CEREBRO-SPINAL MENINGITIS

There was a remarkably low incidence—less than 0.2 per 1,000—of this disease considering the gross overcrowding of sleeping accommodation which occurred on stations in India at some stages of the war. Although conditions in living quarters during the hot season and the numerous epidemics of coryza would seem to belie the fact, it is possible that the flimsy construction of buildings allowed better ventilation than more solidly built structures would have done, and that this did diminish, to some extent, the spread of cerebro-spinal meningitis by droplet infection.

#### DISEASES OF THE RESPIRATORY SYSTEM

Several medical officers who compared sick parade attendance in the United Kingdom and in India reported that the incidence of respiratory disease showed little difference in the two countries. Seasonal variations occurred but the effect of climate on the total incidence was minimal. In humid areas the bronchitis rate was high but upper respiratory tract infections less common. In the dry areas of the north-west the converse was found.

This difference is seen plainly from a comparison of the records of No. 9 R.A.F. General Hospital, Calcutta (a humid zone), and those of No. 10 R.A.F. General Hospital, Karachi (a very dry zone), for April to June 1945. The percentage of all admissions was about the same in

both hospitals and equivalent to the numbers to be expected in a hospital of the same size with a similar population at risk in the United Kingdom. Pneumonia accounted for about 10 per cent. of these admissions in both hospitals but at Karachi 75 per cent. were U.R.T. infections and only 14 per cent. bronchitis, whereas at Calcutta only 55 per cent. were U.R.T. infections and 30 per cent. bronchitis.

*Bornholm Disease.* An interesting outbreak of Bornholm disease was reported by the officer in charge of the medical division at No. 10 R.A.F. General Hospital later in 1945. Over six weeks there were 31 admissions from various units in Karachi. The patient was admitted with what appeared to be a dry pleurisy, but the pain was aggravated by certain movements rather than by breathing. There was a coarse rub on auscultation which varied in site and even side from day to day. This was most frequently found on the anterior chest wall. There was a variable degree of malaise and fever but the patient usually felt fit. The erythrocyte sedimentation rate was moderately raised in most patients. Recovery was complete, the pain disappearing in from 7-10 days.

*Invalidings.* Just over 10 per cent. of all invalidings from the Command from July 1943 to 1945 were suffering from respiratory tract diseases. Over a quarter (27 per cent.) of these had pulmonary tuberculosis, which is discussed in the next section; about one half were chronic bronchitis and/or asthma patients—the former being in the great majority; the remainder were assorted chest conditions. The table below shows the total invalidings from these causes over the relevant years:

TABLE XXVI

*Diseases of the Respiratory System. Invalidings 1941-1945*

Year	Strength	Invalidings	Rate per 1,000
1941	2,881	Not known	Not known
1942	24,425	Not known	Not known
1943	67,718	133*	3.93*
1944	96,228	356	3.70
1945	120,388	497	4.13

\* July to December only.

From these figures it will be seen that in 1944 and 1945 between 3 and 5 men in every 1,000 were invalided for respiratory diseases, which means that at least two men out of every 1,000 arriving in the Command were returned to the United Kingdom because of chronic bronchitis or



asthma. Medical board records indicate that nearly half the patients with bronchitis had a previous history of the condition at home, and that a number of those invalided were over 40 years of age. Asthmatic patients did badly all over the Command, for the humid climate brought on frequent attacks and when some were posted to the drier North West frontier stations the attacks continued, probably because of the excessive dust. A history of asthma in adult life, no matter how mild, might well be considered a bar to overseas service in the Tropics. Similarly, any history of attacks of bronchitis or any radiological evidence of lung changes of the bronchitic type, especially in a middle-aged man, should be grounds for a similar ban. More has been said on this subject under 'invaliding', in the section on 'Health of the Command.'

*Tuberculosis.* The incidence of tuberculosis for each year 1942-5 was 0.80, 0.74, 0.96 and 0.86 per 1,000 respectively, about one patient in ten dying from the disease. Climatic conditions, a low standard of accommodation and excessive strain might have been expected to produce a much higher incidence, and the fact that the rate per 1,000 remained fairly constant would appear to indicate that all personnel posted to the Command had been carefully selected. This was not borne out by the reports on patients invalided, many of whom had histories of tuberculosis or other lung conditions. There is, indeed, ample evidence that much of the disability caused by this disease could have been prevented by better history recording at the overseas medical examination before embarkation, and by a miniature chest X-ray at that time.\* This subject has already been mentioned in the section on invaliding.

#### DISEASES OF THE EAR, NOSE AND THROAT

Although all possible diseases and abnormalities of ear, nose and throat were encountered, the two conditions which predominated were *otitis externa* and chronic suppurative *otitis media*, the latter being responsible for 75 per cent. of the invalidings for E.N.T. conditions.

Practically 100 per cent. of the cases of chronic *otitis media* gave a previous history of suppurative *otitis media* at home, and several medical officers mention airmen arriving direct from home with dry perforated tympanic membranes and a long previous history who had to be returned home with a chronic discharging ear within a few months. A history of recurrent ear discharge, or chronic perforation of the tympanic membrane, or a tissue-paper scar should be an absolute bar to service in the Tropics.

During the hot weather men with an acute *otitis externa* were regular attenders on sick parade. All units reported such patients in some numbers and many had minor epidemics each summer. The aetiology

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\* See R.A.F. Volume I, Chapter 6, Mass Miniature Radiography, page 288.

was in some doubt, for although bathing was blamed by many stations, epidemics occurred on units where the nearest swimming was some hundreds of miles away. The excessive dust in the dry belt appeared to aggravate the infection but again the proportion of cases was even higher in the humid zones. At routine medical examinations many ears were found to be infected with a symptomless, powdery mould which on removal by syringing left raw, red granular areas on the external meatus. Microscopically this mould was akin to the mycelia of certain cheeses.

The difficulty in treatment is indicated by the long list of drugs recommended by different medical officers—acetic acid, industrial spirit drops, hydrogen peroxide drops, packing with ichthyol and glycerine, packing with acriflavine and spirit, mercurochrome drops, packing with magnesium sulphate and glycerine and insufflation with sulphonilamide or sulphathiazole powder were all reported as very satisfactory treatments by some and as having little effect by others. Whatever treatment was adopted it was essential to cleanse the meatus thoroughly before employing any drugs. It seems reasonable to suggest that in the humid areas at least the use of wet treatments would delay healing. The following procedure produced good results in both humid and dry areas and by 1945 had become the standard treatment employed by many medical officers. If the oedema was severe the patient was admitted to S.S.Q. and hot fomentations applied to the external ear four-hourly until the swelling had disappeared. The ear was then syringed with warm sodium bicarbonate solution (any bland solution could be used) and dried thoroughly with cotton-wool pledgets. This stage was started on the mild case as an out-patient. Powdered sulphathiazole powder was then blown into the meatus until the lining was completely covered. Sulphanilamide powder was not satisfactory as it tended to cake. The ear was then left for two days when mild infections were usually healed. The more severe examples might require a further one or two cleansings and insufflations. Several reports show that at least 95 per cent. of some fairly large series of infections were cured within seven days by such methods. It must be emphasised that this treatment necessitated personal care by the medical officer at every stage, and that none of it could be delegated to nursing orderlies.

#### SKIN CONDITIONS

Dermatological conditions were responsible for over 10 per cent. of the total invalidings from the Command from July 1943 to the end of the war in 1945.\* The invaliding rate per 1,000 of 1·7 for July to December 1943, 3·33 in 1944 and 5·9 in 1945, together with medical

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\* See Table X in section on 'Health of the Command—Invaliding', page 631.

officers' reports of consistently high proportions of such conditions on sick parades, gives some indication of the importance of skin diseases in the Command.

The humidity of the atmosphere or, in dry areas, the excess of dust, associated with poor ablution and laundry facilities, were undoubtedly the main causes of this high incidence. All types of skin disease occurred, but three groups were predominant: furuncles, boils and chronic ulcers from cuts and scratches; fungus infections, particularly *tinea*; and, in the humid areas, eczema or bullous impetigo over prickly heat.

Minor cuts and abrasions were very slow to heal and frequently became infected causing large chronic ulcers particularly on the legs which required prolonged treatment in hospital. The only satisfactory treatment of these chronic sores was excision of the slough with subsequent treatment of the clean wound and in many instances pinch grafts. It was found to be important to have a complete bacteriological examination where possible—No. 24 M.F.H., for instance, discovered two infections with *Cl. diphtheria* in this way during 1945.

When excision and pinch grafting were not undertaken, cure was tedious if not impossible. Local applications of zinc paste, paste viridans (1 per cent. brilliant green in zinc paste) or plain 'Elastoplast' caused healthy granulation to form in time. Sulphanilamide powder had to be avoided for a number of reasons. Local applications of penicillin were of value in the early stages. Full doses of vitamin C were found to make no difference in the time taken for complete healing.

*Tinea*. Infection of the groin or axilla was common and *tinea interdigitalis* of the feet even more prevalent, up to 75 per cent. of the personnel in some units being affected in varying degrees. Untreated cases were liable to become secondarily infected and in many areas nearly half the skin admissions were *tinea* with a superimposed eczema. Cleanliness of both body and clothing was the important factor in prevention, but even the most careful found this difficult on active operations when clothing was soaked in sweat a few minutes after changing.

Treatment of *tinea* varied according to the drugs available, but no particular method was found to be effective. The commoner unguents used were Whitfield's ointment and in chronic cases 2 per cent. chrysarobin, while a standard powder was used to prevent foot infection; aniline dyes, when available, gave good results in a number of patients. Certain cases which could not be treated on the unit were referred to hospital, but as few M.F.Hs. had beds for such patients this often meant a long and hot journey back to a base hospital; on arrival the patient's condition would have become much worse, *tinea* in the groin, for example, frequently having spread up to the abdomen and chest. Invaliding was often the only possible treatment for 'sensitive' patients, and the number of rufous or fair-skinned personnel among this group was striking.

*Prickly Heat.* During the monsoon season nearly everybody in the humid areas suffered from some degree of prickly heat, varying from mild rashes over some part of the body to a generalised eruption with a superimposed eczema or bullous impetigo. Nevertheless, little could be determined concerning its aetiology and treatment, the only certain fact being that fair-skinned people were more susceptible than those with darker skins.

Each medical officer and each dermatologist had his own prophylactic and his own treatment which he swore was successful but which others said was of little use. It is probable that a good sun tan helped, but airmen with a deep tan still had to be admitted with complicated prickly heat; cleanliness and any bland powder to ensure thorough drying were also useful. Experience showed that only by trial and error could a system of treatment be determined, as each case reacted differently to the same prophylaxis.

It was particularly unfortunate that many unit medical officers in India had had little experience in dealing with skin conditions, for severe eczematous rashes and chemical dermatitis were possible sequelae to the mismanagement of any skin rash or abrasion. Indeed, so much disability was caused in this way that in 1944 the P.M.O. issued an instruction on the whole subject of the treatment of skin disease, with special reference to this risk. Many such cases still occurred, however, and it was distressing to encounter patients who had been treated for weeks with ever-increasing doses of the offending agent, sulphanilamide powder being the chief culprit.

One further point must be stressed regarding dermatological conditions. The Command Medical Board in Calcutta invalidated 76 cases of skin disease over a period; 23 of these patients had a previous history of skin disease in the United Kingdom before posting to the East. This proportion of one in three was typical and indicates that at least 360 men were returned home prematurely who could have been eliminated by careful overseas medical examination before embarkation; the majority of those men would have been fit for service in a temperate climate without disability. A history of any of the following conditions should debar a man from service in a tropical climate: seborrhoeic infection, psoriasis, severe acne vulgaris, chronic tinea interdigitalis, leucoderma or chronic cheiropompholyx and helio sensitivity.

*Malingering.* Lastly, it must be mentioned that skin conditions provided an excellent opportunity for the man who wanted to malingering with a view to repatriation. Certain cases of malingering were detected in hospital wards by such methods as applying gentian ointments in the evening and then covering the area and instructing the patient not to remove the dressing—an examination of the hands on the following morning proving guilt beyond doubt. The commonest irritant used

to stimulate skin conditions was button polish. It was noticeable, in these cases, that following the medical board at which they were invalidated the skin conditions magically improved between the period of the board and the boat home! A threat that a 'reboard' should be carried out equally mysteriously exacerbated the condition.

#### FUNCTIONAL NERVOUS DISEASES

Functional nervous disorders were second only to the gastro-intestinal group of diseases as a cause of invaliding from the Command, the 1,723 personnel invalidated from July 1943 to the end of the war in 1945 comprising 18·2 per cent. of the total number invalidated during the period. The man-hours lost through this invaliding, however, were only a fraction of the total wastage. The average time spent in the Command by these patients before their repatriation board was eighteen months to two years, during the last year of which most of them were doing less and less effective work and were causing more and more trouble on their units in the intervals between visits to psychiatrists and to other specialists to exclude organic disease. Under a fifth of the group were psychopaths, of whom the vast majority were schizophrenics, about a half were anxiety states and the remainder a miscellaneous collection of defectives, hysterical personalities and temperamental instabilities.

These invalids could be divided into three main types:

- (i) Those with a previous history of mental instability or 'nerves'.
- (ii) Youngsters in their late teens who were posted to the Command soon after finishing their basic training; many of these airmen, especially those on 'general duties', had no civilian trade, were physically and emotionally immature and had difficulty in adapting themselves to strange surroundings.
- (iii) Men, often in their thirties, who had led a sheltered and routine life before call-up and who reacted to the change in their way of living by the feeling 'I don't think I can take it', which rapidly became 'I can't take it' or 'I won't take it'.

An interesting observation regarding those invalidated with schizophrenia was that many had a long history of Service crime, such as absence without leave, insubordination, assault, failure to obey orders and like offences. Their records also revealed a succession of movements from unit to unit as each commanding officer passed on his 'bad pennies'. Nevertheless, the truculent misfit, slovenly in dress and habit, is not always an incipient schizophrenic although this diagnosis should always be considered when sending such a man overseas, for experience in a unit in the forward areas revealed that some of the best and most cheerful workers had a similar history of Service crime while in the United Kingdom.

The factors responsible for the high incidence of mental breakdown in the Command were complex. The proportion was higher in base units than in the forward areas; the rate was high in 1943 when living conditions were bad, messing poor, welfare arrangements minimal, and mail to and from home very slow, but although there was a very great improvement in all these things during 1944, the invaliding rate from mental breakdown rose for that year. The rate was higher still in 1945 when there had been an even greater improvement in the living and welfare conditions. Possibly the time between the start of the breakdown and eventual invaliding might explain the rise in 1944, but this can have had little effect in raising the 1945 rate. Again, the standard of airmen arriving in the Command in 1944 may have been lower than in previous years as standards were relaxed to provide the necessary drafts. Family troubles at home, particularly infidelity by a man's wife, was a frequent precipitating factor, but it is difficult to determine how much this was a sign of general long standing instability rather than a major cause of the breakdown. Many men had family troubles including marital infidelity without requiring psychiatric treatment. It was noteworthy that such treatment made no impression on the majority of those referred to psychiatrists, but that invaliding produced an instant improvement in many.

The medical officers on No. 181 Signals Wing in Imphal just before and during the Siege attempted the difficult task of assessing all ranks for service with small advanced warning radar sets close to and often behind the Japanese lines. Many of their assessments were later tested and confirmed by service with such units. They determined that excluding those on the borderline of mental deficiency the intelligence level had little influence on the liability to breakdown and that after eliminating those with signs of minor instability, nail-biting, tics or trigger emotions, the important factor was the man's attitude to his work and leisure. If his work was satisfying and kept him fully employed, but not overworked, and if he had some interest to occupy his leisure, there was little risk of breakdown. It was essential to consider a man's intelligence in relation to his duties. There was a higher incidence of breakdown among tradesmen in the radar and wireless groups where the responsibility sometimes became a little too much for them or the work called for such a high standard of intelligence that the men were required to use all their ability to keep on top of their job. Such personnel, although carrying out their normal duties efficiently, were unable to stand up to any extra strain.

The use of leisure and the question of morale have already been discussed in detail. The incidence of functional mental breakdown was directly and closely correlated with the morale and spare-time activities on the stations and units. Where a man's leisure was fully occupied and

where officers took an interest in the airman's problems, no matter how little they were able to help, there was a significant diminution in the functional complaints on the daily sick parade. A high proportion of those invalided with anxiety states were first brought to a medical officer's notice by their frequent attendance on sick parade with trivial or non-existent symptoms.

An interesting commentary on the attitude in the United Kingdom to the high rates of invaliding for functional disease is given by a draft of 244 reinforcements who arrived at the R.A.F. Regiment Depot at Secunderabad in the spring of 1945. All were of uncertain mental stability and many were physically debilitated and showed minor anatomical or physiological abnormalities. One hundred and forty-four were over the age of 35. These airmen were A.A. gunners who had been serving with static light A.A. squadrons in the United Kingdom which were disbanded at the end of 1944. All young and fit gunners had been transferred to the Army and the remainder, of whom this draft was a part, were posted as gunners to S.E.A.C. Many of the men had been misemployed for years as batmen, waiters, equipment assistants and on similar duties. None of these airmen could be employed as gunners and the majority were invalided within a few months of arrival.\*

*Malingering.* Finally, something must be said about malingering. It is always difficult to distinguish between the true psychological case and the semi-malingerer, but certain personnel determined to 'work their ticket home' undoubtedly used this method of attaining their object.

It was common knowledge in the Command that if a man could get an appointment with a psychiatrist he stood an excellent chance of being invalided home if he could tell a sufficiently plausible tale. Frequently the man's story was not credited at first, but after several visits, seeing different psychiatrists, it was common to obtain a recommendation for home posting—the patient's objective. This method was undoubtedly used by many men in 1945, especially after V.E. day, when men could see little reason for remaining abroad and any moral scruples which they may previously have had concerning loyalty to their unit and to the Service were cast aside.

The picture was often clearest at unit level; up to the time of their invaliding board, such men would take every opportunity to impress all in authority with their peculiar behaviour, but after the board many forgot to keep up the pretence and their duplicity was apparent to all. This type of malingering was commonest in the safe areas and was rare in forward units, but, although these men were poor material and probably not worth retaining, their conduct was infectious and,

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\* See R.A.F. Volume II, Chapter 12: R.A.F. Regiment, page 685.

moreover, often meant that another man had to do the work of the malingeringer as well as his own until a replacement could be obtained.

#### EFFECTS OF HEAT

The admission rate for personnel suffering from the effects of heat rose from 5.4 per 1,000 in 1941 to 22.3 per 1,000 in 1942, dropping to 8.8 and 8.6 per 1,000 in 1943 and 1944 respectively. The high rate in 1942 was no doubt due to the large influx into the Command during that year of unseasoned personnel, accommodated on units which were often incomplete and had few hot weather amenities; the majority of cases occurred in a few stations in the 'hot belt'. The P.M.O. recommended that drastic action should be taken before the next hot season, but his recommendations could only be put into effect gradually and large numbers were still admitted from these stations in 1943; nevertheless the overall rate fell considerably and thereafter the incidence on any one station or group of stations was never very high.

The signs and symptoms reported were in line with those mentioned in the text-books and little need be said on this point. The one symptom which was always mentioned by patients with heat exhaustion was progressive muscular weakness of gradual onset. This was usually associated with fatigue.

Numerous patients presented the classical syndrome which was rarely mentioned in the text-books until after the war. A man who had been suffering from severe prickly heat, frequently with a secondary infection, suddenly was completely cleared of his affliction. A few days later his skin became dry and he began to complain of an increased frequency of micturition, followed by bodily discomfort and headaches. Examination revealed a mild pyrexia of 99°-101° F. The skin was characteristic, finely granular both in appearance and to touch, it was completely dry and there might be a fine branny desquamation. The urinary chlorides and total blood chlorides were frequently normal. Occasionally islands of skin remained normal, the forehead or the hands and feet not being affected. This clear-cut picture was plainly one of failure of the sweat glands, but whether the prickly heat cleared because the sweating failed or whether sweating ceased because of the widespread involvement of the sweat glands is debatable. The risk was that if cases were not recognised promptly they rapidly developed hyperpyrexia.

*Prevention and Education.* Two distinct problems were presented by heat effects in this theatre. The first was the prevention of cases in the very hot or humid zones and the second, which was much more difficult to achieve, was the education of all personnel in the causes and prevention of heat exhaustion.

The relative importance of different factors in the aetiology of heat effects was studied extensively by numerous medical officers over the



four years, and many stations prepared records of the relative humidity, maximum temperature and case incidence. These figures confirmed that temperature and humidity must always be considered together when seeking an indication of the initial level. At Allahabad, for example, the greatest number of admissions occurred when the maximum temperature was around 109° F. with a relative humidity of 40 per cent., while in Bengal large numbers were affected with a maximum temperature around 100° F., but with the relative humidity of 80 to 90 per cent. From this it can be seen that it is imperative for medical officers serving in hot weather areas to have available a wet bulb thermometer and an effective temperature chart. Any temperature above 80° F. should be the indication for advising strict precautions against the heat.

When the temperature rose above this level, the most important factor, always excepting concomitant disease, was length of service in the Command, for this far outweighed any effect which living or working conditions might have; personnel who had been in the country for less than three months, however good their accommodation, were far more likely to succumb to heat effects than were men living in the most primitive conditions who had been in the area for some time.

One of the P.M.O's. recommendations in 1942, referred to earlier, concerned this question of postings, and by the beginning of 1944 it had been agreed by the personnel branch that new arrivals should not be sent direct to certain specified stations where conditions were exceptionally severe. Men who had shown signs of heat intolerance, even if they had not been admitted to S.S.Q. or hospital, were posted to a more temperate station before the next summer, while new arrivals, particularly those who had travelled by air, were held, whenever possible, for about seven days at their arrival centre before going on to their unit. Additional vacancies at the hill depots were allocated to the hot weather stations.

Fatigue was another factor which increased liability to heat effects. Clinically this fatigue was sheer physical exhaustion due to overwork and to working under extremely trying conditions, but the only remedy which could be applied—a short break for all personnel in relatively cooler surroundings—itself aggravated the situation and eventually created a vicious circle. The establishment of a station was calculated on the work to be done, but no allowance was made for men non-effective for any reason. During the hot months a unit of 1,000 might have 70 men in hospital and about 30 off duty for minor medical disabilities; in addition, approximately 10 per cent. of the establishment at a time would be away at a hill depot (allowing all ranks one break in the most trying period). These hill parties overlapped for two or three days on departure and return, so that for part of the time not 100 but

200 men were non-effective for this reason. Thus the work of 1,000 men, which in war-time had to be completed within a specified period, had to be done by 700-800 men. Unfortunately, the general shortage of man-power rendered it impossible to make any improvements in this direction, and, as the short break in a cooler district did postpone the cumulative effects of fatigue, it was desirable to continue this arrangement.

It was found that if airmen could rest for some period each day in cooler surroundings, the incidence of heat effects was markedly reduced, and cooling-off rooms were provided in some numbers before May 1943. These rooms were planned to be near hangars and other work places, to be partially underground, to have double roofs and walls and to be cooled by 'khus-khus' tatties\* worked by coolies. Unfortunately, the rooms were often badly sited, far from the main working sites and they were therefore not used to any great extent. The idea was excellent and if properly implemented would have done much to control the fatigue described above.

Another building which was recommended on the worst stations, but which could rarely be provided, was a convalescent block, planned to be as cool as facilities would permit, to accommodate convalescent patients and when not full to give those working in the worst conditions at least one cool day and night at regular intervals.

The provision of additional salt was universal, but the method employed varied from station to station. A proportion could be added to all food, especially meat dishes, but if too much was added the food would be left; parades night and morning for saline draughts or salt tablets met with limited success; one unit tried salting the tea—an unpopular and ineffective scheme! It was found to be most satisfactory to explain to all ranks the need for taking extra salt and to leave it to the men's good sense to see that they had it; records showed the incidence of the effects of heat to be significantly higher among those who refused this additional salt.

Lack of sufficient readily available drinking water, unsuitable clothing, and excessive alcohol were other factors concerned, while personal idiosyncrasy was found to be very important. The ability of the European to withstand the effects of heat varied considerably between individuals, some of whom, through no fault of their own, were so prone to this disability that it was better to send them to the hills for the whole of the hot season.

One of the most successful steps in preventing the effects of heat was continuous and concentrated propaganda by lecture, poster and film strip regarding the importance of loose comfortable clothing, avoidance

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\* Matting, soaked in water and swung in the manner of a *punkah*.

of glare, necessity for adequate rest and avoidance of over-exertion and ensuring that consumption of water and salt was sufficient. Stress was also laid on the importance of reporting sick when feeling off colour and, to encourage this, an additional sick parade was held in the evenings. Personnel were then seen at their worst and many incipient and early cases of heat exhaustion could be diagnosed before they required admission to hospital and prolonged treatment.

Finally, medical officers were reminded of the aetiology, diagnosis, prevention and treatment of the effects of heat. This was a most necessary step, for many were newly arrived from the United Kingdom and had little knowledge of local conditions or medicine in the Tropics.

#### AVIATION MEDICINE

Much has already been written in this History on the problems of Aviation Medicine, and a special section of Chapter 1 in Volume II is devoted to the subject; it is therefore only necessary here to indicate the particular problems encountered by the few Flying Personnel Medical Officers (F.P.M.Os.) in the Far East and India. The subject held little interest for the small number of aircrew flying obsolescent aircraft in the area before and in the early years of the war and the D.P.M.O.(F.) and his assistants had to fight ignorance and prejudice among the Air Staff and the aircrew they were trying to help, many of whom had been serving in the Command for some years and had therefore little knowledge of the importance which the subject had assumed in other theatres. With some notable exceptions, it was not until 1945 that medical officers dealing with aviation medicine obtained satisfactory co-operation from all the parties concerned, and reports, especially from the F.P.M.O. of Bengal Command from 1942-4, are a succession of tales of long battles to correct errors in the supply, fitting and use of oxygen equipment and other essentials.

#### OXYGEN EQUIPMENT

Prior to the delivery of replacement aircraft in 1942 there had been little requirement for oxygen or oxygen equipment in the Command, there was practically no such equipment in the stores depots and provisioning officers had little information on the necessity for its use with the new aircraft or on the improved types being produced in the United Kingdom. Often squadron commanders had never used oxygen, while many aircrew personnel had not been in the decompression chamber and had the most sketchy knowledge of the effects of anoxia. The situation was not improved by the multiplicity of types of aircraft introduced at this time, some British, some American, with wide differences in the planning and fitting of their oxygen equipment.\*

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\* See R.A.F. Volume II, Chapter 4: Transport Command, page 399.

When masks and other oxygen stores began to arrive in bulk they were distributed to squadrons without any expert advice, the latest types of masks being sent to low-flying squadrons while photographic reconnaissance squadrons were still using much older types, and masks and fittings for British systems going to squadrons whose aircraft were fitted with American medium low-pressure demand systems where they could not be used effectively. There was no co-ordination of equipment, the aircrew of one squadron might be using several different types of mask and the latest information on oxygen equipment was either not distributed by higher authority or received by the squadrons and filed without being read and understood. Not until late 1944, when the F.P.M.O. Bengal Command was appointed D.P.M.O. (Oxygen) at A.H.Q. was the necessary co-ordination of supply and distribution satisfactory. The following two examples will give some idea of the extent of the problem:

Early in 1943 several squadrons were equipped with Vultee Vengeance dive-bombers which had no fitted oxygen system. When operating, these aircraft were required to dive from anything up to 12,000 feet before dropping their bombs on levelling out. The country over which they were bombing was on the average 4,000 to 5,000 feet above sea level. Crews therefore had to fly for some time at an altitude over 15,000 feet where oxygen was an essential. The log-books of two pilots picked at random by a wing commander on tour from the Institute of Aviation Medicine in December 1943, showed that each had completed two operations on that day in which they climbed to 16,000 feet in thirty minutes and flew at that height for 45 minutes before bombing. The total operational time was 2 hours 20 minutes, of which at least 45 minutes was above oxygen height in an aircraft without oxygen. Thus crews were diving and bombing immediately after a period of mild anoxia. Squadrons and wings which operated these aircraft and Groups which controlled them had requested oxygen fittings within two months of converting to the Vengeance but not until early 1944 was this agreed by A.H.Q. who stated in earlier replies that 'consideration of all the evidence did not prove that this modification was necessary'.

In June 1944, No. 1670 Thunderbolt Conversion Unit at Yelahanka had five fatal aircraft accidents within a few weeks which the Courts of Enquiry proved to have been probably due to lack of knowledge of the American oxygen system in the Thunderbolt and to the use of the wrong types of masks, incorrectly fitted.

#### DECOMPRESSION CHAMBERS

The P.M.O. appreciated the lack of knowledge of oxygen requirements among the general duties officers in 1942 and arranged for a mobile decompression chamber to be sent to the Command from the

United Kingdom. This chamber arrived in May 1943 and was sent to Peshawar where, after teething troubles, it was used by the local flying school. In February 1944, it was moved to the Aircrew Reception Centre at Poona where as many aircrew as possible arriving in the Command were given a personal demonstration of the effects of anoxia. Another such chamber was necessary but to save shipping space it was not ordered from the United Kingdom as the F.P.M.O. Bengal, who had considerable experience on the subject, claimed that he could direct the construction of the necessary equipment by local contract. The authority to construct the chamber was received in August 1942 and it was estimated that the work would take five weeks, but owing to a succession of fantastic delays, arising from almost incredible misunderstandings and difficulties of supply, the chamber was not ready until September 1943!

This chamber was working well by the beginning of 1944 and instruction was commenced for aircrew. Later that year an American low-pressure demand system was fitted to the chamber for demonstration purposes. In August 1944 regular three-day courses for squadron medical officers began at both Calcutta and Poona.

#### OXYGEN

The supply of oxygen throughout the Command caused considerable concern. Cylinders, each holding oxygen to fill 12 aircraft bottles, were filled either at the India Oxygen Company (I.O.C.) Depot at Calcutta or at R.A.F. mobile oxygen plants. The I.O.C. had only the one plant at Calcutta which could be used to fill the transport cylinders to the required pressure and this plant had a maximum capacity of 16 such cylinders each day when working for the full twenty-four hours. The Command was established for 22 mobile plants, but in January 1944 only 15 had been received, the remaining seven being expected in the spring of that year; each mobile plant could fill  $2\frac{1}{2}$  cylinders each twenty-four hours. This gave a maximum output for the whole Command, with all plants working without halt, for the servicing of 642 aircraft bottles each day.

Unfortunately, however, of the 15 R.A.F. plants available two were derelict and beyond repair, and as they had been sent to the theatre with the minimum of spares, the remainder, after several months of uninterrupted use, began to break down with alarming frequency. In January 1944, not one of the three units in Ceylon was serviceable and although two were working in February it was only by using parts from the third. The position was not helped by a severe shortage of cylinders, aggravated by carelessness in returning them from the squadrons and the time each cylinder might spend in transit. When the Ceylon plants were unserviceable, squadrons in the island sent

their empty bottles by air to Cochin from whence they were shipped to Karachi, then by rail to Calcutta for filling at the I.O.C. Depot and return to the squadron in Ceylon by sea. This problem of oxygen supply was the main point raised in a report to the D.G.M.S. by an inspecting officer from the Institute of Aviation Medicine who toured the theatre early in 1944. Thereafter the D.G.M.S. gave the matter his personal attention.

#### SURVIVAL AND FIRST-AID KIT

The terrain over which squadrons were operating in this theatre—mainly thick, uninhabited or sparsely-populated jungle—made a good jungle escape kit essential. In 1942 and 1943 this kit, measuring ten by six by two inches, was supplied in two tins made and packed in India. This packing was very badly done, so that the components were able to rattle about and soon became damaged and unserviceable—particularly if the iodine ampoule, included at that time, was broken. Again, the sealing of the tins was poor and the corners easily damaged, so that the tin 'breathed' during ascent and descent and the contents were rapidly ruined by water vapour. Squadrons soon discovered that all tins required to be opened, checked, repacked and sealed in new containers.

There was no fixed place to carry this equipment while flying and each squadron developed different methods; for instance a harness produced by No. 17 Squadron for use with Hurricanes proved very satisfactory. It was put on before the parachute harness so that it remained if the parachute had to be jettisoned.

In July 1943, the F.P.M.O. Bengal Command produced a back pack which would hold all the escape kit and which could be used in all types of aircraft in use in the theatre. When production of this pack was being arranged in August it was discovered that the chief maintenance officer had ordered seven thousand sets of American jungle kit early in 1943. This kit had not been examined prior to order and was found to be unsuitable for use with the vast majority of aircraft then operating in the Command, Mohawks being practically the only aircraft whose cockpit seats could be adjusted to take the harness for the American escape kit.

A squadron leader in Bengal in September 1943 produced a prototype light overall with multiple pockets for carrying the kit, which had been repacked in smaller containers with double waterproof covers. After several minor adjustments this overall was approved and put in priority production, but unfortunately it was produced locally and the first deliveries were useless owing to cheap, bad workmanship. The zip fastener was too short, resulting in the overalls tearing between the legs, the buttons were of poor quality and loosely attached so that they came off and the tins fell out, the cotton thread was of poor quality and the seams separated after only a little use, while the belt buckle was cheap

and badly fitting so that it rarely closed properly. When these errors were corrected the overalls became standard for aircrew (*see* Plates LXVI and LXVII). To assist in training in jungle escape a Self-Preservation Jungle School was opened at Poona during 1944 which was attended by all aircrew arriving at the Aircrew Reception Centre. Apart from lectures and other classroom work, each man spent some days and nights in the jungle and this considerably diminished the fear natural to the European and corrected many of his misapprehensions concerning jungle life.

#### FLYING-CLOTHING

The issue flying-helmets, goggles, and flying-boots required considerable modification before they were satisfactory for use in India and Burma. The D.P.M.O.(F.) and his counterpart at Groups did much work in devising and testing these modifications.

Flying-clothing was on the personal charge of aircrew, who were expected to arrive in the Command kitted to scale. Complaints to Air Ministry about failure in correct kitting of aircrew arriving from both the United Kingdom and the Middle East were frequent all through the war, with little permanent improvement. The list below shows the state of essential flying-clothing in 110 aircrew who arrived at Poona during January 1945 and gives some idea of the size of the problem:

Equipment	Satisfactory	Unsatisfactory or not in possession
Oxygen masks . . . .	36	74
Goggles Mk. VII or VIII .	88	22
Helmets . . . . .	91	19
Boots . . . . .	34	76
R.T. equipment . . .	19	91
Gloves . . . . .	101	9

## Hospitals

### INTRODUCTION

Until the late 1930s, the few R.A.F. stations in India did not have sick quarters, as they were established on or near cantonments where Army hospitals were based. Just before the war, S.S.Qs. were established at some stations, but all patients requiring hospital treatment were still transferred to the nearest Army hospital.

The Army was still responsible for providing hospital accommodation for all the air forces in India in 1942 and the difficulties of this arrangement soon became apparent, when rapid expansion of the R.A.F. was exceeded by that of the Army, particularly in the Indian regiments and services. There was thus a requirement for a very large increase in hospitals, specialist and nursing staff and equipment, which the Army Medical Directorate found it impossible to meet in full, the deficiency being aggravated by the increased amount of sickness in both the Army and the R.A.F.

Where the two Services were stationed in the same area, a hospital of some kind was possible, but large numbers of R.A.F. personnel were serving many miles from Army units and the P.M.O. had to make other arrangements for hospital cover. In the native states, such as Bhopal and Jodhpur, R.A.F. wings were added to the local state hospital; in other areas contracts were made with the nearest mission, railway or Government hospital, but at several stations this was impossible and sick men had to be transported as many as 80 or 100 miles over rough roads to the nearest Army hospital.

The difficulties of staffing were increased by rapid changes in operational plans; this might result in a hospital being understaffed after providing reinforcement for other areas and then suddenly itself having to cater for large numbers of casualties. Standards of equipment, treatment and messing in both Service and civilian hospitals varied considerably and the nursing staff were often poorly trained, short-handed and consequently overworked—a qualified nursing sister having nearly 100 beds under her care. Most of the civilian and many of the Army hospitals were primarily Indian and the provision of a diet suitable for British patients created a further problem.

#### NEED FOR R.A.F. HOSPITALS

By the approach of the monsoon in 1943, the state of the hospital provision for R.A.F. patients was becoming critical. Complaints of lack of facilities and of inefficient treatment by unskilled staff were received at A.H.Q. from all over the Command. Even the areas where the situation was apparently satisfactory gave trouble, as the arrangements were so strained that they broke down when any excess of patients were suddenly admitted for any reason. At B.M.H. Allahabad, when in one week the R.A.F. station admitted about one hundred patients with the effects of heat, the nursing had to be done by volunteer airmen, mainly aircrew, from the R.A.F. The Military Directorate appreciated these difficulties and complaints, which were common to both Services, but what made the R.A.F. problem more acute was the major difference in attitude to casualties in the forward areas. To the Army Commander a sick man was of little use and his concern was that casualties be



evacuated as soon as possible and that the drafting offices give him an immediate replacement of a trained soldier. The R.A.F. Commander, on the other hand, said to his medical branch 'This is a skilled tradesman who is difficult to replace and on whom I rely to keep my aircraft operational. Get him fit as soon as possible and return him to his unit.' While this applied by and large to all R.A.F. personnel it was of particular importance in the highly trained aircrew branches and trades which had very special standards of fitness, of which, not unnaturally, few Army specialists had any knowledge or experience. As the hospital service was under Army control the Army policy of evacuation was standard. A patient once admitted to a hospital in the forward areas was gradually transferred farther and farther back to the base zone before his recovery and discharge or thorough investigation and treatment. For example, an airman admitted to an Army hospital in North Assam with malaria was discharged to duty from a B.G.H. in Bombay—1,600 miles from his unit! When a soldier or sepoy was discharged in the base areas he was sent to a reinforcement camp where, after a toughening course, he became available for drafting back to any unit, not necessarily the one he had left. Not so the airman, who had to set out on his own on the long rail and road journey (which might take him months) back to his unit. The liability to infection with malaria or dysentery when travelling by train has already been mentioned and too often the discharged airman was either re-admitted to another hospital on the way back or arrived at his unit to fall sick within a few days, be re-admitted and start the circle once again.

#### MOBILE FIELD HOSPITALS

This difference in disposal, with its consequent wastage of trained man-power—especially aircrew—gave the P.M.O., who had been agitating for R.A.F. hospitals for some time, the lever which he required and in the summer of 1943, it was agreed that four mobile field hospitals (M.F.H.) would be formed in the United Kingdom for service in the forward areas in S.E.A.C. On September 15, 1943, Nos. 60, 61, 62 and 63 M.F.Hs. landed at Bombay, but unfortunately the essential medical equipment for these hospitals did not leave England until September 10, and did not arrive in Calcutta until December 15. The hospitals were therefore not operational until the end of 1943, but by this time they were well established in the east of Bengal and Assam. While the staffs awaited their equipment, they were attached to Army hospitals and to civilian training schools in Calcutta, where they not only relieved the staff shortage, but gained valuable experience.

#### GENERAL HOSPITALS

By March 1944, the success of the four M.F.Hs. had set another problem for the P.M.O. The beds available were insufficient to give

cover to all the R.A.F. in Bengal and Assam and the hospitals were situated so far forward that they were unsuitable for treating the moderate and long term patient or for carrying out extensive investigation. At the end of that month Air Ministry was requested to provide a further M.F.H. and to authorise the construction of two general hospitals, one of 600 beds at Calcutta and one of 400 beds at Comilla. In April approval was given for the construction of a 1,000-bed hospital in Calcutta but the Comilla hospital was not agreed. Decision regarding an additional M.F.H. was delayed.

In June 1944, high level planning for the prosecution of the war against Japan after the defeat of Germany again raised the problem of hospital provision. It was agreed that this would remain an Army responsibility, but that Air Ministry would provide, in addition to those planned and in existence, a general hospital and four M.F.Hs. which would have a primary responsibility for the treatment of aircrew and highly skilled tradesmen; the M.F.Hs. would be established for 50 beds each and the general hospital for 500 beds, to be expanded on the defeat of Germany to the full 200 beds each and 1,000 beds respectively. Two M.F.Hs. were accordingly allocated to the Command from the Middle East Air Force—No. 24, which was to move at once and No. 31, which would remain temporarily in the Middle East. No. 24 arrived in August and was sent to Ceylon where the northern and jungle stations had no hospital within reasonable distance.

#### ADDITIONAL HOSPITAL ACCOMMODATION

Before the rest of this plan could be put into operation a further exchange of signals between the P.M.O. and the Air Ministry resulted in an increased allocation of hospitals to the Command. The P.M.O. pointed out that:

- (i) the long distances covered by the forward areas resulted in many airfields being a long way from a M.F.H., with the result that man-power was still disappearing into the Army pipeline back to Central India;
- (ii) many R.A.F. training and maintenance bases were still without hospital cover and seriously ill patients had to be transported many miles over poor roads to hospital;
- (iii) while the staff position in Army hospitals was improving, the specialists and sisters still had too many beds to supervise and the standard of the nursing auxiliary was low.

The P.M.O. also stated that, in this theatre, Army patients were usually being treated by Army hospitals and that the function of the M.F.H. was to treat purely R.A.F. casualties and to serve groups of isolated units; he therefore suggested that the number of beds for each M.F.H. should be 100 instead of the normal 200. Air Ministry agreed to the 12 M.F.Hs. detailed at this time having such a bed establishment

and further agreed that the balance of personnel remaining be organised into hospital expansion sections each capable of being attached to a M.F.H. to increase its maximum beds by 100. At the same time the existing M.F.Hs. in the Command were organised to a similar establishment.

#### SITING OF HOSPITALS

The P.M.O's. planning staff provisionally allocated three of the additional M.F.Hs. to the forward areas and fixed sites for the remaining nine in India. These plans were discussed with Army representatives at a conference early in November 1944 when the whole subject of hospital provision was reviewed. It was agreed that the siting of the forward hospitals was better left to local arrangements depending on the operational position, but there were divergent views on the areas in India where M.F.Hs. would prove of most value. The Army agreed to M.F.Hs. opening at Digri, Cuttack and Dhubalia, where no satisfactory arrangements for hospital patients existed and to M.F.Hs. taking over existing Army buildings at Allahabad, Cawnpore and Trichinopoly, but would not consider giving up a hospital at Bangalore where the P.M.O. had planned a 300-bed hospital (M.F.H. and two expansion sections). They proposed that the R.A.F., who predominated in the area, should take over all hospital arrangements at Karachi and leave South India, with the exception of Trichinopoly, to their care. The Army further insisted that the R.A.F. take over some of the responsibility in the Calcutta area at once, as the general hospital approved by Air Ministry in April 1944 for that city had been included in their 1945 planning of hospital beds in Bengal.

Meanwhile Air Ministry had been considering the P.M.O's. plans and recommendations regarding R.A.F. hospitals and had agreed that, rather than M.F.Hs., what was required at Allahabad, Cawnpore and Bangalore were small static hospitals, for which they would provide the additional specialist staff. After prolonged discussion it was agreed that the static hospital planned for Bangalore would be cancelled, that the static hospital at Cawnpore would be staffed by a M.F.H. and that the two 300-bed hospital units thus freed be used to take over the 600-bed hospital at Karachi.

Three additional M.F.Hs. arrived in the Command in December 1944. One, No. 56, was sent to Digri in Bengal which was the centre of a group of strategic bomber stations, the other two, Nos. 64 and 65, were sent to staff the limited accommodation ready for the Calcutta hospital, now called No. 9 R.A.F. General Hospital, very few of the personnel for this hospital having arrived in the theatre. Except for the two M.F.Hs. from the Middle East (Nos. 24 and 31) these three were the only hospitals to arrive in the Command at the same time as their

equipment, and No. 56 M.F.H. was therefore able to open before the end of 1944. The equipment for the others was sent to store unopened, as a limited stock was available to permit No. 9 R.A.F. General Hospital to open for medical admissions on January 1, 1945.

A further four M.F.Hs. arrived from the United Kingdom in January 1945, but as some of their equipment had been supplied from the United Kingdom in bulk and the remainder was Indian supply, it was over a month before they were ready for deployment. Meanwhile in February, No. 31 M.F.H. had arrived, ready to operate, from the Middle East, and went direct to Allahabad to take over the local British Military Hospital (B.M.H.) pending the arrival of the staff of No. 11 R.A.F. General Hospital. No. 66 M.F.H. went to Trichinopoly and opened in the local Pudukkottai Palace, as the Hope Hospital which had been leased to the Army and which they were to take over, had not been completed. No. 68 M.F.H. went to Cuttack; the staff of No. 9 R.A.F. General Hospital now having arrived, No. 64 M.F.H. went to Cawnpore to take over the British wing of the Indian General Hospital (I.G.H.) and No. 65 went to Raipur to prepare for operations in Burma; Nos. 67 and 69 M.F.Hs., still awaiting stores, were allocated to the forward areas. The Karachi hospital (No. 10 R.A.F.G.H.) took over from the Army on April 1, 1945, and the promised allocation of station and mobile hospitals was completed by the arrival of the staff of No. 11 R.A.F.G.H., setting No. 31 M.F.H. free to prepare for operations in the forward area.

Two further M.F.Hs. were at sea when the war ended, as part of 'Tiger' Force going to Okinawa to operate against the Japanese mainland, but these hospitals, Nos. 80 and 81, did not operate in that theatre in the war; one disbanded at Singapore and the other formed the nucleus of the R.A.F. Hospital at Hong Kong after reoccupation.

#### FUNCTION OF M.F.Hs. IN A.C.S.E.A.

The development of the mobile field hospital in this theatre followed somewhat different lines from that in other Commands, each M.F.H. being one of two distinct types. Firstly, as a mobile or semi-mobile hospital serving operational groups or wings in the forward areas or covering temporary concentrations of R.A.F. units training for some special operation in base areas. Secondly, as a small static hospital in a base zone where R.A.F. personnel predominated and where the Army had insufficient or no hospital facilities. Any M.F.H. might have to carry out one type of duty at one period and be changed to the other at short notice. It was essential, therefore, that the organisation of such units should be flexible and that the establishment and equipment should not be stereotyped. Rigid preconceived plans detailing every action for the hospital C.O. were a drawback to efficient function, when

the situation might change every few weeks. The units gave better service when the C.O. was permitted to improvise and change his organisation as he, the man on the spot, thought fit. When mobile, the unit required a smaller staff and less specialist equipment than when static. The basic establishment, agreed in 1944, of staff and equipment for 100 beds with separate expansion sections, which could be attached to parent hospitals as required, proved very satisfactory. Although expansion sections could not operate on their own they could be used with Army hospitals just as easily as with M.F.Hs. One expansion section, No. 6, was moved from No. 67 M.F.H. which was not busy in July 1945, to assist 86 I.G.H. in the Cocos Islands where it served until the end of the war. An Army garrison and R.A.F. squadrons on these islands required hospital cover, but there was insufficient work for both an Army hospital and a M.F.H.

The history of the individual M.F.Hs. indicates that the number of surgical admissions and the standard of surgery required varied considerably in different circumstances. The small base hospitals might be many miles from any other surgical facilities; they were usually in permanent buildings with a satisfactory theatre and being in base areas out-patients requiring 'cold surgery' could be admitted for operation without difficulty. A fully qualified surgeon was necessary on such units. In the forward areas the volume of acute traumatic surgical admissions varied at different stages of the campaign, but in India and Burma the acute R.A.F. traumatic admission was rare. M.F.Hs. in the field had very unsatisfactory theatres, but only emergency operations were performed as patients could not be spared from operational units for 'cold surgery'. In any event, there was usually an Army hospital with busy surgical divisions close to the M.F.H. and the latter would not provide sufficient work for a surgical specialist. All that was required was a medical officer with surgical experience who could deal with minor acute surgery, any major emergencies being treated by the nearest Army surgeon and surgical out-patient opinions being obtained either from this surgeon or from the nearest R.A.F. surgeon, according to the circumstances.

R.A.F. hospitals in sufficient number, through no fault of the R.A.F. medical branch, arrived in this theatre too late to provide all the cover needed, but once the initial difficulties were overcome they gave very satisfactory service and met an urgent need.

#### WORK OF THE HOSPITALS

The distribution of hospitals, in addition to No. 9 R.A.F. General Hospital at Calcutta can be seen from Maps 3 to 8. Planning for further hospitals went on, but Japan surrendered before any others could be formed.

Space does not permit the inclusion of the full history of all the hospitals referred to above, and in any event such histories would be largely repetition. The movements of most of the hospitals referred to above are therefore shown in Fig. 13, while the following paragraphs record only the outstanding features, difficulties and triumphs

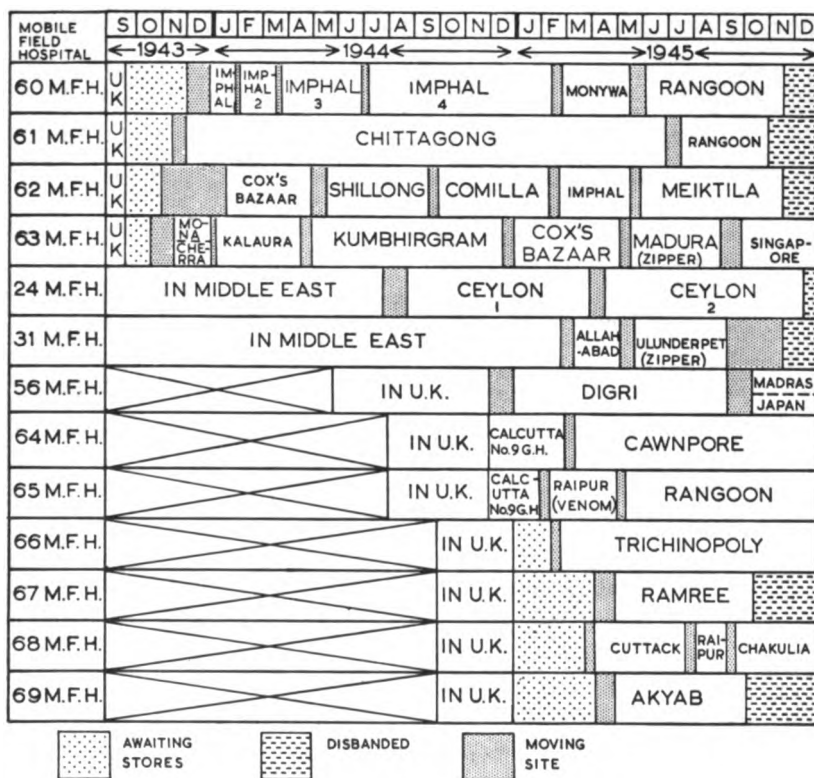


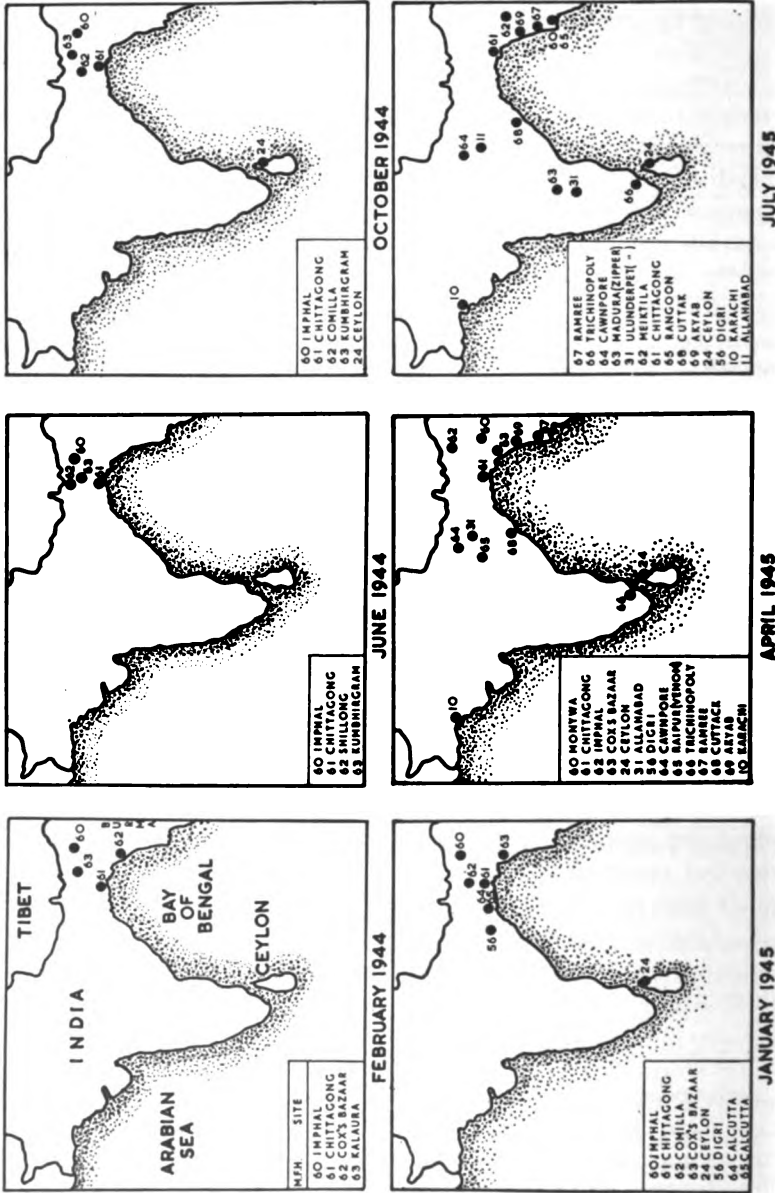
FIG. 13. Mobile Field Hospitals in India and A.C.S.E.A. 1943-5.

of particular hospitals, without showing clearly the vast amount of routine but essential clinical work carried out by these and the other hospitals both in the field and in the base areas. Exceptions are No. 9 R.A.F. General Hospital and No. 60 M.F.H., which have been described in some detail as typical static and mobile formations respectively.

NO. 9 R.A.F. GENERAL HOSPITAL

Accommodation for this hospital in Calcutta was difficult to find, but it was eventually agreed that La Martinière Girls' and Boys' Schools, at that time an Army transit hospital, should be converted to provide facilities for 500, expanding to 1,000 beds, with all the required ancillary

departments. It was planned to use the boys' school while alterations were carried out on the girls' school, and on January 1, 1945, the hospital opened with 250 medical beds and the minimum of equipment and other facilities. All surgical patients had to be admitted to 47 B.G.H. where the surgical staff assisted Army surgeons.



MAPS 3-8. Sites of Mobile Field Hospitals in certain months of 1944 and 1945.

The boys' school was originally an old Indian palace, begrimed with the dust of ages, which defied all attempts at cleaning. The wards which were in use were inconvenient and difficult to work, several communicating with each other and making segregation of patients impossible. Ward kitchens and duty rooms were few and small, and lavatories and ablutions inadequate and inconvenient—often the lavatories could only be reached *via* the ward kitchen.

There were only a few telephone extensions available and all the wards were paralleled. Clinical equipment was shockingly inadequate. There was only one sphygmomanometer and one inaccurate weighing machine in the whole hospital. The Physiotherapy Department was a screened and curtained portion of one of the wards and the X-ray department was housed in a temporary hut. Although equipped as a general hospital capable of carrying out full diagnostic investigations there were no facilities for X-ray screening and patients requiring this examination had to be transported to an Army hospital some miles away. In a country where laboratory examination was of first importance in diagnosis the facilities for that department were ludicrous. One small room on the ground floor with one sink and one water tap and a partitioned shelter under a flat roof containing a few bucket latrines was the total accommodation available. The equipment was equally inadequate and was more suitable for a clinical side room than a large general hospital. For the first three months of the hospital's existence there was one microscope, one set of blood counting pipettes and the minimum of stains and culture material.

The night accommodation provided for the duty medical officer was a small, airless, box-like room leading off an internal stairway, built in the outside wall, which was originally used by coolies responsible for the removal of night soil, the room itself being used as a store by the head coolie. It is not surprising that this room became known as the 'Black hole of Calcutta' and that medical officers preferred to have the odd nap in a chair in a ward rather than brave the atmosphere of this so-called rest room.

One interesting medical emergency early in 1945 showed up the poor state of the hospital and demonstrates how serious was the position regarding medical supplies. This occurred when a cholera patient was admitted at 4.0 a.m. On opening the specially locked 'cholera cabinet' the medical officer found it to contain nothing apart from some button-cleaning materials; there was no transfusion apparatus in the hospital stores and an ambulance had to be sent to a nearby Army hospital to borrow the necessary equipment. When a further eight cholera cases were admitted, their nursing presented further difficulties for there was no suitable ward and they had to be housed in a small annexe leading off the main medical ward, which meant that all medical



and nursing staff, and nursing equipment including bed-pans, had to pass through the main ward to reach these patients. In addition, the main hospital kitchen was within fifteen yards of the annexe and the latter had no netting over the windows to exclude flies.

Work on the hospital was proceeding so slowly and so much obstruction was met at all levels that in March 1945, the P.M.O. brought the Engineer-in-Chief from G.H.Q.(I.) to inspect and review the progress of the alterations. This officer was suitably impressed and promised immediate action to complete the plan, but by the end of June there was no change in the facilities available and the hospital was still equipped for only 300 medical beds. In July it was obvious that the war had moved on from the Bengal area and the necessity for a large general hospital in Calcutta had passed. Alterations to the girls' school were suspended in that month and after the capitulation of Japan in August all further alterations were cancelled. The hospital remained open with at first 300 and then 200 medical beds until 1946 when the majority of the R.A.F. had moved from Bengal. Considering the lack of equipment and the unsatisfactory accommodation the hospital maintained a high level of treatment, approximately 1,500, 1,700, and 1,900 in-patients receiving treatment during the first three quarters of 1945. In this nine month period 2,550 out-patients were also seen, at first only by the physicians but in the spring by an E.N.T. specialist and in August an ophthalmologist.

#### NOS. 10, 11 AND 12 R.A.F. GENERAL HOSPITALS

When Nos. 10, 11 and 12 R.A.F. General Hospitals took over the existing Army hospitals, it was agreed that the barrack and medical equipment there should be vouchered to the R.A.F. An attempt was, however, made to remove the air conditioning plants from Allahabad and Cawnpore, in the centre of the heat stroke zone, but fortunately this was discovered in time and stopped. One difficulty was that the Army relied on central laboratories serving several hospitals and consequently the laboratories taken over were little more than clinical side rooms; even with additional equipment and accommodation, the more specialised work had to be sent to Army central laboratories because of lack of equipment. The X-ray departments taken over required overhauling and re-equipping before they were considered up to the standard required.

The buildings were taken over gradually and in April 1945, 1 B.G.H., Karachi, officially became No. 10 R.A.F. General Hospital with 600 equipped beds expanding to 1,000. The hospital provided facilities for all European troops in the area, an I.G.H. remaining in the city for Indian troops. The hospital also received, on occasions, convoys of patients for disposal from the Middle East. Being surrounded

by the Sind desert, No. 10 was the only European military hospital for some hundreds of miles and numerous small units scattered over a wide area sent patients both for treatment and for specialist opinion. There was a women's wing which treated families and members of the Women's Services, this section including a maternity centre. From the time the hospital opened in April 1945 until September, just after the war ended, 1,409 R.A.F. and 1,009 Army patients were admitted for treatment. This hospital was expanded to 800 beds in that month and remained busy until the R.A.F. left the country.

#### BRITISH MILITARY HOSPITAL, CHAKRATA

Before leaving the subject of general hospitals a further comment must be made on the British Military Hospital, Chakrata, under Army control but manned by a R.A.F. staff with a wing commander in command. This hospital provided 150 beds for the R.A.F. hill depot and the Army convalescent camp from 1942 until the end of the war. The history of the hospital during these years proves that divided control of such a unit adds numerous difficulties above those normally met by a R.A.F. or an Army hospital. The buildings had been erected seventy years before as an Army hospital: there was no electric light and no piped hot water, illumination being given by paraffin lamps and one boiler in an out of the way corner providing warm water which had to be carried in buckets to the wards; the kitchen was small, badly ventilated, dark and full of obsolete equipment; there were no paths between the wards and the domestic quarters. In the monsoon the buildings were surrounded by a sea of mud. When the C.O. attempted to get authority for Works Services to improve these conditions the R.A.F. referred him to the Army and the Army referred him to the R.A.F.

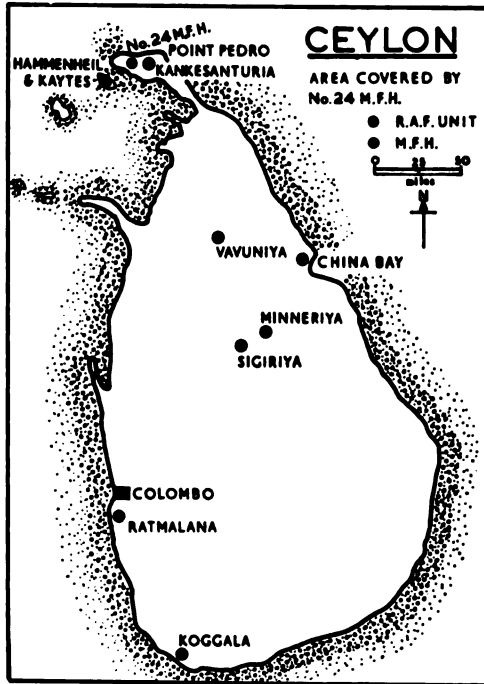
The supply of additional medical equipment provided a similar situation, neither R.A.F. nor Army including the unit in their allocation plans for stores in short supply. Book-keeping and statistics had to be kept in duplicate using two different systems\* and all returns had to be rendered to two different headquarters. Where instructions differed between the two Services, as they frequently did in points of detail, the C.O. received both and had to decide which to obey. While battling against the administrative chaos, the R.A.F. staff provided excellent treatment for large numbers of both Army and R.A.F. personnel. The wards were always full except for a short period in the spring. For example between July and December 1944, there were 1,000 admissions, 527 R.A.F., 29 I.A.F. and 444 Army.

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\* Editorial Note: Many of the documentary difficulties have been overcome by the introduction, in 1950, of standard medical forms for the three Fighting Services.

## NO. 24 M.F.H.\*

Although equipped for 200 beds, only 50 were in use when the hospital opened in the extreme north of Ceylon in September 1944, as the M.F.H. was occupying a disused A.M.E.S. site until proper buildings were constructed. This site was compact, but very small, allowing only 3 wards—a 28-bed medical, a 7-bed officers' and a 15-bed surgical. All domestic accommodation was under canvas. Before the unit moved to its permanent buildings six miles away in April 1945,



MAP 9. Ceylon. Area covered by No. 24 Mobile Field Hospital.

accommodation was often strained and the absence of a separate dysentery ward caused considerable difficulty, particularly as amoebic infection was common and assumed epidemic proportions in December 1944. The new accommodation proved very satisfactory, consisting as it did of four 48-bed wards and two 20-bed wards in line along the seashore, all communicating with a main corridor running the full length of the hospital and therefore with access to the kitchens, theatre, X-ray department and laboratory. One 20-bed ward was reserved for dysentery patients and its side room was converted into a clinical room equipped with a small couch for sigmoidoscopy, a steriliser and a table

\* This hospital is described fully as it was one of the very few which had good accommodation and where conditions generally were satisfactory.

with microscope and lamp. It was thus possible to have stools examined within a minute or so of their being passed, and scrapings following sigmoidoscopy could be examined on the spot. This proved to be an ideal arrangement. Before the arrival of No. 24 M.F.H., a group of R.A.F. units in the northern part of Ceylon and the three jungle stations at Vavuniya, Minneriya and Sigiriya, had no hospital within 150 miles. There were also scattered Army and Navy units throughout the area. The three jungle stations were still some distance from the hospital, but emergency admissions could be carried by air to Kankasanturia (KKS) airfield close to both the old and new sites (*see* Map 9).

The hospital also received admissions from other R.A.F. units and transfers from Army hospitals in the island, usually for opinion on the disposal of skilled R.A.F. personnel. During the year that the hospital operated up to the end of the war, 635 patients were admitted to the medical wards and 116 attended for medical specialist opinion. The surgical side was never so busy although there was a regular proportion of emergency and minor surgical patients in the hospital and rather more attended for specialist opinion than on the medical side. After the war the hospital remained open until the end of 1945, by which time the area was practically clear of British troops and the unit was disbanded.

#### NO. 56 M.F.H.

This M.F.H. was one of the few hospitals to arrive in the Command fully equipped except for M.T. and a few items of barrack equipment which were already reserved for them in Calcutta. The unit arrived at Bombay on December 4, 1944, having been formed in the United Kingdom in June of that year as a reserve for the European operations; after a spell of casualty air evacuation reception in England, it became redundant in that theatre and was allocated to S.E.A.C. After two weeks acclimatisation in Bombay, the advance party went by rail to Calcutta to collect M.T. and to proceed to Digri which they reached on December 28, 1944. The main contingent arrived on January 3, 1945, and the hospital admitted its first patients on the morning of January 6. This gives some idea of how rapidly an efficient M.F.H. could become organised after the long journey from the United Kingdom and in a country such as India.

On opening, the unit was accommodated in tents and had beds for 100 patients, but it was planned to build a 200-bed hospital by the end of March; it was eventually completed at the beginning of September 1945. Between January and April 1945 the average daily bedstate was between 40 and 60 patients and at no time was accommodation over-taxed. In the period May to August there was far too little work and boredom, loss of efficiency and lowered morale resulted. The only advantage was that all airmen could be sent to a hill depot for a period during the hot season, before moving to Japan in the winter.

NO. 60 M.F.H.

Formed in the United Kingdom in July 1943, No. 60 M.F.H. arrived in the Command in September of that year and after waiting in Calcutta for stores until December it opened in Imphal in January 1944, where it was in close support of the advanced tactical squadrons until the end of the war. Imphal was situated in a high valley surrounded by mountains, 130 miles from the Assam railhead at Dimapur and astride the tracks leading down to the Chindwin River and Central Burma from the North. It was the base for the tactical squadrons holding the Japanese on this front and the stepping off place for the second Wingate expedition in the spring of 1944. By the time the M.F.H. had settled in on an old A.M.E.S. site and had 100 beds available for patients the R.A.F. strength in the valley was about 10,000. This was the second site used by the hospital, the first selected before the unit arrived being used for only a few days, as it was out of the way and approached by a very bad road. This emphasised the advisability, as stressed elsewhere in this volume, of a member of the M.F.H. staff, or at least an officer with M.F.H. experience, being present at the siting boards for such hospitals even in the very forward areas.

The unit had just settled down as a fully functioning hospital when it had to move again. The advancing Japanese armies had infested the valley and all scattered formations were drawn into defended 'boxes', No. 60 M.F.H. moving to a site on a hillside near No. 221 Group Headquarters. This site was small and inconvenient, there were only two small *basha* huts available and the remainder of the hospital was organised in a variety of tents. Despite this the wards were soon full and the staff had such a good reputation in the area that medical officers had difficulty in refusing all the Army personnel who wished to be referred to it, either as in-patients or out-patients. After the relief of the besieged garrison the hospital found more suitable quarters and settled to an uneventful but busy period.

In February 1945, the M.F.H. followed the advancing squadrons on to the plains of Burma and was opened at Monywa to cover their advance, moving again early in May, after the fall of Rangoon, to its final site which was occupied until the end of hostilities. At Monywa the accommodation was tented except for the theatre, which was established in a Burmese temple of the wooden chalet type. This building had a brick floor which was a great advantage over the dusty loose earth on which the tents had been pitched. The inside of the building was given an artificial double wall and roof by pitching in the building the inner part of an E.P.I.P. tent. This gave a relatively cool building, easy to keep clean and dust free. In Rangoon the hospital adapted a block of modern flats into wards, theatre and other necessary accommodation.

The outstanding professional feature of the hospital's work was that, despite the fact that it was close to the front line for most of its existence, medical admissions exceeded the surgical admissions in the proportion of nine to one. Not only were there few surgical admissions, but casualties due to enemy action were remarkably rare. During the three months of the siege of Imphal no unit was farther from the Japanese than four or five miles, shelling of the airfields was frequent and during the hours of darkness Japanese offensive patrols wandered throughout the whole valley. One Indian Army hospital was 'shot up' by such a patrol and most of the staff and patients were killed, while at one air force landing strip eight aircraft were blown up. All sentries were 'trigger happy' and any movement at night was liable to start a fusillade of shots—in fact, the M.F.H. spent one night in slit trenches while a battle raged around them. There were no casualties but in the morning the hillside above the hospital was littered by a very dead colony of baboons! No night passed without its incident, all serious at the time, but many comic in the light of dawn. Yet from all this activity and with a population of nearly 10,000 at risk, during the three months only three patients were admitted with gun-shot wounds, one abdominal, one thoracic and one minor laceration of leg, the latter being the only one caused by enemy action.

With intensive operations by tactical squadrons in support of the Army and the complete supply of 100,000 fighting men by transport squadrons, the paucity of flying casualties was also marked, only five flying casualties being admitted with injuries due to enemy action and four due to flying accidents. The most probable cause of this situation was the ineffectiveness of the Japanese Air Force and the nature of the terrain over which aircrew were operating—mainly steep hillsides covered with thick jungle. From February 3, 1944, until August 22, 1944, the total medical admissions were 1,134 and the surgical 138. A similar proportion continued down through Burma to Rangoon, although the proportion of minor surgery did rise on arrival in Rangoon when 40 surgical patients were admitted during the month of June. This rise in minor surgery is explained by the fact that many of the 40 were suffering from conditions for which they had received either out-patient or no treatment while intensive operations were in progress. The outstanding cause of medical admissions was the dysentery group which accounted for nearly half of the total. Of the 1,952 medical admissions during the first year of the hospital's period in the theatre 779 were suffering from such conditions.

NO. 61 M.F.H.

This M.F.H. was at Chittagong from December 1943 to July 1945, being accommodated in a girls' school and *basha* huts and with 150 beds

equipped. As the district was highly malarious the medical wards were kept full and the average daily bedstate over the year was 90 rising to 130 in summer, over 50 per cent. suffering from malaria. The proportion of surgical cases was higher than at No. 60 M.F.H. being 32 per cent. of the first 1,000 admissions but the majority were minor conditions, the proportion of battle casualties being low.

In July 1945, the hospital moved to Rangoon, where the difficulty in finding accommodation points a useful lesson. The recapture of Rangoon had been planned as Operation 'Venom' and in the plans, buildings in the University area had been earmarked to accommodate hospitals giving a cover of 8,000 beds and to include No. 61 M.F.H. Army hospitals started to move into this area immediately after the reoccupation, but with the formation of Twelfth Army a fortnight later this Command decided that the planned hospital zone was the only suitable place for their headquarters. New sites were found for the hospitals already in the area, but as No. 61 had not arrived no site was reserved for their use. By the time their advance party arrived a month later accommodation in the town was very scarce and it was not without difficulty that a suitable site for a 200-bed hospital was found in the Government school. It is essential that accommodation planning be as precise as possible in such circumstances, as after the first allocation there is a wild scramble for the remaining accommodation and it is unjustifiable to retain unoccupied quarters for units whose date of arrival is uncertain when there are other units whose claims are pressing. The capitulation of the Japanese in August removed the necessity for three M.F.Hs. in the area and No. 61 was disbanded in the autumn.

#### NO. 62 M.F.H.

Soon after the M.F.H's. arrival in Calcutta, the C.O. visited Cox's Bazaar to find a suitable site for the hospital. Several positions were considered and rejected either by the executive or by the hospital before a site on an area of paddy in a small valley was agreed; the hospital opened there in January 1944. Later, this site proved to be badly drained and in a highly malarious area, with the result that, as suppressive treatment was started too late, a high proportion of the staff was sick with the disease during March and April; from a strength of 80 there were 36 infections, including four of the six officers and one of the two nursing sisters. The surgical specialist, in a fit of depression while convalescent from his third attack in three months, committed suicide.

The general health and morale of the unit were so adversely affected by these factors that early in May, the hospital not being busy, it was moved to the hill depot at Shillong where it opened with from 50 to 75 beds in the S.S.Q. While here the staff were relieved by the staffs of Nos. 61 and 63 M.F.Hs. for a period. Later moves can

be seen on pages 709 and 710. The hospital admitted mainly medical patients, although a surgeon was always available, the surgeon from No. 63 M.F.H. being attached after the death of the unit's original surgeon. During the period at Cox's Bazaar from January 17 until May 6, 1944, there were 630 admissions of which 502 were medical, 42 venereal disease and the remaining 86 surgical. The physician had considerable experience in venereology and a S.T.C. was a feature of this hospital. The surgical admissions, as with the other M.F.Hs. in the forward areas, were nearly all of a minor nature and very few were due to enemy action. A similar proportion continued at the other sites at which the hospital operated. Well over 50 per cent. of the medical admissions were suffering from malaria or dysentery. At Cox's Bazaar malaria predominated but with the increased use of suppressive mepacrine in the latter part of 1944 the number of such admissions fell sharply.

#### NO. 63 M.F.H.

This hospital, one of the four which arrived in September 1943, was detailed to cover the proposed occupation of three isolated air strips in the Surma valley. It opened in November with 30 medical beds and borrowed medical stores as a tented unit at Monacherra, two miles from Rajyeswarpur. After three weeks the squadrons had not arrived owing to altered plans, and the M.F.H. had admitted only one Army and six R.A.F. patients.

On December 26, the hospital moved to Kalaura, 60 miles west, to which the squadrons were now to be sent. The unit's medical stores, missing up to this time, arrived on the day of the move, with the exception of two crates, containing the bulk of the surgical equipment, which were never traced.

The unit was sited in a mango grove, at first in tents, with the addition later of six 14-bed *basha* huts and an excellent brick-built operating theatre, the latter being completed after three months, only one month before the onset of the monsoon when the M.F.H. had to move to Khumbirgram as the site was liable to flood; three weeks later, this theatre was under ten feet of water! It is a commentary on the situation in the Command that this M.F.H. was the only one which had a satisfactory theatre built in reasonable time and without months of correspondence, but that the M.F.H. had practically no surgical equipment and the surgeon had left the unit, on attachment to No. 62 M.F.H., before the theatre was completed.

In the period from January 1 to March 22 when the surgeon left, he had treated ten patients: three hernias, three circumcisions, one elevation of the malar bone, one excision of a scar on the face and two simple fractures. He had also given 20 out-patient opinions. Apart from these



surgical patients, during the four months at Kalaura the hospital treated 1,360 men, including out-patients, mainly medical with a few dental admissions and a few venereal disease treatments. The vast majority of these patients were British or Indian soldiers as the expected squadrons did not arrive until the beginning of April, only one month before the unit moved.

Khumbirgram, also in the Surma valley but 100 miles to the north east, was the only all-weather airfield in the area. It was 100 miles behind the front line, but separated from it by high mountains; the station was a base for a dive bomber wing of three or more squadrons. Hurriedly constructed, sanitation on the station was poor and dysentery was rife, the area was highly malarious and when the M.F.H. arrived the disease was assuming epidemic proportions, six to eight patients a day being transferred to an Indian C.C.S. in Silchar 25 miles away.

Accommodation was in concrete floored *basha* huts augmented by tents in the middle of the summer, when the hospital expanded to 130 beds. A convalescent bungalow was opened on a tea estate about ten miles from the camp. Patients were admitted not only from Khumbirgram but from all R.A.F. units in the Surma valley as far south as Argatala. During the last two months of the Imphal siege the M.F.H. received about 20 short term cases per week by air from No. 60 M.F.H. in Imphal, the men returning to their units by air when fit. Until September, by which time personnel in the area were taking suppressive mepacrine and the incidence of malaria had considerably diminished, the daily bedstate varied between 120 and 130. Thereafter until the unit moved at the end of November the average fell to around 75.

There was no surgeon in the unit during this period, but only one patient, an acute appendicitis, required transfer to an Army hospital for immediate operation; minor surgery was done by the hospital doctors and patients requiring surgical opinions or cold surgery were sent by air to No. 60 M.F.H. or to Calcutta or by ambulance to the nearest Army hospital. There were 1,249 admissions at Khumbirgram, 867 medical, 294 S.T.C. and 88 surgical. Of the medical patients 578 suffered from malaria. Plans for the reoccupation of Akyab and Ramree Island necessitated a concentration of squadrons in the Arakan which No. 63 M.F.H. was moved to cover in late November 1944. The hospital reopened in a *basha* camp at Ramu on December 1 and moved again on May 1, 1945 to more solid buildings which had been occupied by an Army hospital on an island at Cox's Bazaar nearby. There were no outstanding incidents during this period.

No. 63 M.F.H. was selected to provide immediate cover in Operation 'Zipper' (the seaborne landings in Malaya) and was therefore withdrawn in June 1945 to Madura in Madras Province to re-equip and

train. The hospital was still closed at the end of hostilities, but proceeded to Malaya in September and eventually formed the nucleus of R.A.F. Hospital, Changi (on Singapore Island) which is still in being.

NO. 67 M.F.H.

This M.F.H., which was formed in the United Kingdom in November 1944, and arrived in Bengal to await equipment at the end of January 1945, was detailed the following month to open at Ramree, as soon as stores were complete, to provide cover for the R.A.F. units on the island. The hospital C.O. was informed by the P.M.O. Third Tactical Air Force that arrangements had been made for the hospital to occupy accommodation beside an Army hospital and to share the theatre and specialist departments. When the C.O. arrived in mid-March at Ramree to make preliminary arrangements, he found that no one had any knowledge of this plan and that no site had been selected for his hospital. After considerable discussion a site some distance from the Army hospital but relatively close to the R.A.F. station was agreed and construction of *basha* wards commenced. By the end of the first week in April the bulk of the equipment had been received and the unit was able to move forward. It had been planned to open in mid-April as a small tented hospital with some 30 beds while awaiting completion of the *basha* huts, but the equipment was so badly loaded at Calcutta for trans-shipment to Ramree that it could not be used until May by which time the bamboo buildings were complete. Forty medical beds were in use on May 9 and the full hospital of 180 beds on May 27.

After the end of the war in August the R.A.F. were rapidly withdrawn from the area and the hospital disbanded. The unit was never very busy and in the two and a half months from opening until the end of July only 99 patients were admitted, of whom 17 were members of the hospital staff; only four of the 99 medical admissions had malaria and four dysentery, a marked comment on the great improvement in preventive medicine in the forward areas. This diminution in preventable medical admissions altered the ratio of medical to surgical admissions to below two to one (99-59) but there was no increase in the numbers of major surgical patients, the vast majority of the 59 being very minor and suitable for treatment by any physician with a knowledge of minor surgical procedure.



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