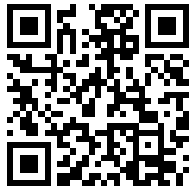

HISTORY OF THE SECOND WORLD WAR

UNITED KINGDOM MEDICAL SERIES

Editor-in-Chief

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

THE ROYAL AIR FORCE MEDICAL SERVICES

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M.A., M.R.C.S., L.R.C.P., R.A.F.

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FOREWORD

BY THE EDITOR-IN-CHIEF

WHEN Louis XIV's grandson became King of Spain, Louis complacently remarked that there were henceforth no more Pyrenees. Emulating this saying and relying on the 'invincible might' of the *Luftwaffe*, Hitler boasted that there were no more islands, but he left the Royal Air Force out of his reckoning.

The War of 1914–18 had seen heroic deeds wrought by the British air arm. Zeppelins had been brought down in flames from the skies by gallant air-fighters and towards the end of the war aerial bombardment was developing.

The intervening years witnessed the establishment of the Royal Air Force, many advances in the construction of air bombers and air fighters, and improvements in strategy, tactics and flying technique.

Progressive work of this kind paved the way for the valiant exploits of British and Allied aviators in the Second World War. The British Navy kept the narrow seas and the Royal Air Force repelled invasion in the Battle of Britain. In the glowing words of Sir. Winston Churchill, which can never be repeated too often: 'Never in the field of human conflict was so much owed by so many to so few'.

These epic deeds are recorded in the *Official Military History*. But, to quote Milton, 'they also serve who only stand and wait'. No medical history of the Second World War would be complete without a record of the Medical Branch of the Royal Air Force, which did so much in countless ways to maintain the health of the airman, to minimise the avoidable risks to which he was exposed in aerial warfare, to heal his wounds and to restore his health when attacked by disease. Aviation medicine was a new science and physiological and pathological wisdom had to be brought to bear upon it. This was realised from the beginning, and with the resources of the Medical Research Committee in the First World War, many problems of altitude, respiration, neurology, etc., were solved by expert investigators, including Sir Henry Head and Wing Commander Martin Flack.

In the Second World War the same enlightened attitude prevailed. New problems arose under war conditions and medical research guided and aided clinical application with effective results.

The history of the Medical Branch of the Royal Air Force is in three volumes, of which this, the first, is devoted to administration. After a survey of the early history of the development of the Service from 1911

to 1919, the medical, nursing and dental services are described, followed by an account of the hospitals and the special services. Hygiene and sanitation are discussed and special problems like dysentery, malaria, yellow fever and the typhus epidemic in Naples examined. Medical equipment and supplies required much planning and medical arrangements were needed for the Women's Auxiliary Air Force, the air evacuation of casualties, air sea rescue and the medical aspects of trooping. The question of prisoners-of-war presented many medical problems, especially in view of the enemy's attitude to the Geneva Convention.

It is hoped that a history on these comprehensive lines will be both interesting as a record of the past and of value as a guide to future defence. The potentialities of aerial warfare have assumed awful and devastating proportions and must demand new and original defensive measures. Nevertheless, the general methods of medical organisation and administration, advanced so much in the Second World War, no doubt will be adapted to meet a situation which one must hope the sanity of the world will never allow to arise.

From the beginning of the planning of this Official Medical History, Air Marshal Sir Harold Whittingham, in spite of his preoccupation with many war duties, took a keen and personal interest in it and helped us with counsel and advice. This co-operation was fully extended to our work by his successors Air Marshal Sir Andrew Grant, Air Marshal Sir Philip Livingston and Air Marshal Sir James Kilpatrick, who has written the preface to this volume.

I have pleasure also in acknowledging the help of previous Royal Air Force editors, Wing Commander R. Oddie, Wing Commander E. B. Davies, Squadron Leader R. Mortimer and Squadron Leader H. N. H. Genese. Their devoted labours in the collation of material and writing in some cases of first drafts have enabled Squadron Leader S. C. Rexford-Welch, the present editor, to edit and prepare this volume from documents written when the events and proceedings chronicled were fresh in memory. I must thank him also for his whole-hearted co-operation in the work of the Official Medical History.

This volume has been prepared under the direction of an Editorial Board appointed by H.M. Government, but the Editor alone is responsible for the presentation of the facts and the opinions expressed.

January, 1954. ARTHUR S. MACNALTY

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LIST OF ABBREVIATIONS

A.A.F.	Auxiliary Air Force
A.A.O.	Air Ambulance Orderly
A.A.S.F.	Advanced Air Striking Force
A.C.1	Aircraftman 1st Class
A.C.2	Aircraftman 2nd Class
A.C.D.	Airmen's Convalescent Depot
A.C.H.	Aircrafthand
A.C.M.B.	Aviation Candidates Medical Board
A.C.R.C.	Aircrew Reception Centre
A.C.S.B.	Aviation Candidates Selection Board
A.C.S.E.A.	Air Command South East Asia
A.C.W.	Aircraftwoman
A. & D.	Admission and Discharge
A.D. Corps	Army Dental Corps
A.D.D.S.	Assistant Director of Dental Services
A.D.G.B.	Air Defence of Great Britain
A.D.M.S.	Assistant Director of Medical Services
A.E.A.F.	Allied Expeditionary Air Force
A.F.V.	Armoured Fighting Vehicle

A.G.	Air Gunner
A.M.	Air Ministry
A.M.G.O.T.	Allied Military Government of Occupied Territories
A.M.O.	Air Ministry Order
A.M.P.	Air Member for Personnel
A.M.W.D.	Air Ministry Works Department
A.O.C.	Air Officer Commanding
A.O.C. in C.	Air Officer Commanding-in-Chief
A.P.	Air Publication
A.R.E.U.	Air Reception and Evacuation Unit
A. & S.D.	Administrative and Special Duties
A.T.S.	Auxiliary Territorial Service
A.V.A.C.	Air Evacuation Control Centre
B.A.E.C.	British Air Evacuation Centre
B.R.C.S.	British Red Cross Society
B.A.F.F.	British Air Forces in France
C.A.E.C.	Casualty Air Evacuation Centre
C.A.E.U.	Casualty Air Evacuation Unit
C. in C.	Commander-in-Chief
C.C.S.	Casualty Clearing Station
C.M.E.	Central Medical Establishment
C.O.	Commanding Officer
D. of D.S.	Director of Dental Services
D.D.M.S.	Deputy Director of Medical Services
D.G.A.M.S.	Director-General Army Medical Services
D.G.M.S.	Director-General of Medical Services
D.I.D.	Detail Issue Depot (Army)
D.M.S.	Director of Medical Services (Army)
D.M.S.R.A.F.	Director of Medical Services (R.A.F.)
D.R.	Despatch Rider
E.M.O.	Embarkation Medical Officer
E.M.S.	Emergency Medical Services
E.T.A.	Estimated time of arrival
E.T.D.	Estimated time of departure
E.U.	Embarkation Unit
F.D.S.	Field Dressing Station (Army)
F.F.I.	Free from Infection
F.48	Medical History Envelope (Form 48)
F.P.R.C.	Flying Personnel Research Committee
F.S.P.	Forward Staging Post

G.D.	General Duties
H.S.L.	High Speed Launch
I.D.O.	Inspecting Dental Officer
I.P.T.M.	Institute of Pathology and Tropical Medicine
I.T.W.	Initial Training Wing
L.A.C.	Leading Aircraftman
L.A.C.W.	Leading Aircraftwoman
L.D.S.	Licentiate of the Dental Society
M.A.A.F.	Mediterranean Allied Air Force
M.A.P.	Ministry of Aircraft Production
M.D.L.	Mobile Dental Laboratory
M.D.U.	Mobile Dental Unit
M.E.	Middle East
M.E.D.	Medical Equipment Depot
Med. M.E.	Mediterranean and Middle East
M.F.H.	Mobile Field Hospital
M.P.(P.)C.	Medical Personnel (Priority) Committee
M.R.C.	Medical Research Council
M.R.S.	Medical Receiving Station
M.R.U.	Medical Rehabilitation Unit
M.S.D.	Medical Stores Depot
M.T.	Mechanical Transport
M.T.E. & D.	Medical Training Establishment and Depot
M.U.	Maintenance Unit
N.C.O.	Non-commissioned Officer
N.W.A.A.F.	North Western African Air Force
N.Y.D.N.	Not yet diagnosed (neuropsychiatric ?)
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.T.	Physical Training
P.T.I.	Physical Training Instructor
Q.A.I.M.N.S.	Queen Alexandra's Imperial Military Nursing Service
R.A.M.C.	Royal Army Medical Corps
R.C.A.F.	Royal Canadian Air Force
R.F.C.	Royal Flying Corps
R.N.A.S.	Royal Naval Air Service
R.T.U.	Return to unit

S.D.O.	Senior Dental Officer
S.E.A.C.	South East Asia Command
S.H.A.E.F.	Supreme Headquarters Allied Expeditionary Force
S.M.O.	Senior Medical Officer
S.S.A.F.A.	Soldiers, Sailors and Airmen's Families Association
S.T.C.	Special Treatment Centre
T.A.F.	Tactical Air Force
T.C.	Transport Command
U.K.	United Kingdom
U.S.A.A.F.	United States Army Air Force
U.S.S.R.	Union of Soviet Socialist Republics
V.A.D.	Voluntary Aid Detachment
V.D.	Venereal Disease
W.A.A.F.	Women's Auxiliary Air Force
W.M.O.	Woman Medical Officer
W.O.	Warrant Officer
W.R.A.F.	Women's Royal Air Force
W.T.	Wireless Telegraphy

PREFACE

THE application of medical science to the needs of fighting forces has a long and interesting record. Study shows that war which destroys health and life has also been the stimulus for rapid increase of knowledge in preventing suffering and in saving life. This in no sense justifies war. But it is clear that medical experience in war must be remembered and appraised.

This medical history of the Royal Air Force in war attempts to collect our experience. It forms part of the combined Medical History of the British effort, comprising narratives of the Services and of the Civil Departments. It is designed to show the Medical Branch of the R.A.F. against the general background of the war, and to illustrate the evolution of a medical organisation, serving the ends of a highly specialised fighting force rapidly increased in size and scope. It brings out aspects of our experience, for example in rehabilitation and in the management of burns, which perhaps have had influence on civilian medical thought.

In sum, the aims of the history may be listed as :

(*a*) To record achievement over the war years.

(*b*) To indicate the use by the Service of advances in medical knowledge, and the value of Service experience in civil practice.

(*c*) To appreciate the medical problems encountered, professional and administrative, and to show the methods adopted to meet them.

(*d*) To define, in the light of after-knowledge, mistakes which were made, and their effects.

(*e*) To provide points of reference for planning in the future.

The R.A.F. History will occupy three volumes. The first is of general interest. It traces briefly the history of the R.A.F. Medical and Dental Branches, and contains articles on the many aspects of a comprehensive organisation which do not fall into patterns of defined area or time. The second volume contains narratives of individual Commands of the R.A.F., and the third volume comprises narratives of Active Operations and Campaigns. Unavoidably, there is overlap, for it is not possible to place sections of this story at once into neat compartments, and to retain definition and perspective.

Names of individuals have generally been omitted from the narratives, but appear occasionally where interest would suffer from omission. In this foreword, however, acknowledgement must be made of the vision of Air Marshal Sir Harold Whittingham, Director-General of R.A.F. Medical Services, who, in 1941, created an organisation to collect and

edit material of historical interest as it was being compounded. Without the records so obtained, informed approach to a history would have been impossible.

It has been a matter of policy that narratives of each particular subject or phase should be prepared or criticised by those with personal knowledge of the occurrences. Ready acknowledgment is made of the effort and time given for this purpose by many members of the Royal Air Force, serving and retired.

J. M. KILPATRICK,
Air Marshal
Director-General of Medical Services.

January 1954

CHAPTER 1

MEDICAL MANNING: OFFICERS

INTRODUCTION

THIS narrative describes medical manning and its problems in the Royal Air Force. An account of the medical organisation provided by the Royal Army Medical Corps for the Royal Flying Corps has been included in a historical survey at the beginning of the narrative. The collection of material for this survey has been difficult, because no official history of the Royal Air Force Medical Service has been written and many valuable historical documents have been lost or destroyed.

The account has been supplemented by facts and figures not concerned directly with medical manning; they have been included because they provide evidence of the amount of work done by medical officers and nurses.

The narrative has been divided into eight sections:

1. Historical Survey 1911–19
2. Conditions of Service 1918–39
3. Reserves of Medical Officers 1923–39
4. Allocation of Medical Officers 1939–44
5. Supply of Medical Officers 1939–45
6. Consultants and Specialists 1924–44
7. Women Medical Officers 1939–44
8. Statistical Analysis

HISTORICAL SURVEY, 1911–19

THE ROYAL FLYING CORPS

An Air Battalion of the Royal Engineers was created by a special Army Order on February 28, 1911 as the first step towards the formation of an air arm. The unit came into being on April 1, 1911 and consisted of two companies, one to work with airships and balloons and the other with aeroplanes. The unit functioned for one year, and was then changed by Royal Warrant on April 13, 1912 into the Royal Flying Corps (R.F.C.) which was actually formed four weeks later. The Corps was divided into two wings, one naval and one military. The naval wing was the foundation of the Royal Naval Air Service (R.N.A.S.). The strength of the military wing at that time was 182 officers and an equal number of non-commissioned officers. As soon as aircraft became more

reliable and the possibilities of aerial warfare were realised, the expansion of the R.F.C. was extremely rapid.

EARLY MEDICAL ORGANISATION FOR R.F.C. UNITS

No separate medical organisation was necessary to look after the increasing number of men of the R.F.C. because the R.A.M.C. undertook the medical care of the Corps at home and overseas. At first, R.F.C. units received medical supervision and attention from the nearest R.A.M.C. medical officer, who saw the sick either at his own medical inspection room or at the R.F.C. unit itself.

In late 1915, the R.F.C. was reorganised on a brigade basis, and, overseas, an R.A.M.C. major was attached to R.F.C. headquarters to direct the medical care provided for the various R.F.C. units. Later, R.A.M.C. medical officers were attached to R.F.C. brigade headquarters under his direction, and it became the responsibility of each medical officer to supervise, apart from the medical care already provided, the five to ten squadrons in his brigade, each squadron having about fifteen or sixteen flying officers and a proportionate ground staff. The first brigade medical officer thus to be attached was sent to the Second Brigade of the Second Army. These medical officers were responsible for the medical equipment, hygiene and sanitation and medical treatment of their units, and only called in their directing superior officer at R.F.C. headquarters for consultation, or if they wished to admit any casualty to the twenty-four bedded British Red Cross Hospital at Etaples. In normal circumstances, injured or wounded personnel were given first aid by the R.A.M.C. medical orderly in each squadron, and were then taken to the nearest military hospital in a tender or car, according to whether the patient was a stretcher case or not. No medical orderly was allowed to give morphia. The medical officers attached to R.F.C. brigades, although directed by the R.A.M.C. officer at R.F.C. headquarters, were under the command of the Director of Medical Services of the Army in which the brigade happened to be, and were responsible to him for hygiene, sanitation and the medical equipment. R.N.A.S. squadrons brigaded with the R.F.C. had a naval medical orderly each, but received medical attention from the R.A.M.C., as though they were R.F.C. units. The accommodation for sick and wounded and for the examination of officers and men at the air units overseas was limited and usually consisted of a small bell tent with one bed, or a temporary hut with two beds. Bomb-proof accommodation was not provided specially for patients, but they naturally shared with other personnel any dug-out shelters available.

At home the treatment and disposal of R.F.C. sick, injured and convalescent were undertaken by aerodrome medical officers, who were mostly R.A.M.C. officers unfit for general service overseas, either

temporarily or permanently. The medical administration and supervision were in the hands of the Deputy Director of Medical Services of each Army command. Medical orderlies were provided for each aerodrome and were responsible for giving first aid in an emergency and taking cases to the nearest hospital. In practice the aerodrome medical officer usually attended injured men personally.

Hospital accommodation for R.F.C. personnel was nearly always provided at the nearest military or civilian hospital. In 1916, a fund was collected by voluntary contributions to open a special hospital of twenty beds for R.F.C. flying officers in Bryanston Square, London, administered by the British Red Cross. The organisation grew to such an extent that another hospital of fifty beds was established in Eaton Square, London, and later a large hotel with an estate of 200 acres was acquired as a convalescent home at Shirley Park, Croydon. There were also other convalescent homes in the country for officers. There were insuperable disadvantages inherent in the establishment of hospitals in such buildings.

FORMATION OF SPECIAL MEDICAL BOARDS

During the course of the war with successive improvements in artillery, flying was gradually carried to greater and greater heights, so that by the autumn of 1916, 'mountain sickness' in its various kinds and degrees gravely increased the difficulties and dangers met by flying officers, and the practical problems of the administration of oxygen at high altitudes by suitable methods had become of vital military importance. It became apparent also that manifold physiological problems of other kinds were confronting the medical officers in the separate flying services, who were responsible for the selection of suitable candidates for commissions, and the maintenance of efficiency in the flying men and its restoration after fatigue or injury. During the latter months of 1916, the Medical Research Committee* gave assistance in France and at home in experimental work undertaken by individual medical officers or civilian physiologists, by supplying medical apparatus and in other ways. At the close of the year, the committee formally offered their services in these matters to the President of the Air Board, and gave further expert physiological assistance to the experiments and investigations already begun by the Directorate of Military Aeronautics. At that time, officers transferring to the R.F.C. from the Army were usually medically examined either by their own R.A.M.C. officer or an R.A.M.C. board. New entrants to the R.F.C. were examined by the usual recruiting boards. A few of the medical officers were pioneering in the field of

* Its name was changed to the Medical Research Council in April 1920.

aviation medicine* and eventually their combined reports carried sufficient weight to make the formation of a Special Medical Board to deal with flying officers advisable. In October 1916† a special board was formed, consisting of two R.A.M.C. officers employed whole-time and two civilian consultants employed part-time. It became the responsibility of this board to deal with medical questions of flying, sick officers, the examination of flying candidates and research. The work increased to such an extent that it became necessary to form four extra boards or committees, called the Candidates or Commissions Board, the Travelling or Aerodrome Board, the Invaliding or Sick Flying Officers Board and the Special Research Committee.

In December 1916, the daily number of candidates and sick officers averaged 20 to 24. A year later, the average number seen daily was 160 candidates and 30 sick officers, who were examined by an increased staff of 14 whole-time medical officers and 2 part-time civilian practitioners. The work of this board limited the activities of the Travelling Board, and at the same time curtailed research owing to the shortage of medical personnel.

The Commissions Board examined all aircrew candidates and gave each a detailed medical examination which was said to be 'unique in its methods and the thoroughness of their application'. The acting president of the board organised the examination of candidates and acted as referee and consultant for the executive on recruiting matters. The majority of candidates had already been passed fit for general service before coming to the board. Advisory visits to the schools of instruction and to sick candidates were carried out, but no official medical supervision was authorised.

The Travelling Medical Board was formed to keep in touch with medical conditions at aerodromes. Their work was greatly restricted because members had to assist the Commissions Board owing to pressure of work. The Army Medical Department instructed the acting president to consider any visits made to aerodromes to examine problems of flying as official, but as unofficial as far as sanitation, hygiene and medical treatment on stations was concerned, because of the danger of interfering with the duties of the Deputy Directors of Medical Services of the various Commands.

The Invaliding Board attempted at first to examine any officers of the R.F.C. due for a board, but found the task impossible owing to the shortage of staff and the lack of accommodation; candidates were therefore limited to flying officers, observers, balloon officers and pupils

* *See* original articles by Priestley, Haldane, Dreyer, Birley, Bazett, Bowdler, Briscoe, Head, Rivers, Stamm and Flack.

† Largely as a result of the work of Flack and Bowdler. See the Selection of Candidates for Flying, Reports Nos. 6 and 7, Medical Research Council series.

under flying instruction who were sick. The work increased so much that the board eventually could only take those actually flying, or about to resume flying, all cases under treatment being excluded and the work previously undertaken being carried out by the various Commands. Even with this restricted scope the work fell into arrears, and if accommodation and doctors had been available, two more invaliding boards would have been established in the spring of 1918.

FORMATION OF FIRST R.F.C. HOSPITAL

A special committee, called the Air Board Research Committee, was formed in February 1917 to discuss and advise on the standards of fitness for flying, and on research and investigation on any subject of medical interest in aviation. This committee kept in touch with the medical officers at the headquarters of the R.N.A.S. and the R.F.C., and thus established a most useful liaison, one of the results of which was the formation of the first Royal Flying Corps hospital at Hampstead, in which patients of both Services were treated by a mixed naval and military staff.

PLANS FOR AN INDEPENDENT AIR FORCE MEDICAL SERVICE

In July 1917, the Prime Minister and General Smuts formulated the principles on which they considered that the air defence of the country should be conducted. Their proposals were approved by the War Cabinet. They envisaged a separate Air Force as distinct from the Army and Navy, and the Flying Services Medical Advisory Committee drew up plans under the direction of Mr. Watson-Cheyne, for an independent Air Force Medical Service. The proposals were submitted to the Air Organisation Committee for consideration on November 29, 1917. Most of the proposals were accepted in principle but the administrative organisation visualised had to be amended because it was too centralised and unwieldy.

In the summary of the reasons for the formation of such a service, it was stated 'Aviation presents new physiological and pathological problems which require special study and which can only be dealt with satisfactorily by a specially trained body of men'. Aviation medicine at the beginning of the War of 1914–18 had not been a recognised speciality and consisted essentially of slight modifications in the existing medical requirements of the various military Services. The date of formation of the Air Board Research Committee (Medical) preceded by a few weeks the formation of a research board, with similar functions, in the United States of America, on September 26, 1917. The extract quoted above was reproduced word for word as the basis of the American argument for the formation of a special independent aviation medical service. The plans submitted by the Watson-Cheyne Committee allowed a gradual

taking over without disorganisation of the medical charge of personnel and establishments of the air services in the United Kingdom, the formation of a Medical Advisory Board and the inauguration of a headquarters directorate. The whole project was to take place by stages, and on January 1, 1918, an estimate was made of the number of medical officers which would be needed. At that time there were 87 R.A.M.C. officers attached whole-time to the R.F.C. and 34 part-time. In addition, there were 50 civilian practitioners employed part-time. It was proposed that the new service would need 138 whole-time and 51 part-time medical officers. These proposals were based on the assumption that every flying school would have at least one whole-time medical officer, each small home defence aeroplane, airship or balloon station a part-time medical officer, stations having more than 200 flying officers, two whole-time medical officers, and that the proportion of medical officers to ground staff on non-flying stations should be one per 1,000.

FORMATION OF THE ROYAL AIR FORCE

The naval and military branches of the R.F.C. were amalgamated on the formation of the Royal Air Force on April 1, 1918. At the time of the Armistice, the strength of the Royal Air Force was 27,333 officers and 263,410 other ranks. The total number of aircraft in service was 22,647 and there were 103 airships. Seven hundred airfields were in use at home and overseas, and on them were based 188 operational squadrons and 56 training stations, each with 3 training squadrons. This mighty force was reduced at the end of the war to such an extent that by March 20, 1920, there were only 25 squadrons in existence.

EVOLUTION OF THE R.A.F. MEDICAL BRANCH

The formation of the Royal Air Force made necessary some decision on the status of medical officers serving Royal Air Force units and in the Air Ministry Weekly Order No. 75/18, published on April 17, 1918, it was stated that medical officers who had been lent to the Royal Air Force as from April 1, 1918, and who were employed exclusively with Royal Air Force units, were in future to take instructions on technical medical matters from the Medical Department of the Air Force, instead of from the Army Medical Department. All medical officers were to communicate on purely medical matters direct with their superior medical officer. Senior medical officers of the Royal Air Force were appointed on July 1, 1918 to each of the area headquarters and were known as the Area Assistant Medical Administrators. They were responsible, under the Medical Administrator at Air Ministry, for the medical arrangements of all units in their area, except those for medical boards, general and convalescent hospitals, schools for aeronautics, cadet and recruiting units, reception depots, and all stations and units

in Ireland. The sanitary arrangements remained for the time being the responsibility of the D.D.M.Ss. of the Army commands concerned. An Area Assistant Medical Administrator with similar responsibilities was appointed for Ireland on August 14, 1918.

It is very difficult to ascertain the number of medical officers who served the R.F.C. at the time of the Armistice, but the first Air Force List, published in January 1919, showed that there was a total of 415 medical officers and 3 administrative officers distributed throughout the Air Force. There were at the Department of Medical Administration 1 major general (Director of Medical Services), 1 lieutenant colonel and 2 captains, all staff officers first class; 1 major and 1 lieutenant, staff officers second class; 2 captains, staff officers third class, and 1 lieutenant, staff officer fourth class. Outside the department there were 15 lieutenant colonels, 19 majors, 239 captains, 133 lieutenants and 3 administrative officers, consisting of a captain, a lieutenant (who had been awarded the Victoria Cross), and a second lieutenant.

The Department of Medical Administration was altered later to 'The Medical Directorate'. The head of the department was not called the 'Director-General of Medical Services' until 1939, but was known as the 'Director of Medical Services'. At first, the Medical Services were under the direction of the Chief of Air Staff as it was considered that the maintenance of health was a matter affecting strengths and the Order of Battle. It was not until 1922 that the Medical Directorate came under the direction of the Air Member for Personnel (A.M.P.).

The Medical Branch was reorganised between March and November 1919 and R.A.F. ranks were introduced in August of that year. The Director of Medical Services became a group captain, and the remainder of the staff consisted of a wing commander (deputy director), staff officer first class; a wing commander and a flight lieutenant, staff officers first class; and a squadron leader and a flight lieutenant, staff officers second class. The total strength of the Branch had been reduced by December to 132 medical officers and 3 administrative officers.

FORMATION OF THE R.A.F. MEDICAL BRANCH

The actual date of formation of the R.A.F. Medical Branch is difficult to determine because medical officers serving with the Royal Air Force were only considered to be attached or transferred to that Service. The plans for an independent medical branch had already been made and reorganisation had begun, but no hard and fast conditions of service were made known; medical officers had in consequence no definite idea of the career open to them. There was considerable delay in obtaining financial approval for an R.A.F. medical establishment and it was not until July 13, 1920, that the first permanent or short service commissions were granted. On that date, 7 wing commanders, 14 squadron leaders

and 25 flight lieutenants received permanent commissions, and 3 squadron leaders and 27 flight lieutenants short service commissions. These appointments were ante-dated for permanent officers of wing commander and squadron leader ranks to October 1, 1918, when they had been granted temporary commissions in the Royal Air Force. If it is assumed that the date of granting permanent commissions, or the ante-date, is the official date on which the R.A.F. Medical Branch was formed, it becomes very difficult to define the status of medical officers serving before October 1, 1918. If, however, the date of the formation of the first Royal Flying Corps Hospital at Hampstead is taken as the date for the formation of a medical organisation from which the future medical services developed, it is possible to say that the first appointment to be made to the new medical branch was that of a bacteriologist on October 11, 1917.

UNIFORM AND BADGES

The first uniform for officers, warrant officers, non-commissioned officers and men of the Royal Air Force was approved on May 1, 1918, and authorised in Air Ministry Weekly Order No. 162/18 a month after the new Service formed. Khaki was to be worn as service dress for the period of the war, after which uniform of the same pattern, but of light blue cloth was to be substituted as soon as possible, but in the meantime the blue uniform could be worn during the war as mess kit if desired.

The cap was of the same design as that worn by the Royal Naval Air Service, but was made of khaki and had a black peak and a black hat-band. The cap badge consisted of a reduced facsimile of the R.N.A.S. cap badge but with a reduced laurel leaf circlet. Rank was denoted by the addition of upright metal bars on either side of the cap badge.* Lace braid was worn on the sleeves as well to denote rank. The braid was similar to that worn by officers of the Royal Navy, except that it was of blue and khaki and instead of the executive curl, a gilded bird surmounted by a gilded crown was worn. The tunic was of the same pattern as the military tunic service dress, except that the shoulder tabs were removed and the Sam Browne belt replaced by a cloth belt with a gilt buckle having one central pin. The buttons were of the same pattern as those worn by officers of the R.N.A.S. Trousers and breeches were of R.F.C. pattern. Shirts and collars were khaki and the tie black. The greatcoat was similar to the British warm greatcoat worn by mounted services but with the addition of badges of rank on the shoulder straps. Shoes and boots were brown. Medical officers were distinguished by the

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* Second lieutenants, Lieutenants .. .. One upright metal bar on each side of the badge
Captains .. .. .. Two upright metal bars each side
Field officers .. .. One row of gold oak leaves on peak
General officers .. .. Two rows of gold oak leaves on peak

FIG. 1. Reproduction of original drawing by Miss S. Munday, aged 13.

FIG. 2. Alternative design not accepted.

FIG. 3. Official badge, 1918–1920.

FIG. 4. Reproduction of original drawing from which existing medical badge was designed.

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wearing of the Caduceus of Mercury badge, without a crown, on the lapels of the jacket.

It was decided in June 1918, that medical officers should wear the same badges of rank as the remainder of the Royal Air Force, but that they should be distinguished from other branches by a distinctive collar or lapel badge and by the wearing of a maroon instead of a black band round the cap.

Several badges were designed during the next few weeks, but the one finally chosen was designed by the daughter of the Director of Medical Services at that time, and consisted of a central Egyptian Ankh, entwined with a snake, surmounted by a crown and surrounded by laurel wreaths. Underneath the body of the badge was a scroll on which the legend 'Nec aspera terrent' was inscribed. The badge was supplied in gilt for officers and in gilded metal for other ranks and was worn on both the khaki and the blue uniforms. Officers, warrant officers and sergeants wore the badge on each lapel of the jacket; other ranks wore it on the collar of the jacket. A Geneva Cross was also worn on both arms of the jacket and the greatcoat, by warrant officers below the crown, by non-commissioned officers immediately above the chevrons, and by other ranks nine inches from the top of the sleeve.

The shortage of light blue material for the new uniform resulted in officers wearing either khaki or blue. This procedure was authorised in Air Ministry Weekly Order No. 617/18, dated July 10, 1918 for officers who were wearing out their khaki uniforms. At the same time authority was given for the wearing of the light blue uniform for general wear, with certain modifications. The rank bars were abolished on the blue hat and alterations were made to the hat badges for officers of higher rank. The buttons were made flatter, and the rope edge discontinued. The belt buckles had to have two prongs instead of one, and the bird and crown arm badges were discontinued, but gold braid was used instead of khaki on the sleeve rank badges and a thin gold stripe, similar in size to that now worn by pilot officers, was introduced for second lieutenants. Breeches and trousers were of light blue cloth, but black boots and shoes were now worn. Shirts and collars became white and the tie remained black. The greatcoat and waterproof continued to be of the Army pattern.

The next change occurred on June 25, 1918, when it was announced in Air Ministry Weekly Order No. 727/18 that medical officers would not wear any medical badge on the lapels of the khaki jacket.

The maroon hat-band ordered for medical officers was very unpopular, and it was reconsidered by the Air Council on October 29, 1918, but was continued on the grounds that the maroon band was distinctive and that it would save time in obtaining a medical officer in an emergency because he would be conspicuous.

The blue greatcoat, of similar pattern to that now worn, but with gold lace rank badges on the shoulder straps, was introduced on December 12, 1918. At the same time a blue double-breasted raincoat was authorised to be worn without any rank badges or rank braid.

The light blue uniform was not found to be serviceable because of its colour and on September 15, 1919, a cloth of a darker shade of blue was authorised in Air Ministry Weekly Order No. 1049/19. The new cloth was used from October 1, 1919, but at first only those officers with permanent or short service commissions were allowed to wear it.

The Director of Medical Services asked all principal medical officers on March 5, 1920, for their opinion on the possible abolition of the maroon cap-band and its replacement by the normal black mohair band, and on the replacement of the existing medical badge by the original Winged Caduceus of Mercury badge. Opinion was unanimous in condemning the maroon cap-band and the existing badge, and marked preference was shown for the original medical badge. The Winged Caduceus of Mercury badge was then chosen as a basis for the new badge, but some alteration or addition was thought necessary, because the United States Army Medical Service had already adopted the Winged Caduceus as their official insignia. Several designs were drawn, the one finally chosen being developed from a sketch produced by the Deputy Director of Medical Services. The popular Winged Caduceus was retained with the addition of a crown. This badge was approved by the Air Council in the first week of June 1920, and at the same time the maroon hat-band was discontinued. The introduction of the new badge began in the following September for officers, but for other ranks the old collar badge was worn until existing stocks were exhausted. (*See* Figs. 1–4).

CONDITIONS OF SERVICE

Provisional conditions of service had been made known in Air Ministry Weekly Orders from time to time, but it was not until the first edition of Air Publication 953, published in 1923, that a definite career could be offered to medical officers. Medical officers serving in the new medical branch knew to a certain extent what their careers were likely to be. In the transition period between the end of the last war and the confirmed establishment of the new branch there were many compromises. Considerable dissatisfaction was felt by medical officers for some time, because the granting of permanent commissions to those already serving was delayed until 1920, by which date many officers had decided to leave the new branch because of the uncertainty of their position. The lack of guarantee of a career made the branch unattractive to medical officers of the other Services, and, in fact, only one regular R.A.M.C. officer elected to transfer from the Army to the

new branch. In 1919 and 1920 there was a very grave shortage of medical officers because few were volunteering to extend their contracts; this, with the small number of new entrants, made difficult the relief of time-expired medical officers serving overseas. In fact, some officers serving abroad at that time were unable to return to the United Kingdom until 1925 and 1926.

All medical and dental officers of the Royal Navy and the R.A.M.C. employed exclusively on Royal Air Force stations were transferred or attached to the Royal Air Force, according to the nature of their commissions on October 1, 1918, unless they gave notice of objection to the Air Ministry before January 1, 1919. Medical officers and dentists with temporary commissions were transferred to the Royal Air Force. Permanent medical officers of the Royal Navy, and officers of the Royal Naval Reserve and Royal Naval Volunteer Reserve were attached to the Royal Air Force for a period of three years or for the duration of the war, whichever was the longer; R.A.M.C. medical officers of the Regular Army, the Special Reserve or the Territorial Army were attached for the duration of the war. Medical officers and dentists were not liable to serve after transfer or attachment for longer periods than they had contracted to do in their own Service.

The conditions of service for medical officers transferred or attached from the other Services were published in Air Ministry Weekly Order No. 1109/18 dated September 26, 1918. In this Order it was stated 'Whilst it is impossible to pledge the future as to prospects of individuals, and while reasonable latitude must be allowed to the Air Council to deal with any privilege or emoluments which are not subject to vested rights, it may be taken as a general principle that no person will suffer loss of emoluments or pension by reason of attachment or transfer to the Royal Air Force'. The Order described broadly the functions of the Royal Air Force Medical Branch as the 'care of effective personnel' and the 'care of non-effective personnel'. It was stated that a medical officer would, subject to the exigencies of the Service, be selected for and eventually allocated to work for which he had the most ability. However, since the selection for special work depended upon a sound knowledge of the living conditions of effective personnel, medical officers were not selected for special work until they had been recognised as suitable for special merit pay. A system was introduced whereby two grades of pay, called Grade A and Grade B, were authorised.* An officer once selected for Grade A pay would draw such pay for a probationary period of one

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* *Daily Rates of Pay*

	Grade B	*Grade A*
Lieutenant	14s.	—
Captain	16s. and 19s.	22s.
Major	24s.	27s.
Lieutenant colonel ..	35s.	40s.

year, and then if his appointment was confirmed would, except in the case of incompetence or misconduct, continue to draw this pay however employed until promoted to the next higher rank, when he was placed automatically in Grade B until selected again as being eligible for Grade A pay. An officer appointed in charge of a hospital or other unit, which in the Navy or Army would carry charge pay or which previously was held by an officer drawing Grade A pay, was not entitled to Grade A pay, nor would seniority alone entitle him to Grade A pay. Permanent commissions were not to be granted yet, and the conditions of service and scales of pay were to be subject to revision at the end of the war, but when permanent commissions were granted previous experience as a medical officer in the Royal Air Force would be taken into account.

Promotion to the ranks above that of captain was by selection to fill vacancies in establishment. On attachment or transfer to the Royal Air Force, officers received temporary commissions with rank corresponding to their new rank, substantive or temporary, before transfer or attachment. Officers who received promotion in the Navy or Army while serving with the Royal Air Force, received corresponding Royal Air Force rank and were held supernumerary to establishment until there was a suitable vacancy. Officers lent to the Royal Air Force, who later became transferred or attached, received seniority in the Royal Air Force from October 1, 1918, and were placed on the Royal Air Force list in order based upon their seniority in the Service from which they were transferred or attached, and they were given the assurance in writing that their prospects of promotion by selection in their own service would not be prejudiced thereby.

The conditions of service for Royal Air Force medical officers have been altered from time to time. The conditions and changes made have been summarised in various editions of Air Publications 938, 953, 968 and in Air Ministry Pamphlets 25 and 101. Full details can be obtained from these documents. It is not intended to give here any more detail than necessary to describe the major amendments which have been made at certain dates.

The conditions of appointments have not altered in so far as age at entry and medical examination are concerned. New entrants were appointed to short service commissions in the rank of flying officer, and after certain periods could be granted permanent commissions. Those who failed to obtain permanent commissions or had no desire for them, ceased to be employed on the active list at the completion of their tour of duty, and were placed on the reserve.

In 1923, it was stated in the first edition of Air Publication 953 that short service commissions were to be held for two years, extendible to four years with the approval of the Air Council, and that thereafter a period of four years was to be served on the reserve. The period of reserve

service could be extended with the consent of the officer concerned and the Air Council by further periods of service, until the age limit of 36 was reached. Conditions for the premature termination by the Air Council of short service and reserve commissions remained unchanged. Retrospective secondments for periods up to a year, similar to those now permitted on resident appointments to recognised civilian hospitals before entry into the Service, also held good at that time.

Medical officers of the Royal Navy, Army and other Government and Colonial Services could be seconded for service in the Royal Air Force for three years, which period could be extended or reduced with the consent of the officer himself, the Air Council and the Service to which he belonged. Such officers were gazetted in ranks equivalent to the substantive ranks in their own Service and were paid according to the substantive rank held in the Royal Air Force.

During the first six years of service permanent officers below the rank of wing commander could be granted permission to attend on full pay, for a period not exceeding nine months, either the Service staff officers' course at the Royal Army Medical College or a post-graduate course in either general medicine and surgery, tropical and preventive medicine, or a specialised subject, such as ophthalmology or oto-rhino-laryngology.

Promotion to the rank of flight lieutenant was made after two years' service, and officers selected for permanent commissions were normally promoted to the rank of squadron leader after ten years' total satisfactory service, irrespective of establishment, but accelerated promotion to squadron leader rank at the end of eight years' service could be granted to officers showing exceptional scientific or professional ability. Promotion within establishment to the rank of wing commander was made by selection after sixteen years' total service, and to that of group captain after twenty-two years' service.

The compulsory retiring ages were subject to the same variations as they are now, but the minimum period of twenty years' service was necessary as a qualification for retired pay. Voluntary retirement on retired pay was not permitted to officers under 40 years of age unless it was in the interest of the Service.

Gratuities of £1,500 were granted to permanent officers with between ten and sixteen years of service, and £2,000 to those with sixteen or more years' service not eligible for retired pay. Medical officers with short service commissions were eligible, on passing to the reserve on conclusion of their service on the active list, for gratuities of £100 for each of the first two completed years of service and £150 a year for the third and fourth years, making a total of £500 for four years on the active list. It became possible later to serve for five years before passing to the reserve, at the end of which time the gratuity was £700.

THE FISHER COMMITTEE

Insufficient candidates were attracted by the above conditions of service and a committee, called the Committee on the Medical Branches of the Defence Services, was formed on May 22, 1931, to investigate the causes of the shortage of officers and nurses in the medical and dental branches of the three Services. The Committee was presided over by Sir N. F. Warren Fisher, and was called after him. In the autumn of 1931, the financial crisis occurred and the United Kingdom abandoned the gold standard. The general condition of uncertainty resulting from this lasted for a considerable time and made impossible further conclusions about the financial attractions which the Services should offer to compete effectively with civilian medical employment. The meetings of the committee were accordingly suspended for a time, and it was not until July 19, 1933, that a report was published. The recommendations made were accepted by the Treasury and the Air Council and were promulgated in an Air Ministry Order, No. A.112/34.

All recommendations made which concerned the Royal Air Force contributed greatly to making the Medical Branch more attractive, although the financial situation was such that improvements in the careers of medical officers had to be made by reducing the establishment, because the total cost of the Service could not be increased at that time. It was thought that the rule by which a medical officer had to stand by at every hour of the day or night while flying was in progress was wasteful of medical man-power. It meant that a unit establishment had to be made solely to enable this duty to be performed, while the amount of professional work was not enough to warrant the full-time employment of a Service medical officer, and it was suggested that more use could be made of civilian medical practitioners instead. The Air Council agreed to abolish the rule at all stations other than at the Royal Air Force College and the flying training schools. A subsequent reduction of establishment by 12½ per cent. was possible and the promotion of officers to higher ranks began. The old establishment of higher ranks was for 23 wing commanders, 9 group captains, 1 air commodore and 1 air vice-marshal; a total of 34. The new establishment created posts for 37 wing commanders, 19 group captains, 1 air commodore and 1 air vice-marshal; a total of 58. The opportunities for promotion, assuming entry at 25 years, were improved so that flying officers could be promoted to flight lieutenant at 26 years of age instead of 27; the promotion to squadron leader remained unaltered at 35 years, but it was possible to become a wing commander at 40 instead of 45 and a group captain at 48 instead of 50. At the same time, compulsory retirement ages were raised to 55 for wing commanders and 57 for group captains.

The yearly intake to permanent commissions was to be regulated so that a proportion approaching 55 per cent. of the short service officers

could obtain permanent commissions. It was realised by the Air Ministry that it would take some time for the promotions recommended to be effected in the proportions stated to be most beneficial, but until it was possible to obtain this theoretical optimum every attempt was to be made to adhere to the character of the recommendations.

The gratuities for both short service officers and officers holding permanent commissions who retired before becoming eligible for pension were increased. The gratuities payable to short service officers at the completion of three years' satisfactory service were increased from £350 to £400, and at the end of five years from £700 to £1,000. Officers holding permanent commissions became eligible for a £1,000 gratuity after five but less than ten years' service, £1,500 for ten but less than fifteen years' service and £2,800 for fifteen or more years' service, if they were not eligible for retired pay.

RESERVES OF MEDICAL OFFICERS

Several different Royal Air Force Reserves have been formed since the First World War; each had a complement of medical officers. A description of the various reserves tends to be confusing, so they have been tabulated first with their dates of formation, and then described in more detail in the narrative:

(*a*) February 9, 1923—	Formation of the Reserve of Air Force Officers, incorporating two classes of reserve medical officers, called Class D.i. and D.ii.
(*b*) October 9, 1924—	Formation of the Auxiliary Air Force. Medical officers serving in this Force formed a potential reserve in addition to the regular Reserve.
(*c*) November 24, 1924—	Formation of the Class D.D. Reserve of medical officers in the Reserve of Air Force Officers.
(*d*) April 18, 1928—	Formation of the Special Reserve of medical officers.
(*e*) September 1932—	Formation of the Auxiliary Air Force Reserve of Officers.
(*f*) 1937—	Formation of the Royal Air Force Volunteer Reserve.

CLASS D.i AND CLASS D.ii RESERVES

The Class D.i Reserve consisted of regular medical officers who had been permitted to resign or relinquish their commissions before the expiration of twenty years' service on the active list. The Class D.ii Reserve consisted of officers who had held short service commissions and who, on the completion of their tour of duty, passed to the Reserve

to complete the remaining period of their engagement, or were permitted to pass to the Reserve before completing their full period of service on the active list. All officers on appointment to the Reserve entered with the substantive rank held at the end of their period of service on the active list. Officers of Class D.i Reserve continued to serve in the Reserve until they reached the age of 55, provided they remained medically fit. The period of service for Class D.ii officers in the Reserve was four years, extendible with the consent of the officer by further periods until the age limit of 36 was reached.

Class D.i officers were not required to attend compulsory courses of training, but were allowed to apply for permission to attend courses not exceeding fourteen days in length in any one year, if they so desired. Class D.ii officers were required to attend a course of fourteen days' training during the second and third years of reserve service and they could, if they wished, apply for further similar courses. Class D.i officers were not entitled to a retaining fee, but Class D.ii officers received £20 a year to cover all expenses for the upkeep, and wear and tear of their uniform and equipment, provided they had carried out their courses of training satisfactorily or had been excused.

AUXILIARY AIR FORCE

The Auxiliary Air Force was formed on October 9, 1924, and was the Air Force counterpart of the Territorial Army. Policy demanded that there should be no larger unit than a squadron in its organisation. The initial period of service was five years from the date of appointment, but this could be extended by further periods of five years with the consent of the officer concerned and the Air Council. The age limits for entry were 25 for a pilot officer or flying officer, 30 for a flight lieutenant, 35 for a squadron leader and 40 for a wing commander, but the age limit could be relaxed at the discretion of the Air Council as far as medical officers were concerned. This decision was altered in 1926, when the age limit for medical officers was fixed at 32 years. Officers who had left the Royal Air Force by means other than invaliding with retired pay or gratuity, could enter the Auxiliary Air Force if they were eligible, the only stipulation being that all such officers of and below the rank of flight lieutenant would be recalled to the Royal Air Force on mobilisation; the disposal of officers with reserve obligations, above the rank of flight lieutenant, was to be decided by the Air Council. Officers who had served not less than two and not more than ten years in the Royal Air Force, Army or Navy, were eligible for flight lieutenant or squadron leader rank. The age of retirement for medical officers was 45 for flying officers and flight lieutenants, 50 for squadron leaders and 55 for wing commanders, but these ages were subject to alteration by the Air Council until 1931, when the age of retirement was fixed at 55.

CLASS D.D. RESERVE OF MEDICAL OFFICERS

The Director of Medical Services received applications in January 1924 from certain doctors who had qualified since demobilisation and did not wish to join the reserve as pilots, but were asking to join as medical officers. There were at that time no officers on the Class D.i Reserve, and only a few on the Class D.ii. On April 1, 1924 there were 1 squadron leader and 8 flight lieutenants on the strength of the Class D.ii Reserve. It was estimated that the strength would gradually increase so that by the end of March 1926, there would be 4 squadron leaders, 36 flight lieutenants and 17 flying officers; a total of 57.

A question then arose of enrolling these applicants in the Class D.ii Reserve or forming a separate type of reserve with them. The matter was investigated and in July 1924, the Air Council requested the Treasury to sanction the creation of a Class D.D. Reserve, which was to consist of doctors recruited direct from civilian practice. It was stated that the anticipated flow into the Class D.ii Reserve was slow and would not for some years create a reserve in any way proportionate to the requirements so far as they could be foreseen. In these circumstances they were compelled to look elsewhere for the necessary personnel and accordingly proposed to form a new reserve. The conditions of service were to be the same, so far as they were applicable, as for other officers in the Reserve in general and the Class D.i Reserve with certain adaptations. Officers in the Class D.D. Reserve would not usually be required to attend any courses or training, but the Council desired to permit any officers who might apply to undergo courses not exceeding fourteen days in length in a year. Officers were not to be given a grant for uniform, nor were they to receive a retaining fee. The Council was unable to forecast accurately the numbers needed, apart from the possible requirements for an expeditionary force, but on the information available they thought that an intake of thirty officers was desirable.

The Treasury agreed to the proposals and a Royal Warrant of Authorisation was granted for the formation of the Class D.D. Reserve on November 24, 1924.

RELEASE FROM LIABILITY FOR TRAINING OF CLASS D.ii MEDICAL OFFICERS

On June 19, 1925, the Air Council decided to release officers on the Class D.ii Reserve from the liability of annual training and cancel the regulation whereby this class of officer received an annual retaining fee of £20. The new rule was to apply only to short service officers who entered after its promulgation, the retaining fee being continued for all those officers in the Service who were likely to be or were already in the Reserve. The Air Council felt that a decision to withhold such fees from the latter would be considered as a breach of faith and would have an

adverse effect on the subsequent recruiting. The Treasury agreed to the proposals on August 20, 1925.

THE SPECIAL RESERVE OF MEDICAL OFFICERS

The officer commanding No. 1 Air Defence Group proposed in October 1927 that selected medical practitioners in localities where cadre squadrons of the Special Reserve were located might be granted commissions. The Special Reserve consisted of two cadre squadrons which were normally cared for medically by civilian practitioners. When these squadrons were called for special training, the practitioners were unable to participate, and it was felt that the Service would benefit if such doctors could be granted a commission and be able to attend in uniform any exercises which took place.

The proposal was held up by the Director of Medical Services while consideration was given to the possible formation of a new type of reserve. The Army used to recruit their Special Reserve medical officers partly through the various Officers' Training Corps and partly by giving commissions in the R.A.M.C. Special Reserve to medical student members of an Officers' Training Corps who were within two years of qualifying as doctors. The R.A.M.C. had abolished the Special Reserve and its substitute, the Militia and Supplementary Reserve, and no longer recruited medical students, but in the Navy a similar system was still in use for the Royal Naval Volunteer Reserve. It was thought that such a scheme might be used for the Royal Air Force if it was instituted in the Special Reserve or alternatively in the Class D.D. Reserve, as the conditions of service were different for each reserve. However, in the opinion of the Director of Medical Services there were no real grounds for asking for it because there was at that time no shortage of medical officers in the Reserve. The Class D.ii Reserve, supplemented by Class D.D., was considered to be sufficient to cater for anything which was likely to be required on mobilisation. If the three officers serving with the Auxiliary Air Force were included, there were 41 medical officers on the Reserve, and it had in fact been unnecessary to recruit Class D.D. officers up to the strength allowed. After careful consideration, in March 1928, the Air Council wrote to the Treasury and requested that appointments similar to those already given in the Auxiliary Air Force should be extended to the Special Reserve squadrons, and that one Special Reserve medical officer should be attached to each of the cadre squadrons. The same regulations were to apply as to other Special Reserve officers, but otherwise the conditions of service were to be the same as those in the Auxiliary Air Force. It was estimated that the extra cost would not exceed £40 for the annual training and would not affect the position of the contract medical practitioners, even if they were granted commissions. In April 1928, the

Treasury agreed to the proposals on the understanding that Special Reserve medical officers could be appointed only if, when the annual training took place, regular or short service commissioned officers were not available on airfields to provide the medical attention required.

AUXILIARY AIR FORCE RESERVE OF OFFICERS

The Auxiliary Air Force Reserve of Officers was formed in September 1932. Only those officers who had served in the Auxiliary Air Force were eligible for commission. The initial period of service was for four years from appointment. Service could be extended by further periods of not less than one and not more than four years up to the age of 60. A gratuity of £5 and an issue of camp kit was given to officers of this Reserve. There were only two medical officers on this Reserve when war began; one entered in December 1931, and the other in February 1938.

ROYAL AIR FORCE VOLUNTEER RESERVE

The Air Council sent a memorandum on the formation of the R.A.F.V.R. to the Treasury in June 1936 for approval. The memorandum explained the plans made for the expansion of the Royal Air Force by the entry of 800 men in each of the years 1936, 1937 and 1938 for training as reserve pilots. Further plans were in preparation for the provision of a reserve of observers. On September 30, 1936, the position of the medical reserves was reviewed. There were approximately sixty on the reserve, distributed among Class D.i, Class D.ii, the Auxiliary Air Force and Class D.D. None of these officers was required to attend annual training; officers of Classes D.ii and D.D. received no retaining fee for their services. It was estimated that with the expansion of the Royal Air Force a reserve of at least 125 medical officers would be needed to meet the requirements of mobilisation, and the Air Council considered that immediate steps should be taken to recruit officers up to that total. It was stated that, from the recruiting point of view, the existing conditions of service of medical officers in the Reserve of Air Force Officers were unattractive, and a deficiency was likely unless they were improved. It was also thought that officers had no real opportunity of becoming acquainted with the Service to which they belonged under the existing conditions; it was considered essential that reserve medical officers should receive training in Royal Air Force practice and procedure. The Council thought that the various classes of reserve personnel to be recruited from civilian life should enter the R.A.F.V.R. and they proposed to admit to that Reserve such a number of qualified medical men from civilian life as would maintain, with the reserves available from other sources, a total strength of 125 medical officers, under the following conditions. Officers would be required to undergo training of

eighteen working days' duration in the first year of service, and, if called upon, twelve working days annually in subsequent years, with pay and regulated allowances and an outfit grant under the general conditions applicable to the Reserve. They were to receive a retaining fee of £15 annually, provided the requisite training was carried out. This corresponded with the provision existing for the officers serving in Classes B and B.B. (Technical) of the R.A.F.O. It was proposed that the regulations should be amended so that promotion from flying officer to flight lieutenant would be possible after two instead of four years' service, to make conditions of service for R.A.F.V.R. officers more comparable with those of regular medical officers, who were eligible for promotion after one year of service, and of Auxiliary Air Force medical officers who were eligible for promotion after two years' service. Officers already serving in the Class D.D. of the R.A.F.O. were to be offered appointments in the R.A.F.V.R. under the above conditions, including the liability to eighteen days' training in the first year. Class D.i medical officers were to remain on the Reserve of Air Force Officers, but were to be given the option of accepting the liability to be called up for twelve days' annual training, in which case they became eligible to receive a retaining fee of £15 a year and pay and allowances during training under the rules in force for officers of Class B (Technical). In view of their previous regular service they were not liable for the eighteen days' training required of the direct entrants in their first year of service. Medical officers of Class D.i who elected not to accept the liability for training were to continue to serve without a retaining fee. Training was to take place at Royal Air Force units and not at the town or aerodrome centres, which were required for the training of the various classes of volunteer personnel. The Treasury agreed in February 1937, provided the Council was satisfied that the proposed issue of a retaining fee would involve no reactions from medical officers of the Auxiliary Air Force.

The position was explained in October in a letter from the Air Ministry to all Class D medical officers. The Air Council informed them that they had decided to introduce annual training for all medical officers in Class D who had completed the first four years' obligatory service after transfer from the active list and had volunteered to extend their service. The training was to consist of an attachment to a Royal Air Force unit for a period of twelve working days annually, generally at times convenient to individual medical officers.

Pay and allowances, where admissible, at the rates appropriate to unmarried officers would be issued for periods of training under the conditions laid down in the reserve regulations. A retaining fee of £15 was also to be paid for each year of service in which the required training had been carried out, or exemption had been granted. A retaining fee

would not be issuable to officers for the first four years of obligatory service.

Officers in possession of uniform were to be required to wear it during attendance for training. The regulations did not permit the issue of an outfit allowance to officers transferred to the Reserve from the regular Air Force; however, an allowance could be paid to officers who were appointed to the Reserve if more than three years had elapsed between the end of previous service in the Royal Air Force, its reserves or auxiliaries if they were not in possession of uniform and were not eligible for issue of an outfit allowance. They could attend for training in plain clothes if they wished, wearing dinner jackets in the mess in the evening.

Officers who had completed their obligatory service and whose current periods of service were due to expire within one year of the date of the letter, would not be eligible to participate in this scheme of training, unless they were willing to extend their service further. Officers then serving in Class D.ii could elect not to accept the liability for attendance at training, but then they would not be eligible to receive a retaining fee.

PRE-WAR EXPANSION OF MEDICAL RESERVES

Plans for mobilisation were well advanced in 1937, but it was soon found that additional medical officers would be needed to man the various mobilisation pools. On January 1, 1938, it was estimated that each pool would require an additional flight lieutenant or flying officer and one nursing orderly. It had been possible to fill the original 30 posts for the 10 mobilisation pools with regular personnel and a few Class D.i and D.ii medical officers. Ten more medical officers were required for these pools and 40 more for proposed additional posts, making a total of 50. Every endeavour was made to meet the demands, but it was clear that further recruitment in the Volunteer Reserve would be necessary. Authority was therefore requested to recruit Volunteer Reserve medical officers up to a total of 110.

The position on January 12, 1938, was as follows:

Total peace establishment authorised	268
Number serving overseas	68
Home establishment	200
Home strength, January 1, 1938	165
Deficiency (which was likely to remain and for which civil medical practitioners were employed)	35
Required on mobilisation	
(*a*) Additions to meet war establishments at mobilisation stations	28
(*b*) Increase for Air Ministry	3

(*c*) Increase for hospitals at:	
Halton	6
Cranwell	4
Uxbridge	1
(*d*) Increase at Institute of Pathology	1
(*e*) Additional Central Medical Boards	
Nos. 3, 4 and 5 (authorised)	15
Nos. 6 and 7 (provisional)	10
(*f*) Continental Contingent Units	
(i) Component field force (headquarters, 8 squadrons, base area, air depot, 3 parks)	17
(ii) A.A.S.F. units (headquarters, 10 squadrons)	12
(iii) Two Medical Receiving Stations	8
Total	105
Total requirements on mobilisation	305+
+(This figure excluded 20 mobilisation pool requirements (for Z + 5 days), the personnel for which would have to be withdrawn temporarily.)	
Medical officers available on mobilisation	
(*a*) Home strength as above	165
(*b*) Medical officers under training at Medical Training Depot	10
(*c*) Retired officers available for recall	11
(*d*) Reserve Class D.ii. and D.D.	44
Total	230
Deficiency for present phase	75
On completion of full western plan, 1939, further medical officers required	30–40
Deficiency 1939	110
The Selection Board had selected 67, of whom 38 had been gazetted and 29 were entering in the near future	67
Requirements for 1939	43

In February 1938, the Air Council informed the Treasury that after careful review of the situation and the developments which had taken place, there were indications that a material increase in the figure of 125 medical officers for the Reserve would be necessary. It was not possible to estimate precisely what the minimum requirements were likely to be, but in the meantime the Council were anxious to settle the intake programme for 1938, and in the circumstances they proposed to enter 50 medical officers, subject to Treasury approval. Approval was given in March 1938.

At this juncture, the Director of Medical Services also drew the attention of the Committee of Imperial Defence, Sub-committee of Co-ordination of the Medical Arrangements in Time of War, to the

estimates made in November 1936, in which the Royal Air Force requirements for civilian medical practitioners during the first six months of an emergency were given. The figures were 247 officers during the first month of war, increasing to 307 during the second, and up to a maximum figure of 387 by the end of the sixth month. These figures remained the same, but authority had been given for increasing the Reserve to 175 by 1939, the Director-General of Medical Services having estimated that the Reserve would only be 116, leaving 131 to be brought in from outside sources. With the increase in the Reserve, the 1939 requirements would be reduced from 131 to 72 for the first month, but 60 more would still be required for the second month to complete the 307.

In December 1938, the Air Council informed the Treasury that the existing establishment, including the 50 Volunteer Reserve officers referred to in March, was 175, but careful review of the position during the emergency and subsequent developments showed that the minimum number of reserve officers required to make the war organisation fully effective on mobilisation was 255. It was estimated that a total of 65 medical officers, either serving in the R.A.F.O. or recallable from civil life, would be available, while the balance of 190 would have to be met from the Volunteer Reserve. The strength of the Volunteer Reserve medical section was at that date 101 and sanction was requested to increase the total strength from all sources up to 255. In January 1939, consent was given.

In August 1939, when war seemed imminent, medical officers on the reserve were mobilised gradually, so that by September 4, 1939 the total strength of the Royal Air Force Medical Branch was 554, of whom 156 held permanent and 132 short service commissions.

SUMMARY OF PRE-WAR MEDICAL MANNING

The distribution of ranks between September 1934 and August 1939, after the acceptance of the recommendations of the Fisher Committee, can be summarised as follows:

Distribution of ranks between 1934 and 1939

Date	A/V/M	A/C	G/C	W/C	S/L	F/L*	F/L†
1. 9.34	1	2	11	28	48	56	34
1. 2.36	1	2	18	36	42	43	63
1.10.38	1	3	20	47	41	37	84
1. 8.39	1	4	24	55	28	44	114

* Permanent commission † Short service commission

The wastage of medical officers who held permanent commissions between 1925 and 1938 is summarised overleaf:

Month and year	Number of medical officers holding permanent commissions	Wastage and retirements during previous 12 months (total)	Causes				
			Age	Within 3 years of retiring age	Invaliding ill-health	Death	Resigned
31.12.25	97	–	–	–	–	–	–
31.12.26	104	2	–	–	–	–	2
31.12.27	111	2	–	–	–	–	2
31.12.28	126	1	–	–	–	–	1
31.12.29	129	4	1	–	1	–	2
31.12.30	140	3	2	–	–	–	1
31.12.31	145	2	–	–	–	2	–
31.12.32	142	6	1	–	3	–	2
31.12.33	149	2	1	–	–	1	–
31.12.34	144	5	3	–	2	–	–
31.12.35	142	8	5	–	2	1	–
31.12.36	140	6	–	2	1	1	2
31.12.37	142	2	–	1	–	–	1
31.12.38	152	6	3	1	–	2	–
Totals		49	16	4	9	7	13

Similar figures for the wastage of officers who held short service commissions are given in the following table:

Month and year	Total number of Medical Officers	Wastage	Causes					
			To Reserve 3 years	To Reserve 5 years	Pre-mature	To per-manent com-mission	In-validing	Other
31.12.25	55	19	6*a*	3*b*	1	8	–	1†
31.12.26	57	24	6*a*	5*b*	2	10	1	–
31.12.27	61	15	–	2*b* 1*c*	2	8	–	1* 1‡
31.12.28	53	26	3	1	2	18	–	2†
31.12.29	46	18	2	2*c* 1*d*	3	6	4	–
31.12.30	26	23	10	1*b*	–	8	1	3*
31.12.31	21	11	4	1*b* 2*c*	–	3	1	–
31.12.32	34	4	–	–	1	3	–	–
31.12.33	30	12	1	1	1	9	–	–
31.12.34	36	6	2	1*b* 1*c* 1*e*	–	–	–	1*
31.12.35	60	7	2	1	–	2	1	1*
31.12.36	81	7	2	2	–	2	–	1*
31.12.37	90	12	2	3	1	4	–	2*
31.12.38	90	27	8	2	1	15	1	–

a 2 years
b 4 years
c 5 years
d 6 years
e 7 years

* resigned
† death
‡ court martial

The ratios of medical officers and civilian practitioners employed by the Royal Air Force per thousand Royal Air Force personnel, between the years 1935 and 1938, are summarised in the following table:

Year	Strength of Royal Air Force	Medical Officers			Totals	Ratio per thousand
		Permanent commissions	Short service commissions	Full time civil medical practitioners		
1935	35,098	143	55	15	213	6·00
1936	47,834	141	72	17	230	4·85
1937	59,232	142	85	25	252	4·25
1938	69,844	148	88	39	275	4·00

THE MEANS OF ALLOCATION OF MEDICAL MAN-POWER

The means by which modern warfare is waged depends upon the skill employed in distributing and training the available national man-power. When war became likely, the expansion programmes for the Services and Industry in general had to be correlated one with the other to obtain the most suitable balance of man-power. It was possible to foresee to a limited extent what training programmes had to be instituted to make available the skilled labour needed, but it was not possible to increase by legislation the numbers of doctors who might be required at short notice, because of the length of the medical curriculum; and it was a matter for serious consideration how many young healthy men should be permitted to start their medical training, which would occupy their whole time for at least five years. Some plans were made many years before the war, but the progressive shortage of doctors which occurred as the war went on and the involvement of the civilian population in a total conflict were not foreseen. A problem therefore arose of obtaining a balance of the inadequate medical man-power available between the Services and the civilian population by which the health standards of both could be maintained.

The allocation of doctors to the Services was made on the advice of various committees formed from time to time as the war progressed, and each new committee was given wider powers under the terms of reference as the gravity of the medical man-power shortage began to assume national importance.

THE CENTRAL MEDICAL WAR COMMITTEE

The Central Emergency Committee of the British Medical Association was reconstituted on the outbreak of war as the Central Medical War Committee in accordance with the recommendations of the Committee of Imperial Defence made in the Brock report* of 1924. The

* This Report allowed for the mobilisation of qualified medical practitioners and their distribution to the Fighting Forces and civilian medical establishments in war-time.

terms of reference included 'the determination of the distribution of the agreed quota of practitioners required for military service as between local areas'. A subsidiary committee, called the Central Medical War Committee for Scotland, was formed at the same time. These committees came to be regarded as the supply agency for all kinds of medical personnel required for duties arising out of the war, and as constituted, were intended to be representative of all sections of the medical profession. The Ministry of Health and the Department of Health for Scotland and the Boards of Education and Control had representative observers sitting on the more important committees.

Two hundred local medical war committees were formed under the supervision of the Central Medical War Committee to examine the position of all practitioners, other than those with auxiliary or territorial obligations, who volunteered for service. The names of those who could be spared from civilian practice, with their preferences,* were forwarded to the Central Committee who in turn submitted them to the three Services. Practitioners were not liable to serve in His Majesty's Forces on a compulsory basis until May 1940, when the Government amended their policy because the voluntary system of recruitment was not keeping pace with the Service demands. Doctors then became liable, with the rest of their age groups, for compulsory service with the Armed Forces, and the Central Medical War Committee was entrusted with the task of advising the Government, through the appropriate health authorities for England and Scotland, on the application of this liability to individual doctors.

The demands made by the Services in the next six months and their estimated requirements up to the end of the first quarter of 1941, were well in excess of the number of medical men who could be supplied without causing disquiet over a too rapid depletion of practitioners serving the civilian population. The Central Medical War Committee was faced with deciding the most equitable allocation of doctors between the Services and the civilian population and, on their terms of reference, felt that it was a responsibility which they were unable to accept. The committee therefore requested, through the Ministry of Health, an immediate Government inquiry into the whole question, whereby independent advice might be given on what allocations should be allowed, without taking into consideration whatever demands the Services might make at that stage.

THE ROBINSON COMMITTEE

As a result a Committee of Inquiry on Medical Personnel, under the Chairmanship of Sir Arthur Robinson, was formed in December 'to consider the relative needs of the civilian population and His Majesty's Forces; the situation which had arisen and was likely to arise in the near

* It was not always possible to place practitioners in the Service of their choice.

future from the recruitment estimated by the Service departments to be necessary; and to report what steps should be taken to secure a proper allocation of medical man-power between civilians and the Armed Forces, bearing in mind the supply of doctors available'.

A report was issued by the committee on January 1, 1941, by which time a review of the situation had been made. Accurate figures of the numbers of medical practitioners had been difficult to obtain, but rough estimates were available. (*See* E.M.S., Volume I, Chapter 14.)

In peace-time there were approximately 45,300 effective practitioners; 1,400 of these held regular commissions in the Services, and 43,900 were in civilian practice, or rather less than one per 1,000 of the population. Seven thousand five hundred had been embodied in the Services up to December 12, 1940, leaving 36,400 in civilian practice at the end of the year. Sixteen thousand seven hundred of this number were over 50 years of age, and of them it was estimated that perhaps 5,000 were over the age of 70 and were either unfit for practice or unable to bear the stress of any additional work. However, if it was assumed that 36,000 were available for civilian practice and that the civilian population was reduced by about three million as a result of Service requirements, the ratio of medical men and women per 1,000 of the population was approximately 0·82. This figure was compared with the ratio per 1,000 of medical officers to total personnel in the Services on the figures supplied, as being 4·1 in the Navy, 2·8 in the Army and 2·9 in the Royal Air Force. It was noted that in addition to the weakening of the ranks of civilian practitioners by the increasing proportion at advanced ages of those who remained, 5,500 were women, of whom some 1,000 were over the age of 50. Despite the recruitment of large numbers of men and women from the civilian population, the burden of work for those practitioners who were not called up increased rather than diminished. They had to staff the expanding emergency hospitals; do part-time duty in the A.R.P. medical services; overcome the health problems of air-raid shelters in dangerous areas; and prevent, as far as possible, the spread of infectious and contagious disease resulting from the influx of evacuees to safe districts. The incorporation of large numbers of the population into an expanding war-time industry also increased the scale of medical attention needed for factory workers. Most of this work became the responsibility of men under 50 years of age, of whom about 15,200 remained in civilian practice of all kinds. It was understood that the average intake into the profession was about 2,100 annually, but this figure could not be considered as a net increase because of retirements and deaths.* It was not thought that medical

* Net increase in the numbers of registered practitioners was as follows:

1940	1941	1942	1943	1944
1,738	1,457	1,090	1,346	1,495

personnel could be made available to anything like the extent desired by the Services, and in addition the Ministry of Labour was envisaging increasing the whole-time medical staff employed in industry.

Certain facts emerged from the evidence. The committee considered that the three Services had co-operated substantially over hospital accommodation, but that in the light of the available information, economy in medical man-power could still be effected by different Services which were working in the same or adjoining areas.

The various Army and Air Force Commands made further contacts to pursue this question after the committee's report. At the same time the possibility of employing American practitioners was considered, but it was decided on March 21, 1941, that the Royal Air Force did not require any medical officers from the United States. The Robinson Committee made certain other observations and recommendations which will be discussed later.

THE MEDICAL PERSONNEL (PRIORITY) COMMITTEE

The Central Medical War Committee then considered that their proposals for an authoritative committee to advise on the allocation of medical man-power were strengthened, and so in April 1941, a further recommendation for the formation of such a committee was made to the Ministry of Health. The proposals were approved and in July, a new committee, called the Medical Personnel (Priority) Committee, held its first meeting with the following terms of reference: 'To investigate in the light of the recommendations made in January 1941 by the Committee of Inquiry on Medical Personnel, what further steps could usefully be taken to secure the utmost economy in the employment of medical personnel in His Majesty's Forces, the civilian defence services, including general practice, and, having regard to any recommendations made as a result of such investigations, to report from time to time what should be the allocation among the above-mentioned services of the available medical personnel.' (*See* E.M.S., Volume I, Chapter 14.)

The committee issued its first interim report on August 6, 1941. It was intended to present further reports as soon as more detailed information became available, but in view of the demands made by the three Services for the next six months and the serious difficulties created by the proposed drain on medical man-power, the committee wished to make a number of urgent recommendations, the need for which had already been established. It was recommended that the Central Medical War Committee should continue to provide medical officers for the Services at the existing rates in proportion to their demands, and that further co-operation should be fostered between the Services by the formation of regional committees covering various areas of Great Britain.

Each committee was composed of the senior medical officers representing the various commands of the Fighting Services in that region and the regional medical and hospital officers in the Ministry of Health with such other officers as were thought necessary. A liaison medical officer for the area, appointed by the Central Medical War Committee, was also a member. The chairman was usually the Regional Commissioner or his deputy. These committees were supposed to meet regularly and were charged with the duty of ensuring the maximum economy in satisfying civilian and Service needs in their areas.

Further investigations by the committee were summarised with recommendations in new reports. For the most part the recommendations were fruitful in reducing any overlap which existed between the medical attention provided for the personnel of one Service and another, but the tendency of arguments at that time, and indeed later, on methods to be adopted for general economy in medical man-power, was in favour of a greater degree of pooling of resources in various areas. It was often overlooked that the Royal Air Force was organised on a functional rather than a regional basis, and that area pooling of resources would necessitate the complete reorganisation of the Royal Air Force which, even if effected, would raise new problems both operational and medical.

In September and October 1942, there was some critical comment on the difference between the numbers of medical officers per 1,000 of Service personnel and of civilian practitioners per 1,000 of civilian population. A correct perspective of the situation was offered in a statement by the Air Member for Personnel to the Air Council on November 10, 1942, in which the various duties of civilian practitioners and medical officers were explained. It was shown that the figures of medical men given for the population commonly excluded both hospital staffs and specialists employed by public health authorities, whereas the total strength of Service medical officers included those employed in similar appointments which were largely of a purely administrative character. The need for the constant supervision of the living conditions and general health of serving personnel, and for the detection and prevention of physiological and psychological flying stress, in addition to the care of the sick, which was a common responsibility of both Service and civilian doctors, rendered any comparison invalid, because the standards by which such comparison could be made were not similar either in range or degree. The disparity in numbers of doctors available per 1,000 of the population in civilian life and in the Services was therefore striking unless the facts already described were known. If, indeed, all the Royal Air Force medical officers had been discharged into civilian practice, it would only have raised the ratio of doctors by 0·05 per 1,000.

The medical man-power situation had become critical by December 1942. Thirteen thousand six hundred and fifty doctors had been recruited since the outbreak of war for the Services, which had recently put in demands for as many as 5,900 doctors in 1943. The Navy had asked for 600 of this number, the Army 4,800 and the Royal Air Force 500. These demands were considered by the Medical Personnel (Priority) Committee, who considered that there were only two possible courses: either a drastic reduction in the basis and scope of general practice and of the public health organisation, or a limitation of recruitment for the Services in 1943 to 225 doctors a month.

The Services had one medical officer for every 320 men and women, and the individual Service figures were 1 : 300 for the Navy, 1 : 285 for the Army and 1 : 475 for the Royal Air Force. The corresponding figures for the civilian population were 1 : 1,500. If the new demands of the Services were met, the ratio of Service and civilian medical men to their potential patients would have been 1 : 275 and 1 : 2,250. Six hundred doctors were giving part-time service in industry, and there had been an increase in the average age of the industrial workers. Any weakening of the industrial medical services would, it was thought, lead to an increase in absenteeism and loss of production. Further cuts in the school medical services were thought out of the question.

THE CRANBORNE INQUIRIES

The M.P.(P.)C. felt that the choice between a drastic reduction of the civilian services and a severe curtailment of the demands of the Services was outside their province. The matter was accordingly referred to the Lord President's Committee of the War Cabinet who recommended that an independent minister of cabinet rank be invited to conduct an inquiry into the situation for them. The work was undertaken by the Lord Privy Seal, Lord Cranborne, who in due course made his findings known to the Lord President's Committee, which in turn made its recommendations to the War Cabinet on what the allocation of medical officers to the Services should be.

The Service demands had been related to the maximum strengths which it was anticipated they would reach by the end of 1943. The cuts in Service man-power requirements, then under discussion by the War Cabinet, resulted in a considerable reduction in the total man-power increases determined for the Services. The attention of Lord Cranborne was drawn to the ratios of the medical officers in the three Services, and it was emphasised that the Royal Air Force was already working on a lower ratio than the Army and Navy; despite these facts Lord Cranborne after careful consideration, recommended drastic reductions, which were approved by the Lord President's Committee and the War Cabinet in July 1943. The Royal Air Force demands were reduced by

a smaller percentage than the other two Services, but any reduction at all was, by very reason of the lower ratios, equally severe. At the Committee's request, Lord Cranborne continued his inquiries and submitted further reports. These also involved reductions in the Service estimates for medical officers.

After the landings in Normandy, it was obvious that enough medical man-power would not be available until Germany was defeated. The introduction of the demobilisation scheme complicated the procedure for postings overseas, because it was uneconomical to send abroad men whose release categories were of such high priority that they would have to be brought home before completing the overseas tour of three years' duration.

SUPPLY OF MEDICAL OFFICERS

NUMBERS AND DISTRIBUTION OF MEDICAL OFFICERS

On August 1, 1939, there were on the strength of the Royal Air Force Medical Branch 156 medical officers with permanent commissions and 114 with short service commissions, making a total of 270. In addition, 66 civilian practitioners were employed by the Air Ministry on a whole-time basis. The establishment of medical officers at that time was 336 and the inclusion of these 66 practitioners filled the establishment. Full medical supervision and attention was then being provided for approximately 120,000 airmen and airwomen* who were then in the Royal Air Force either at home or overseas.

Mobilisation began before war was declared, and on September 4, 1939, there were on strength 156 medical officers holding permanent commissions, 132 holding short service commissions, 34 officers embodied in the Reserve of Air Force Officers, 48 Auxiliary Air Force officers, 175 embodied Royal Air Force Volunteer Reserve officers and 9 officers who had rejoined from the retired list, making a total of 554. Nearly all the civilian practitioners employed whole-time by the Air Ministry had been granted commissions in the Volunteer Reserve very shortly after war began. Ten permanent commissions were granted to selected medical officers in the ensuing year, but thereafter the number of officers holding permanent commissions did not change except through retirements and deaths. No short service commissions were granted after September 1939, all volunteers or conscripts being embodied into the Royal Air Force Volunteer Reserve.

The immediate mobilisation of this number of medical officers was completed before there had been any large increase in the recruitment rate of the Royal Air Force as a whole, and at no time thereafter was the

* There were 2,399 airwomen in the Women's Auxiliary Air Force on September 1, 1939. (All figures for strengths have been obtained from the Medical Statistical Branch at Air Ministry unless otherwise stated.)

ratio of medical officers to total personnel so favourable. There was then one medical officer to 221 airmen and airwomen or, if expressed as a ratio, 4·5 medical officers per 1,000 personnel.

The rate of increase in strength of the Royal Air Force was steady up to the end of the first quarter of 1942, after which it slackened, but the enrolment of medical officers was carried out more slowly on account of the shortage of medical man-power, so that from the beginning of the war up to September 1941, the ratio of medical officers per 1,000 personnel in the Royal Air Force steadily decreased from 4·5 to 2·18; it remained at this level except for a slight transitory rise to 2·37 per 1,000 in March 1943.

The committee machinery for advising on the allocation of medical officers to the Services has been described, and it is now proposed to outline in narrative form, as far as possible, the demands made by and the allocations made to the Air Ministry of medical officers at certain dates. These dates are in chronological order, but have irregular spacing; they have been chosen because more accurate summaries of the manning position of the Royal Air Force Medical Branch could be made on these dates by reason of peculiarities in the records available.

On February 12, 1940, there were 728 medical officers on strength and of these 578 were serving at home and 150 overseas. The total strength of the Royal Air Force at home and overseas was approximately 240,000 which gave an overall ratio of medical officers of 3·3 per thousand.*

The medical officer establishments in the Royal Air Force were based on actual needs as soon as they were known, but there were general rules governing the basic requirements. Careful consideration was given to the merits, size and function of various types of station and only when these were known was the establishment prepared for inclusion in the station establishment tables.

DISTRIBUTION IN 1940

The 728 medical officers in February 1940 were distributed throughout the Air Force as follows:

1. *Administrative Staffs*	Medical Officers
(*a*) Air Ministry Directorate: Director-General of Medical Services and five medical advisory branches	9

* This figure is that given by the Directorate of Manning. About 206,000 were at home and 34,000 overseas, and the returns commonly excluded certain training strengths. The ratio of medical officers per 1,000 based on these figures was 2·8 for the forces at home and 4·5 for those overseas.

(*b*) Command Headquarters: Medical Officers

One Principal Medical Officer and at least one other administrative officer

(i) Training Command in United Kingdom	4
(ii) Three operational Commands	6
(iii) Three other operational Commands	6
(iv) Five overseas Commands	10
(v) Field Force Commands	8
	34

(*c*) Group Headquarters:

Normally each group had one Senior Medical Officer, but in three groups the staffs required were three, three and two respectively

Number of groups at date of statement 28 33

2. *Hospitals*

Requirements were based on the actual work to be undertaken as well as the number of beds. The establishment for each hospital was decided on whether it was to be a separate medical unit or part of a station:

At Home

Hospital Units in United Kingdom with Separate Establishments:	Medical Officers
Halton General Hospital	20
Cranwell General Hospital	12
Littleport General Hospital	8
Matlock Hospital	5
Torquay Hospital	7
Uxbridge W.A.A.F. Hospital	2
	54

At certain large stations with populations of between 4,000 and 10,000, station hospitals of 50 to 100 beds were established. Medical personnel were on a station basis:

Station Hospitals:	Medical Officers
Cosford	8
St. Athan	8
Locking	4
Yatesbury	6
Hednesford	6
Henlow	5
Padgate	9
Blackpool	7
Bridgnorth	4
Morecambe	6
	63

Overseas	Medical Officers
Iraq	7
Aden	4
	11

3. *Special Medical Units*

	Medical Officers
(*a*) Central Medical Establishment:	
Consultants	8
Two Central Medical Boards	10
Seven Aviation Medical Boards	28
Special research workers	4
(*b*) Medical Training Depot	3
(*c*) Institute of Pathology	3
(*d*) Three Medical Receiving Stations (Field Force)	12
	68

4. *Units in Operational Commands*

Units located at permanent stations holding two, three or four squadrons had one or two medical officers, but operational requirements made necessary the provision of extra medical officers in the event of urgent movements and location of squadrons at an operational airfield away from the parent station.

	Medical Officers
Bomber Command	50
Fighter Command	65
Coastal Command	30
Balloon Command	67
B.A.F.F.	30
Special Contingencies	12
Overseas: Mediterranean, Middle East, Iraq, India, Far East	30
	284

5. It will be observed that the above figures total only 556. The balance of 172 is accounted for by medical officers who were awaiting posting, detached from units and under training.

Training Command administered the hospitals, all large training units and the larger special medical units.

Medical officers were sometimes attached to each of the operational units in Bomber, Fighter, Coastal and Balloon Commands.

Distribution may be summarised as follows:

At Home	Medical Officers
Air Ministry	9
Training Command	280
Bomber Command	57
Fighter Command	70
Coastal Command	37
Reserve Command	40
Balloon Command	75
Maintenance Command	10
	578
Overseas	
B.A.F.F.	68
Mediterranean	5
Middle East	30
Iraq	15
Aden	10
India	12
Far East	10
	150

It was then estimated that by August 1940, fifty more medical officers would be needed for overseas service, and 62 for duty at home, making a total of 112 within the next six months.

Eleven months later, in December 1940, the Air Ministry reviewed the statement made in February and estimated the requirements of medical officers for 1941 for the Robinson Committee.

The medical officer strength had increased from 700 to 1,300 in the twelve months of 1940, and as far as could be foreseen the increase required in 1941 would be approximately 500. These medical officers were needed for the progressive increase in the numerical strength of all commands; the formation of new commands and their natural development; the increased commitments in Northern Ireland, the Middle East, the Mediterranean, Aden, West Africa and other areas undergoing expansion; the United Kingdom training schools which had been transferred to countries outside Great Britain; the accelerated and greatly increased intake of aircrews which required the formation of more Aviation Candidates Medical Boards; the further expansion

of several large stations with an Air Force population of over 4,000; the development of special units, such as eye training teams, orthopaedic and neuropsychiatric centres; and the necessary close-continued association of medical officers with flying personnel in all squadrons in accordance with a definite policy.

Home units at that time consisted of:

8 Commands
38 Groups
170 Stations

at which were located approximately:

200 Squadrons
20 Operational Training Units
80 Maintenance Units
20 Elementary Flying Schools
15 Technical Training Schools
6 Air Observer and Navigation Schools
6 Initial Training Wings
25 Balloon Centres, each with two to four squadrons, totalling 70 squadrons in all
50 other miscellaneous units

There were also 7 General Hospitals and 14 Station Hospitals.

The strength of medical officers was, at the time of the report, 1,253, which was 80 less than existing establishment requirements. The formation of new squadrons and the opening up of new stations for units of all types, and the reinforcement of Commands overseas, required an assured intake of 40 medical officers per month for the first six months of 1941, and a similar rate was thought necessary for the remainder of the year.

The type of commission and the ranks held by the 1,253 medical officers are tabled below:

Type of Commission	A/M	A/V/M	A/Cdre.	G/C	W/Cdr.	S/Ldr.	F/Lt.	F/O	Totals
Permanent	1	2	7	31	69	44	13	–	167
Short service	–	–	–	–	–	20	87	8	115
Retired	–	–	1	6	7	1	1	–	16
R.A.F.O.	–	–	–	–	1	25	25	1	52
A.A.F.	–	–	–	–	1	24	30	1	56
R.A.F.V.R.:									
Male	–	–	–	3	13	79	189	547	831
Female	–	–	–	–	–	1	–	15	16
Totals	1	2	8	40	91	194	345	572	1,253

The strength of the Royal Air Force was approximately 480,000 and the figure estimated for the end of 1941 was over 838,000.

The distribution by Commands or special units, with the expected increases for each, is shown in the following table:

Command or special unit	Distribution	Expected increase 1941
At home		
Air Ministry	9	4
Technical Training Command	476	100
Flying Training Command	134	50
Bomber Command	111	60
Fighter Command	139	60
Coastal Command	77	30
Army Co-operation Command	28	20
Balloon Command	105	10
Maintenance Command	21	20
Special Duty List	8	4
Northern Ireland	10	?
Overseas		
Mediterranean Command	6	4
Middle East	64	40
Iraq	17	Indefinite but less than 50
Aden	20	
India	10	
Far East	12	
Dominions	6	
Totals	1,253	Approx. 450–500

There had been no increase in administrative officers at Air Ministry since the outbreak of war, but an increase of four was expected, making a total of thirteen.

Technical Training Command. This Command held approximately one third of the total medical officer personnel distributed as follows:

(*a*) Seven General Hospitals—Total medical officers 112

Hospital	Beds	Medical Officer establishment	Specialists included
P.M.R.A.F. Hospital, Halton	750–800	24	6
Cosford	500	22	5
Ely and Littleport	250+150	19	6
Rauceby	450	16	5
St. Athan	350	17	5
Torquay	240	8	2
Matlock	150	6	2
Totals	2,840	112	31

(*b*) Fourteen large stations provided with station hospitals which were expanding—Total medical officers 129

Station	Station population	Additional population in area	Hospital beds	Station and hospital Medical Officer establishment
Compton Bassett	4,000	—	70	6
Gloucester	4,500	1,500	120	9
Hednesford	4,600	—	80	6
Hereford	3,000	—	120	9
Kirkham	5,000	3,000	160	11
Locking	4,000	3,500	150	9
Weeton	5,000	5,000	200	11
Melksham	4,000	2,000	120	8
Morecambe	7,600	1,000	170	9
Padgate	4,100	1,500	115	9
Bridgnorth	3,300	3,000	140	9
Saughall Massey	2,700	7,000	200	11
Wilmslow	3,500	3,500	150	11
Yatesbury	5,600	10,000	295	11
Total Medical Officer establishment 129				

(*c*) Blackpool: Royal Air Force population between 35,000 and 40,000, expanding rapidly. There were thirty-six medical officers established for hospital, medical board and station duties.

	Medical Officers
(*d*) Cranwell (Population over 6,000) . . .	6
(*e*) Halton (Population over 5,000) . . .	4
(*f*) Central Medical Establishment	
A medical unit which held the consultants, certain research workers and three Central Medical Boards	26
Detail:	
Officer Commanding Unit and Adjutant 2	
Consultants 8	
Board Presidents 3	
Specialists 6	
Medical Officers 7	
(*g*) (i) Nine Aviation Candidates Medical Boards (Dispersed)	45
Establishment for each was:	
President 1	
Specialists 2	

Medical Officers 2	
(Six more Boards were likely to be formed during 1941)	
(ii) One Special Board which functioned centrally	11
(*h*) (i) Medical Training Establishment and Depot .	6
(ii) Pathological Laboratory, Halton . .	4
(*i*) Bombing and Gunnery Schools . . .	20
(*j*) (i) Command Headquarters	4
(ii) Group Headquarters (three) . . .	8
(*k*) W.A.A.F. Recruiting and Training Depots (Women Medical Officers) . . .	10
Total number of Medical Officers . .	421

There were therefore 421 medical officers dispersed in Technical Training Command, excluding approximately 50 who were posted to the lesser stations and units with one or two medical officers.

All these units were to be expanded in 1941 and added to them would be the new station hospitals. At least one new general hospital was also to be formed. The estimate of the additional requirements of medical officers in this Command was approximately 100.

Operational Commands (*Home*)

	Medical Officers
Fighter Bomber Coastal Army Co-operation	
(*a*) Each of these Command Headquarters normally held two whole-time administrative officers and one officer who was part-time administrative and part-time clinical . . .	12
(*b*) Twenty-one Group Headquarters each with two medical officers	42
(*c*) Operational Stations each with a station medical officer	80
(*d*) Squadrons and Operational Training Units with establishments for medical officers . .	200
(*e*) Additional miscellaneous units . . .	21

Thus the four operational Commands employed 355 medical officers, and it was expected that the 1941 commitments would make an additional 170 necessary.

Maintenance Command

(*a*) Command Headquarters	2
(*b*) Group Headquarters (three)	6
(*c*) Units (eighty)	13

This Command had a mixed Service and civilian strength of more than 41,000. The thirteen medical officers were placed at maintenance units where the number of Service personnel was substantial. Civilian practitioners were employed at other units; several units were on Royal Air Force stations already provided with medical officers.

The proportion of Service personnel was increasing on all these units and it was expected that about twenty additional Service medical officers would be required.

Flying Training Command

	Medical Officers
(*a*) Command Headquarters	3
(*b*) Group Headquarters (six)	12
(*c*) Units	
Initial Training Wings	20
Service Flying Training Schools	40
Elementary Flying Training Schools	20
Air Navigation, Bombing and Gunnery Schools	28
Other Units	11
	134

A considerable expansion in this Command was expected which would require fifty medical officers.

Balloon Command

	Medical Officers
(*a*) Command Headquarters	2
(*b*) Group Headquarters (five)	10
(*c*) Centres (twenty-five)	25
(*d*) Squadrons (seventy)	68
Total personnel over 40,000	105

Although a considerable increase in the personnel of the Command was expected, the additional number of medical officers needed was not thought likely to exceed 10.

There were, in addition to the units referred to, many detached units in each Command, the medical supervision of which was carried out either by the nearest Service medical officer or civilian practitioner on part-time employment. Fifteen special units and an unspecified number of radio maintenance units, wireless telegraphy schools and other units dispersed all over the country with between 50 and 150 personnel on their establishments received medical attention in this way.

Overseas Requirements. Between 140 and 150 medical officers were employed overseas. It was estimated that the commitments had increased and that in addition to the 50 medical officers demanded in the February statement, a further 50 would be needed, making 100 in all.

Reinforcements for overseas commands were effected as required and were frequently of an urgent nature; in these circumstances medical officers were taken from the strengths of home commands and for this reason strengths of units at home were frequently below establishment.

Amplification of various portions of these statements was required by the Robinson Committee. It was not understood why operational and balloon squadrons should have an establishment for a whole-time Service medical officer. The organisation of Balloon Command and the dispersal of the individual units therein was explained. It had been found impossible to arrange for civilian practitioners to undertake the attention needed for these units, not only because of their dispersed nature, but also because of the many Service matters which arose from their organisation and administration. There were already about 30 civilian practitioners employed in providing medical attendance at Air Ministry Experimental Stations, and a further 50 for the various Maintenance Command units at which no Service medical officers were established. The policy, therefore, of utilising such medical attention was not new. Medical officers had been posted to operational squadrons only after the most careful consideration. The Secretary of State for Air had approached the Director-General of Medical Services at the end of September 1940, on this question. The war establishment for operational units included a medical officer for each squadron proceeding to the field, and one was provided for each unit in the Expeditionary Forces. It had become evident with the increase of air operations at that time that it was desirable to extend the application of such a policy to squadrons based in this country. The general application of a policy of this nature had not previously been urged; first, because medical officers could not be obtained and given their preliminary training fast enough to meet all demands; secondly, because squadrons at home were not too frequently moved and the system of station posting had made the problem of continuity in the care of flying personnel one of small

importance; and thirdly, because the establishment of medical personnel on a squadron basis was regarded as uneconomical when squadrons were collectively located and not frequently moved. The added fact that the supply of doctors for the Services was not inexhaustible caused further embarrassment.

However, the medical care of aircrew became a primary factor in maintaining an adequate first line of defence during the Battle of Britain and it was considered desirable that a policy of providing medical officers to squadrons should be initiated. The question was discussed at a Royal Air Force Establishments Committee in October 1940, and was approved. The committee, with the co-operation of the Medical Directorate, recommended that one medical officer should be allowed for each squadron, one per airfield for operational training units and an additional medical officer of squadron leader rank for each operational or operational training unit station. This involved the addition to establishment of 110 squadron leaders and fifteen flight lieutenants. It was originally thought that this would be unduly expensive in man-power, but after further consideration by the Directorate of Organisation, the Treasury and the Medical Directorate, it was agreed that a less generous establishment of doctors would involve a definite sacrifice in efficiency. The Air Member for Personnel reaffirmed that provision on this scale was essential. It was realised that at a later date the shortage of doctors might become so acute that the sacrifice of efficiency would have to be accepted, but until this was shown to be the case it was not recommended that any departure from the new establishment should be made.

The possibility of economising in medical officers by using Allied and Dominion doctors and friendly alien medical officers was examined. It was explained that the Royal Air Force demands had been met hitherto by the Central Medical War Committee, and as long as it was possible to maintain an adequate supply, recruiting had not been contemplated from other sources; however, a few aliens who had volunteered had been employed. It was further explained that the training programmes in Canada absorbed a large number of Canadian medical officers and that the Royal Air Force had sent some of its own medical officers to Canada to assist in the Empire Training Scheme. Selected friendly alien medical officers were accepted and employed for the medical care and treatment of their own nationals serving in air forces. At that time there were thirty Polish and four Czechoslovakian medical officers in the Royal Air Force.

The Robinson Committee report, issued on January 1, 1941, recommended that all medical establishments should be reviewed to ensure the fullest utilisation of personnel and to reduce the size of future demands.

NUMBERS IN 1941

The Air Ministry subsequently reviewed the medical establishments and effected certain economies. These were summarised in the statement prepared on July 1, 1941, for the first meeting of the Medical Personnel (Priority) Committee. Statements submitted amplified and brought up to date that given by the Robinson Committee in December 1940. Little change had been made in the basis on which medical establishments for the Royal Air Force were calculated, and considerable expansion had taken place during the last six months. The number of Royal Air Force stations at home and in Northern Ireland had increased from 170 to 500. One more Command and eleven more groups had been established. The four operational Commands now controlled some 200 stations. Flying Training and Technical Training Commands administered 180 stations, Maintenance Command over 100 stations and Balloon Command about 20 centres on which squadrons were based in dispersed formations. Northern Ireland had as well ten stations on a field force footing. The figures for units and strengths had increased by between 20 and 100 per cent. Three more station hospitals had been formed, so that ten now had beds for more than 50 patients and each of the new stations was provided with a sick quarters on a 1 per cent. bed basis.

The medical officer strength of 1,650 (including 22 women), of whom 190 were serving overseas, was 80 below establishment. The total represented an addition of 397 or 33 per cent. during the last six months, and it was estimated that a similar rate of intake would be needed for the next six months. The type of commission and existing ranks held by the 1,650 medical officers is shown below:

Type of Commission	A/M	A/V/M	A/C	G/C	W/Cdr.	S/Ldr.	F/Lt.	F/O	Totals
Permanent	1	1	6	37	69	44	4	–	162
Short service	–	–	–	–	1	57	42	3	103
Retired	–	–	1	4	8	3	–	–	16
R.A.F.O.	–	–	–	–	10	35	17	–	62
A.A.F.	–	–	–	–	4	38	15	–	57
R.A.F.V.R.:									
Male	–	–	–	4	22	175	287	697	1,185
Female	–	–	–	–	–	1	2	19	22
R.A.A.F.	–	–	–	–	–	–	5	–	5
Polish	–	–	–	–	–	–	–	32	32
Czechoslovakian	–	–	–	–	–	–	–	4	4
Dutch	–	–	–	–	–	–	1	–	1
American	–	–	–	–	–	–	–	1	1
Totals	1	1	7	45	114	353	373	756	1,650

DISTRIBUTION IN 1941

The following table gives the existing distribution by Commands:

Command	R.A.F. Medical Officers	Women Medical Officers	Totals	Poles	Czecho-slovaks	Dutch	American	Totals
Air Ministry	12	–	12	–	–	–	–	12
Bomber	155	–	155	5	2	–	–	162
Fighter	158	–	158	6	2	–	1	167
Coastal	113	1	114	–	–	1	–	115
Technical Training	589	21	610	15	–	–	–	625
Flying Training	178	–	178	2	–	–	–	180
Balloon	119	–	119	–	–	–	–	119
Maintenance	26	–	26	1	–	–	–	27
Special Duty List	6	–	6	–	–	–	–	6
Army Co-operation	36	–	36	1	–	–	–	37
Northern Ireland	11	–	11	–	–	–	–	11
Mediterranean	8	–	8	–	–	–	–	8
Middle East	94	–	94	2	–	–	–	96
Iraq	20	–	20	–	–	–	–	20
Aden	18	–	18	–	–	–	–	18
India	10	–	10*	–	–	–	–	10*
Far East	12	–	12	–	–	–	–	12
Canada	12	–	12	–	–	–	–	12
South Africa	8	–	8	–	–	–	–	8
Totals	1,585	22	1,607*	32	4	1	1	1,645*

* Plus 5 Royal Australian Air Force medical officers who were with Australian units serving with the Royal Air Force.

A comparison of these figures with those given previously shows that Technical Training Command, which held the great majority of the Royal Air Force medical units such as hospitals, medical boards and training establishments, continued to employ 33 per cent. of the total number of medical officers. The number of medical personnel in each command had increased strictly in accordance with requirements, which were considered individually by the Air Ministry Establishments Committee before approval.

The distribution of medical officers and the economies achieved are summarised below:

Medical Directorate. There had been an increase of three, one less than had been expected.

Technical Training Command. The population of the Command had increased by over 50 per cent., but there had been an increase of only 33 per cent. of medical officers, and they had been absorbed into new units within the Command, more particularly Aviation Candidates Medical Boards formed to meet the needs of recruit centres and schools.

In addition, approximately 35 medical officers were shown on the strength of this Command while in the process of going overseas. On the other hand, the total number of medical officers employed in general hospitals had been reduced from 112 to 99, figures which included specialists, although the number of beds had continued to increase. The opening of two further general hospitals in the near future would, however, make the addition of approximately 30 medical officers necessary.

The population of stations which had station hospitals had increased by about 50 per cent. and the average increase of beds in station hospitals varied from 20 per cent. to 50 per cent. Consequently, additional medical officers were provided and the total establishment for the duties of the stations and the hospitals had been increased from 129 to 143, an increase of 9 per cent.

The stations and station hospitals of Blackpool, Uxbridge and Henlow required to be added to this list, with 32, 10 and 9 medical officers respectively. This represented a reduction of 4 medical officers at the first of these stations and an addition of 3 and 2 at the second and third.

Central Medical Establishment. This medical formation within Technical Training Command employed 127 medical officers in various appointments:

(*a*) Administrative . . .	2
(*b*) Consultants	10
(*c*) Senior Specialists . . .	3
(*d*) Special Research . . .	3
(*e*) Central Medical Boards . .	18

There were two Central Medical Boards composed of 7 and 11 medical officers respectively; the former dealt mainly with the re-boarding of aviation personnel, and invaliding, whereas the latter dealt with the intake of all officers other than aviation candidates. The establishment in each instance was based on actual requirements, and alterations took place when necessary.

The Aviation Candidates Medical Boards employed 91 medical officers. The boards were dispersed throughout the country in association with Aviation Candidates Selection Boards. Of the latter there were 28, whose output was dealt with by 9 Aviation Candidates Medical Boards, established according to the rate of output, as shown below:

1 of Type I, with 5 medical officers	5
2 of Type II, with 6 medical officers	12
1 of Type III, with 8 medical officers	8
3 of Type IV, with 11 medical officers	33
1 of Type V, with 13 medical officers	13
1 of Type VI, with 20 medical officers	20

The 91 medical officers included 9 presidents, 7 assessors of boards Types IV, V and VI, 9 eye specialists, 9 ear, nose and throat specialists

and 57 medical officers, some of whom on the larger boards were assistants to the ear, nose and throat and eye specialists.

Previously, when only 9 Selection Boards were functioning, each had associated with it a Medical Board of Type I for which a total of 45 medical officers had been necessary. The increase to 28 Selection Boards, for which on the original basis 140 medical officers would have been required, necessitated organisation on the lines shown above, which saved about 50 medical officers. About 25 candidates per day could be examined at a Type I Board, and for each additional medical officer added to the Board establishment, the output could be increased by 10 to 12 candidates per day.

The 610 British medical officers in Technical Training Command were dispersed as follows:

	Medical Officers
(*a*) Command Headquarters	4
(*b*) Group Headquarters (four)	8
(*c*) General Hospitals (seven) (approximately 3,000 beds)	99
(*d*) Seventeen Stations with Station Hospitals. (Total beds approximately 3,000, with a combined station population of about 120,000 and a surrounding population of 50,000)	191
(*e*) Central Medical Establishment	127
(*f*) Twenty to twenty-five Recruit Centres and Schools, other than those at the Stations referred to at (*d*) above, and with an average population of 5,000 each	80
(*g*) Institute of Pathology and Tropical Medicine	3
(*h*) Medical Training Establishment and Depot:	
Training and Administrative Staff	10
New entries awaiting posting, average	20
(*i*) W.A.A.F. Recruiting	9
(*j*) Non-effective, *en route* overseas, trooping, sick, etc	59
	610

In addition there were 15 Polish medical officers employed in the Command, making a total of 625.

Operational Commands. The Home Commands employed 463 British Air Force medical officers, and in addition there were 18 alien medical officers, making a total of 481. This represented an increase of 126 over the figure of 355 given in the previous statement, and was within the total anticipated. These Commands administered about 200 operational stations at which work was carried out day and night. The medical administration of these Commands and groups was performed by 8 medical officers at the four Command headquarters, and 40 medical officers at the twenty-four group headquarters. This total was 6 less than

the number given in the previous statement, the adjustment having been effected after a review of establishments. The remaining 433 medical officers were actively and fully employed on medical duties associated with operational work, in which it was considered essential that the medical officers should be able to maintain a close and continued contact with aircrew.

It was estimated that there would be a progressive increase in the number of medical officers necessary with the opening of new stations and the formation of new squadrons, and it was thought that the estimated requirement of 170 medical officers by the end of 1941, given in the previous statement, would most certainly be greater before that date.

Maintenance Command. The numerical size of the Command had increased by over 200 per cent. and the number of stations by 25 per cent. while the number of Service personnel was well over the combined figure given in the previous statement. There had been an increase of 6 medical officers, including 1 Polish medical officer, to a total of 27, which was 14 fewer than had been anticipated. It was considered that this figure gave ample evidence of the degree of co-operation which existed between the medical officers of the three Services and the civilian practitioners, as over 120,000 mixed Service and civilian personnel were receiving medical supervision and treatment.

Flying Training Command.—The total medical officers employed were 180, which included 2 Polish medical officers. This represented an increase of 46 over the previous figures, against the expected increase of 50 during 1941. Taking into consideration the functions of the Command, with its intensive flying training at Elementary and Service Flying Training Schools, and the immense intake from the Initial Training Wings, the allocation of 180 medical officers, of whom 2 were administrative medical officers at Command headquarters, and 14 at group headquarters, the provision of medical officers was regarded as the very minimum. Day and night duty was continuous and it was expected that further provision would have to be made during the year.

Balloon Command. The total of medical officers was 119, an increase of 14 in the last six months. A very careful review of the requirements of the Command had been made, particularly to discover whether or not more civilian medical practitioners could be employed for dispersed units. It had not yet been possible to depart from the policy of providing a medical officer for each squadron, but the matter was still under review.

Northern Ireland. The Command was maintained at bare requirements and had a total of eleven medical officers.

Special Duties. Six medical officers were employed and held against a special establishment.

Overseas. One hundred and ninety medical officers were employed overseas and out of the figure of 59 already shown, approximately 35 were *en route.* A reduction of 4 medical officers had been effected at Command headquarters. There had been 23 medical officers for 7 commands, or 3·3 per Command. There were now 8 Commands with 19 medical officers, or 2·4 per Command. Similarly, at 38 group headquarters there were 80 administrative medical officers, an average of 2·1 medical officers per group. At the time of the report, there were 49 groups holding 66 medical officers, an average of 1·35 per group. A reduction of 14 medical officers had been effected at group headquarters, giving a total reduction of 18 medical officers at both Command and group headquarters.

Further facts were given to the Medical Personnel (Priority) Committee, showing the amount of work being done at Royal Air Force hospitals and the degree of co-operation which existed between the medical services of the Royal Air Force and those of the Army, Navy and Emergency Medical Services in the admission and treatment of Royal Air Force sick.

ESTABLISHMENT AND WORK OF THE R.A.F. HOSPITALS, 1941

A summary was made giving the number of Royal Air Force personnel treated in all types of hospitals for the twelve months ended March 28, 1941, with additional figures giving the number of personnel of the other Services treated in Royal Air Force hospitals.

During the year there were 77,384 Royal Air Force and 3,386 W.A.A.F. sick, totalling 80,770, admitted to hospitals at home. In the same period there were 67 Dominion, 1,983 Allied, 2,247 Army and 552 Navy personnel, totalling 4,849, admitted to Royal Air Force hospitals. Full details with percentages are given in Appendix A, Table I.

The average number of daily sick in R.A.F. hospitals was 1,997·3 Royal Air Force, 74·2 W.A.A.F., 94·4 Army, 18·5 Navy, 3·0 Dominion and 66·8 Allied personnel. In Army and Navy hospitals the average numbers of Royal Air Force sick daily were 320·8 and 109·6 respectively (*see* Table II).

There were 7 Royal Air Force general hospitals and 17 Royal Air Force station hospitals in use during the period mentioned. The total number of beds was 6,004, but a further 776 could be put into use in an emergency. An average of 65 per cent. of the beds were occupied daily; the total number of medical officers employed in these hospitals was 236 and the number of beds per M.O. averaged 28. (Appendix A, Table III.)

General hospitals had approximately 1 medical officer to 30 beds and station hospitals 1 to 28 beds. The higher proportion in station hospitals was necessary because the medical officers on establishment had station

as well as hospital duties. The number of medical officers working at station hospitals included in each instance a commanding officer and an adjutant, so that after due allowance had been made for the duties carried out by the hospital staff outside the hospital, it was fair to state that the proportion of medical officers to beds throughout the United Kingdom was 1 to 30. In the three overseas hospitals the ratio was 1 to 45 there being 22 medical officers to about 1,000 beds. The average of medical officers to beds at home and overseas was therefore 1 to 36.

As the ratio of medical officers per 1,000 personnel overseas was higher than at home, greater medical supervision was possible at operational units, where the application of preventive medicine was of prime importance.

Each hospital admitted medical and surgical cases and there were facilities in certain selected hospitals for the treatment of orthopaedic, infectious, neuropsychiatric, burns and venereal disease patients, according to the numbers of the types of cases likely to be admitted from different areas.

The establishment of each hospital by specialities, and the type of work undertaken, may be seen in Appendix A, Table IV; Table V gives the hospitals which had special treatment units.

The total number of out-patients seen in the six months, February 1 to July 31, 1941, by Royal Air Force hospitals was 60,245; this number was sub-divided as shown below:

Medical	5,900
Neuropsychiatric	1,977
Surgical	12,408
Ear, Nose and Throat	6,451
Ophthalmological	15,189
Gynaecological	464
Venereal	1,149
X-ray	16,707

Full details will be found in Appendix A, Table VI.

The average number of out-patients per hospital over a period of six months was 3,012 or 502 per month. These figures excluded Matlock, Compton Bassett, Cranwell and Hednesford Hospitals, because Matlock had had no out-patient department, and at the other three hospitals out-patient cases were seen in the medical inspection rooms with those on the normal daily sick parades. The number of out-patients receiving attention was small because it was policy to filter all cases through the medical inspection rooms, so that no unnecessary cases were sent to hospital for specialist opinion.

Royal Air Force medical officers also provided medical attention and treatment for about 60,000 Army personnel who were engaged on

airfield defence in the United Kingdom. These, with those of certain adjacent anti-aircraft and other Army units, were in the habit of sending their daily sick and injured to Royal Air Force station sick quarters, whereby the amount of work done by Royal Air Force medical officers was increased by about 10 per cent. It is impossible, without further analysis of the numbers of medical officers, to convey by mere quotation of the ratios of medical officers to personnel the amount of work actually done by them in each Command. An overall ratio for the Service created the impression of an abundance of staff, because it gave no information about the number of medical officers employed on administrative or purely hospital duties. The number of medical officers employed on special duty and not available for general medical duties in July 1941 was 545. The table below shows the duties on which they were employed:

Medical Officers on Special Duty and not available for General Medical Duties

Hospital, General	99	Night Vision Testing	9
Station	98	Psychological pre-selection	6
Central Medical Establishment	127	Embarkation	2
M.T.E. & D. Administrative Duties	104	Recruiting Centres	9
Troopships	10	Institute of Pathology	4
Transit	65	Flying personnel	5
Special Duty List	6	Mobile Decompression Chamber	1

The total number of medical officers at home at that date was 1,425, so after subtraction of the 545 on special duty, 880 remained to provide a medical service to about 641,000 Royal Air Force personnel, which gave 1 medical officer to 727 airmen and airwomen, or a ratio of about 1·4 medical officers per 1,000 personnel. Approximately 407 of the 545 medical officers on special duty were in Technical Training Command; if these were subtracted from the total number of medical officers in the Command, the ratio became about 1 medical officer per 1,000 personnel. The ratios by Commands are summarised in the table opposite.

The establishments of medical officers at Royal Air Force general and station hospitals had been reduced by the posting of officers of the Administrative and Special Duties Branch as adjutants, and in this way it had been possible to release 23 medical officers for other duties. The airmen commissioned for duty as adjutants were selected from non-commissioned officers in Group M trade, who had a knowledge of hospital administration and had had considerable experience in compiling medical records.

Statistics of Royal Air Force Medical Officers at Home and Abroad showing Relation to Personnel Strength

	Strength	Medical Officers	Ratio
Total Royal Air Force . .	702,000	1,650	1 : 420
Total Royal Air Force at home .	641,000	1,425*	1 : 450
Total Royal Air Force overseas†	60,900	190*	1 : 320
Technical Training Command .	220,000	610	1 : 361
Flying Training Command‡ .	64,000	178	1 : 352
Bomber Command . . .	81,000	155	1 : 527
Fighter Command . . .	79,000	158	1 : 500
Coastal Command§ . . .	51,500	114	1 : 364
Maintenance Command‖ . .	31,500	26	1 : 1212
Balloon Command . . .	56,300	119	1 : 473
Army Co-operation Command .	15,700	36	1 : 436
Northern Ireland . . .	7,200	11	1 : 655

* These figures do not include 35 medical officers in transit between Home and Overseas Commands.

† The higher ratio of medical officers overseas was due to the dispersed nature and smaller size of individual units.

‡ No very large stations in this Command, but day and night flying and many satellites.

§ Fewer personnel in average squadron than in Bomber or Fighter Commands.

‖ Many small units, which could be looked after by nearby stations or civilian medical practitioners.

MEDICAL PERSONNEL (PRIORITY) COMMITTEE'S REPORTS

The first interim report of the Medical Personnel (Priority) Committee was issued on August 6, 1941. This committee had met twenty-five times since July 3, and wished to make certain recommendations. It was thought that the Service demands for 1,600 medical officers could not be met without imposing undue strain on civilian practitioners and it was again urged that the Services should continually review their distribution of medical officers to effect all possible economies. The first recommendation of the committee was for the formation of the regional committees already mentioned in the introduction. It was suggested that the Ministry of Labour should consider the advisability of raising the age limit of the liability for service of doctors by five years to overcome the shortage of medical practitioners in the Services. This proposal was accepted by the Minister of Labour and liability to military service was extended to medical men between the ages of 41 and 46. It was also recommended that the medical departments of the Army and the Royal Air Force should take immediate steps to see how far economies could be made by the pooling of medical officers in the Anti-Aircraft and Balloon Barrage Commands and employing them on an area basis.

The Principal Medical Officers of the Commands mentioned formed a committee and investigated the disposition of medical officers in their commands throughout the country. It was found that it was possible to reduce the establishment of Royal Air Force medical officers in Balloon Command from 119 to 87, with a further reduction at a later date to 78.

A second interim report was issued on February 11, 1942. It was recommended that the attention of the Secretary of State for Air should be drawn to what the committee regarded as the excessive provision of medical officers at some operational stations. It was stated that the need for maintaining the morale of flying personnel engaged in fighting and bombing duties was appreciated, but the committee suggested that there should be an immediate review of the medical establishments of all operational stations with several squadrons. The committee also thought that a recommendation for more transport for medical officers of all Services would enable them to do more work than they were doing under existing conditions.

The Director-General of Medical Services replied to these recommendations by summarising the economies already made by the Royal Air Force, and stating that a reduction by 37 per cent. of the anticipated medical officer requirements to the end of 1941 had already been made, and had entailed the acceptance of a considerable degree of reduced strength as compared with establishments, except at operational units, which were regarded as having a priority. The establishment of medical officers on squadrons was discussed on the lines already mentioned in the introduction, but in order to represent fully the necessity for having squadron medical officers, a copy of the memorandum on the care of flying personnel issued to all medical officers was forwarded for information. (*See* Air Publication 1269A, Chapters XXXIXA and XXXIXB.)

NUMBERS AND ESTIMATES, 1942

On February 2, 1942, the Air Ministry asked for 120 medical officers for the period April 1, 1942 to June 1, 1942, and a further 180 up to the end of the year. It was stated that 40 women medical officers would be acceptable in this total and that approximately 10 fully qualified specialists* would also be required. It was estimated that of these 300 medical officers, 180 would be needed to fill vacancies created by increased commitments at home and 120 for overseas service. The actual strength and the requirements are summarised in the following table:

* Two surgeons, 2 physicians, 2 ophthalmologists, 2 neuropsychiatrists and 2 radiologists.

	Actual Medical Officer strength on October 1, 1941	Actual Medical Officer strength on March 31, 1942	Anticipated Medical Officer requirements by June 30, 1942	Anticipated Medical Officer requirements by December 31, 1942
Available for United Kingdom establishments of Royal Air Force	1,514	1,511	1,577	1,691
Available for overseas establishments	272	519	573	639
Totals . . .	1,786	2,030	2,150	2,330
Dominion and Allied Medical Officers available for their units . . .	62	68*	68*	68*
Grand totals . .	1,848	2,098	2,218	2,398

* Twenty Canadians, 8 Australians, 32 Poles, 5 Czechs and 1 American, 1 Dutchman and 1 Norwegian.

The increase of 244 in column 3 on March 31, 1942, represented the new intake between October 1941 and March 1942, less casualties and retirements. The increase of 300 in columns 4 and 5 represented the number asked for during the period mentioned. There were in addition about 20 medical officers over from the March quota, but they were offset at the end of the year by those in the December selection who would not be available until 1943, and by casualties.

The medical officers shown under the category of Dominion and Allied medical officers were employable only with their own units and could not be taken into account when estimating Royal Air Force requirements. The figure of 68 was likely to be increased considerably with the arrival of further formations from Canada and America. On many occasions the Royal Air Force had to make good any deficiencies in the establishments of Dominion and Allied medical officers owing to the arrival of the units and their medical officers at different times. The figure shown under 'Available for overseas establishments' was that which was estimated to be needed by known commitments. The numbers quoted for the specific commands varied from time to time, but it was estimated that the totals anticipated would not fall far short of the actual requirements. (*See* table overleaf.)

Medical officers were nearly always fully employed pending embarkation; for instance, at the end of March 1942 only 14 of the 519 officers had not embarked, but they were all working up to within a day or so

	October 1, 1941	March 31, 1942	June 30, 1942	December 31, 1942
Middle East (Egypt, Palestine, Western Desert, Aden)	142	262	280	314
Mediterranean	8	9	12	12
Iraq	30	45	45	45
India, Burma, Ceylon	35*	68	80	102
Ferry Command	2	6	6	6
Canada	30	63	70	75
South Africa and Rhodesia	13	42	50	55
West Africa	12	24	30	30
Totals	272	519	573	639

* Those who were in Far East, now under India.

of sailing. Embarkation warning notices had been served to an additional 54, who were to proceed at the beginning of July. The figures under Canada,† South Africa and Rhodesia represented the provision made for Royal Air Force training schools overseas, the number and size of which had shown a progressive increase. The countries concerned had stated that they had been unable to staff these schools from their own resources.

The estimated ratios of medical officers per 1,000 personnel at the dates given below were obtained from the estimated Royal Air Force and W.A.A.F. strengths on those dates:

Date	Medical Officers	Ratio per 1,000 personnel
October 1, 1941	1,514	2·15
March 31, 1942	1,511	1·85
June 30, 1942	1,577	1·8
December 31, 1942	1,691	1·7

These estimated ratios in fact agreed reasonably with the realised ratios at those dates: at the end of 1942 the total number of medical officers was about 2,375, which gave ratios of 1·85 per 1,000 personnel at home and 2·75 overseas.

There had been a small increase only in the number of medical officers employed at home in the six months ended March 31, 1942, despite an increase of 130,000 in the strength of the Royal Air Force, which had been expected and legislated for in the October estimates of 1941. The main factor which made possible the economies effected at home was that the numerical increase of Royal Air Force personnel had not entailed the opening up of a proportionate number of new stations,

† *See* Official History of the Canadian Medical Services.

but rather additions to the strengths of existing stations. Some stations had changed in character so that fewer medical officers were needed; for this reason a certain number were made available for other duties. In addition, satellite airfields and landing grounds were not being manned to their full medical officer establishments until they had been completed, although they were being progressively developed into operational stations. It had also been possible to release temporarily for attachment to units, where establishments had not been filled, several medical officers employed on Aviation Candidates Medical Boards. The number of medical officers posted overseas had permitted a reduction in those employed permanently on transport duties with convoys.* Finally, the non-effective sick rate had been lower than had been anticipated.

The consolidated result of the economies effected was substantial. There had been a saving of 23 medical officers by the substitution of administrative and special duties adjutants in hospitals, 6 by a similar procedure at administrative headquarters, a further 6 in various miscellaneous appointments, and 32 in Balloon Command, 67 in all.

Six months later it became obvious that more than the 300 medical officers asked for in February were needed, and on August 22, 1942, a revised estimate was made, based on known immediate requirements as far as the end of 1942, and an additional 114 medical officers were requested.

This increase was wholly due to the commitments in North-West Africa which had been met by the posting of 46 medical officers; in India, where the rate of expansion during the period under review had accelerated beyond all expectation; and at home where the posting of more medical officers overseas than had been foreseen had created vacancies.

The strength of medical officers on April 1, 1942, was 2,030. The estimated strength on December 31, was 2,529, made up as follows:

	Medical Officers
Strength on April 1, 1942 .	2,030
Estimated requirements up to December 31, 1942 . .	300
Revised estimated increase to December 31, 1942 . .	114
Increase necessary in October 1942	85
Total estimated by December 31, 1942	2,529

* There were on the average between 12 and 15 medical officers employed on these duties at one time.

The actual strength on November 1, was 2,291, a deficiency of 238, calculated on the estimated numbers by the end of the year. Additional commitments for 1943 were forecast for each theatre of operations, as far as could be foreseen, without any allowance being made for dramatic changes which might arise out of the progress of the war. In this way the estimated strength of 2,897 medical officers at the end of 1943 was obtained, an increase of 368. This number took no account of the deficiency which remained at the end of 1942.

ESTIMATES FOR 1943

The figures of estimated strengths to meet commitments had been arrived at as follows:

	Strength	Estimated			
	November 1, 1942	December 31, 1942	March 31, 1943	June 30, 1943	December 31, 1943
Middle East (includes Malta, Iraq, Sudan, Aden)	361	399	420	450	450
India	145	195	250	300	300
Ferry Command	4	4	4	6	6
Canada	63	63	63	63	63
U.S.A. and Bahamas	6	7	7	7	7
South Africa and Rhodesia	47	55	60	65	70
West Africa	45	65	80	80	80
Australia	1	1	1	1	1
North Africa (Algeria, Tunis)	46	46	46	46	46
Missing (not posted)	24	24	24	24	24
Totals	742	859	955	1,042	1,047
Home	1,549	1,670	1,730	1,780	1,850
Grand totals	2,291	2,529	2,685	2,822	2,897

It was considered that the heaviest requirements would be in the early part of the year and that the position in the second half was uncertain, although it was probable that the requirements would be substantially lower.

A distinct change now became apparent in the medical manning position. All three Services were affected, because similar demands had been made by the Army and the Navy. Up to the end of 1942 an allocation of medical officers, which corresponded within reasonable limits with the numbers demanded, had been possible. The sudden increase in the *tempo* of warfare throughout the world with the change-over to the offensive by the Allies had, in the eyes of the Services, created a need for many more medical officers. Unfortunately, there was no prospect of the demands being met, because of the increasing medical man-power

shortage and the depletion of the sources from which the Services obtained their medical officers. It became as essential to maintain the medical services of the civilian population as it was to increase the allocations of medical officers to the Armed Forces. The Lord President's Committee was faced with the unenviable task of determining the precise needs of the civilians and Services in such a way that, although both would suffer curtailment in the numbers of doctors and medical officers, in neither would there be the prospect of a breakdown in medical supervision or treatment.

The review made by the Lord President's Committee of the medical man-power shortage has been referred to above. After invitation by the committee, the Lord Privy Seal, Lord Cranborne, opened an inquiry into the demands made by the Services and employed an expert in statistics to assist him in compiling his report. The committee used the report as a basis for their recommendations to the War Cabinet on what allocations there should be to the Services.

It was found during the inquiry that the strengths estimated for the R.A.F. by the end of the year had been overstated by the Directorate of Manning, though in good faith, on information available at the time the estimates were made. The War Cabinet curtailed the expansion foreshadowed, and the increases required for the Medical Services were thus reduced considerably both at home and overseas.

It was confirmed on March 11, 1943, that at least 60 medical officers would be needed up to the end of the year, or, if the months before March were excluded for the sake of accuracy, 32 would be required. However, the figure for wastage was much higher than the 20 estimated in a previous statement. In the three months, December 1942, and January and February 1943, 12 medical officers had relinquished their commissions on account of ill-health, 4 women medical officers had resigned because of pregnancy and 2 Dominion medical officers had resigned on transfer to their own Dominion's Air Force. The total wastage was 18, a rate of 60 in ten months. Admittedly, the wastage rates were high in the months mentioned, but the figures gave an idea of what might be expected.

There were two other factors which made an increase in the numbers of medical officers necessary, apart from the increase in the total strength of the Royal Air Force. Balloon Command was being decreased in strength by about 20,000 personnel, who were being absorbed into other Commands. There had been close co-operation between the Balloon and Anti-Aircraft Commands over the medical care of the personnel of the two Services. The ratio of medical officers per 1,000 personnel in Balloon Command was 1·3, and in the other Commands 1·9, so that extra provision had to be made at a higher ratio for the transferred personnel. An increase in the proportion of the forces overseas

automatically required in the same way an increased number of medical officers, because the ratio overseas was 3·0 per 1,000, a figure higher than the ratio at home by 1·1. Extra hospital facilities were also needed overseas because of the higher rates of sick incidence. It was not thought that the moving of hospitals to the Continent would take place to anything like the extent visualised by the Army, because evacuation of casualties by air would necessitate the provision of hospitals at the receiving rather than at the despatch end of the air ambulance service.

A new analysis was made a few days later showing the numbers of medical officers employed on administrative duties. (*See* Appendix B.)

The total number of medical officers employed on administrative duties at Command and group headquarters at home was 112. In addition, seventeen more were employed at Air Ministry; a total of 129. However, included in this total were a number appointed for special duties, or not employed on full-time administrative duties. Flying Personnel Medical Officers were established at Bomber, Fighter, Coastal and Flying Training Command headquarters. They were primarily concerned with the welfare of flying personnel, the technical problems of aviation medicine and research on specialised equipment. These officers were specialists in aviation medicine and applied physiology.

Women medical officers were appointed at eight of the command headquarters to advise the Principal Medical Officer on the medical problems of the W.A.A.F. The greater part of the duties consisted of visiting stations, lecturing and making any medical examinations that were necessary. These duties, part clinical and part advisory, could not be considered of an administrative character.

The Senior Medical Officer at a number of group headquarters was assisted by one junior medical officer, except at No. 54 Group, Flying Training Command, where there were two. These officers looked after the headquarters personnel, apart from carrying out administrative duties, and acted as reliefs at stations in the group. It was fair to state that these officers were employed on part-time administration. Therefore, of the officers established at group headquarters, nineteen were employed part-time on administrative and four on clinical duties.

The Deputy Principal Medical Officer at Headquarters Maintenance Command was also regarded as employed part-time on administration and part-time in an advisory capacity on problems of industrial hygiene.

To sum up, of the total of 112 medical officers at command and group headquarters, 16 were not employed on administrative duties and of the remaining 96, 20 were on part-time administration, leaving 76 employed on full-time administrative duties.

At Air Ministry, 2 of the 17 medical officers were employed on research, 1 was on temporary duty for three months, and 1 was non-effective sick, leaving 13 employed on full-time administration.

On March 31, 1943, the Royal Air Force estimates were reviewed and re-submitted after the increase in the total strength of the Royal Air Force for the year had been fixed at 30,000. In making this estimate the intake for the period January 1, 1943, to February 17, 1943, was omitted from the calculations.

Estimate of Medical Officers required for 1943:

		Medical Officers
(*a*) Increase of total strength of Royal Air Force by 30,000 for 1943 at 2·1 medical officers per 1,000		63
(*b*) Transfer of 20,000 personnel from Balloon Command to Overseas Commands at the difference in rates for these Commands—3·0 per 1,000 and 1·3 per 1,000, i.e. 1·7 per 1,000		34
(*c*) Increase of personnel in units on transfer overseas from Home at difference in rates between Home and Overseas—3·0 per 1,000 and 1·9 per 1,000, i.e. 1·1 per 1,000		52
Increases Overseas		
'Round Up'	55,000	
North Africa	12,000	
	67,000	
Less Balloon Command personnel (see (*b*) above)	20,000	
	47,000	
(*d*) New Base and Mobile Hospital commitments, additional to clause (*c*) above		
Base Hospital, North Africa (approved)	20	56
2 Mobile Field Hospitals, North Africa (approved)	8	
4 Mobile Field Hospitals, India	16	
Base Hospital, Benghazi (approved)	12	
(*e*) Wastage (invaliding, resignations, etc.). (Calculated at known rate for months of December 1942, January and February 1943)		72
(*f*) Non-effective through temporary release to civil life. (Calculated at rate for 1942)		6

(*g*) Deficiency of provision during period April to December 1942

Asked for in March 1942 . .	300	
Asked for on August 22, 1942 to cover known new commitments	114	
Total	414	
Numbers provided:		
Male	335	
Female	26	
Total	361	
Deficiency	53	53
Estimated total required for 1943 . . .		336

From January 1, 1943, until February 17, 1943, when recruitment to the Royal Air Force was temporarily suspended, 97 male medical officers and 15 women medical officers—a total of 112—were accepted for service with the Royal Air Force. If the estimates for the year 1943 were approved, the outstanding requirements for the remainder of the year would be 336 minus 112, a total of 224.

The method of obtaining the number of medical officers needed by the use of specific ratios, such as 2·1 per 1,000 personnel, was rough and ready, but came within reasonable limits of the figures calculated by the Organisation (Establishments) Department. It was to be realised that the overall ratio of medical officers to total personnel was merely a statistical average derived from a combination of all kinds of different units, each with different ratios: for instance, hospital figures were clearly in a class by themselves. The number of medical officers in hospitals was related to the estimated casualties from the whole of the Royal Air Force, but included a variety of specialists whose numbers hardly ever varied in proportion to the cases treated. For large units at home, which trained only ground personnel, one medical officer was normally provided for every 1,000 to 2,000 men and women. On the other hand, small flying units of perhaps 300 men were allowed a medical officer because of the constant flying carried out. Generally speaking, it was the flying commitment which dictated the medical officer requirement, and since most units were flying day and night, two medical officers became necessary on an airfield. These two also gave attention to ground personnel on the station, but the strength of these personnel bore no relation to the medical officer establishment. Overseas, Royal Air Force units tended to be small and dispersed in character, so that the ratio was inevitably higher.

Lord Cranborne informed the Secretary of State for Air in May 1943 that he would have to recommend that the Royal Air Force requirements should be reduced by 25 per cent. One of the main arguments for this decision was that 'it was difficult to contend that ground personnel must continue to enjoy a standard between three and four times that of the civilian population, including older people and young children, whose needs were certainly no less, and might well be greater than those of young men and women in the prime of life, who constituted the ground staffs of the Royal Air Force'. As a large majority of the total strength of the Royal Air Force was made up of ground personnel it was suggested that without involving any reduction in the present high standard for aircrews, it should be possible to maintain a thoroughly satisfactory overall medical service on a rather smaller number of doctors.

That this argument was based upon an inaccurate appreciation was shown in a reply to this letter, supported by facts detailed by the Director-General of Medical Services, who stated that it was a debatable point of policy to provide a high standard of medical attention for aircrew and a lower one for ground crew even if it were possible; in fact, in the Royal Air Force both aircrew and ground crew were so intermixed in small units that the technical difficulties of ensuring such a policy were very great.

Allocation for 1943. The War Cabinet met on July 12, 1943, and authorised the recommendations made by the Lord Privy Seal, which were as follows:

	Allocation recommended	Demand
Royal Navy .	400	620
Army . .	1,000	2,025
India . .	360	480
Royal Air Force	256	336
	2,016	3,461

At the same meeting the Lord Privy Seal was asked to consider for the Lord President's Committee what allocations should be made to the Services in 1944.

ESTIMATES FOR 1944

In September 1943 the Air Ministry submitted demands for 261 medical officers for 1944, and on November 26, Lord Cranborne submitted an interim report on the medical man-power situation after the demands from all the Services had been examined.

It had not been possible for him to make any recommendations, because Service demands had been framed on the assumption that they would obtain, in 1944, the allocations of general man-power for which they were asking. Any cuts in these allocations would affect materially the requirements for medical officers, and until the War Cabinet had decided what the distribution of man-power was to be, no recommendations could be made.

It was emphasised that the allocation of 2,016 doctors to the Services recommended in the last report, could only be made at the cost of a further reduction in the number of doctors available for the civilian population. In view of the need to provide for the operational requirements of the Services, the risk involved had been accepted, but it had been hoped that the allocations made would meet the essential needs so that civilian standards could be partially restored. It had been thought that the Services would have reached their full expansion in 1943 and the strengths of medical officers would only have to be maintained in 1944. The Services had, however, asked for over 2,500 medical officers; a number far in excess of the maximum which could be provided.

In the period January 1 to November 9, 1943, 1,715 doctors had been recruited, of whom the Royal Air Force had received 233 of their quota of 256. In order to reach the approved total figure of 2,016, 300 further doctors had to be provided in the next two months. The Lord President's Committee had been advised by the Medical Personnel (Priority) Committee that not more than 100 were likely to be recruited in that time, and in consequence a deficit of about 200 had to be accepted for the year among the Services.

It had been agreed at the July meeting that the allocation of doctors in 1944 should be no greater than the number which could be provided without involving any further deterioration in civilian standards. On the information then available it appeared that about 1,500 doctors would be recruitable without there being any reduction in the actual number of doctors available for the civilian population. The number of newly qualified men and women during the year was estimated at 2,000. Wastage of doctors from civil practice, due to death, retirement or other causes, was estimated at 800; against this number about 300 would return to civil practice after being invalided or released from the Services. It was therefore necessary to absorb about 500 newly qualified doctors into civil practice to offset wastage and to keep the numbers constant. The provision of doctors for the Services involved the recruitment of a further 300 established civilian practitioners. Experience suggested that so large a number could not, in fact, be provided. It seemed therefore that in 1944 the supply of doctors for the Services would have to be limited to 1,200 newly qualified fit men.

In December, the War Cabinet authorised the distribution of the available general man-power between the Services; the Royal Air Force was to be increased by 70,000, a reduction of 72,000 on the estimates on which the demand for 261 medical officers had been made.

Meanwhile, the shortage of civilian practitioners was felt acutely in the winter of 1943. An influenza epidemic* threw great strain on these practitioners, who were already working overtime. On December 3, the Lord President's Committee considered the situation and issued a report, in which it was recommended that the Services should, in the emergency, release temporarily or for part-time duty a number of medical officers to assist civil practitioners in their own areas. The Air Ministry issued instructions to this effect on December 7, with a proviso that, whatever arrangements were made, they were not to interfere with the operational efficiency of any Royal Air Force units.

The Royal Air Force commitments were again reviewed and in January 1944 the Air Ministry asked for 170 doctors for the year. The actual requirements were 189, but it was thought that a reduction of 19 was possible in view of the acute shortage among the civilian population. A basis for the demands made is summarised below:

Estimate of Royal Air Force Medical Officer Requirements during 1944

(*a*) Establishment of medical officers on January 1, 1944	2,709
(*b*) Strength on January 1, 1944	2,503
(*c*) Less non-effective prisoners-of-war	26
(*d*) Effective strength on January 1, 1944 (*b*—*c*)	2,477
(*e*) Deficiency on January 1, 1944 (*a*—*d*)	232
(*f*) Estimated establishment on January 1, 1945	2,798
(*g*) Add estimated wastage during 1944 (actual losses in 1943 were 95—mainly through invaliding)	100
(*h*) Entry during 1944 to meet full requirements = (*f* + *g*—*d*)	421
(*j*) Entry to meet 1944 requirements only (*h*—*e*)	189
(*k*) Estimated strength on January 1, 1945, assuming entry as at (*j*) (*d* + *j*—*g*)	2,566

Requirements were assessed by adding up the posts in the establishments of individual Royal Air Force units, either existing or planned, at the target dates.

The figures were net. No allowance was made for officers who were not available for active duty through sickness or because they were in transit between postings. Experience showed that this amounted to a continuous loss of 2·5 per cent. of total strength, or about sixty-two officers.

* The peak was at the beginning of December, when there were 1,100 deaths in one week. Deaths occurred mostly from post-influenzal infections, usually from some form of pneumonia.

The approximate target figures for the Royal Air Force (including W.A.A.F.) as a whole on January 1, 1945 were as follows:

	Home	Overseas	Totals
Royal Air Force and W.A.A.F.	798,000	385,000	1,183,000
Medical Officers in proportion	1,516(*a*)	1,155(*b*)	2,671(*c*)

(*a*) At 1·9 per 1,000
(*b*) At 3·0 per 1,000
(*c*) = 2·3 per 1,000

The estimated strength on January 1, 1945 was 2,566 medical officers, giving a ratio of 2·2 per thousand.

Allocations for 1944. On March 31, 1944, the Lord President's Committee approved Lord Cranborne's recommended allocations for the first nine months of 1944 and these were later accepted by the War Cabinet. It was found that the Royal Air Force quota was to be 90 medical officers, or a rate of 120 for the whole year, leaving a deficiency of 50 in addition to the numbers not received in the 1943 quota, the accepted deficiency of 232 on January 1, 1944.

In March 1944, the strain of meeting overseas commitments of medical officers (particularly at this time for 2nd T.A.F.) was telling on the home establishment. The deficiency of medical officers here had grown to 250. The Central Medical War Committee was well aware of this but civil needs were equally acute. The recruitment of doctors remained limited and even showed signs of declining; it was therefore impossible to make good the Service deficiency in medical officers.

During the second half of 1944 A.C.S.E.A. assumed increasing importance, and with this, of course, an increasing demand for medical officers. In the opinion of Air Ministry, M.A.A.F. had ceased to require its total strength of medical personnel, and in July the transfer of No. 31 Mobile Field Hospital from M.A.A.F. to A.C.S.E.A. was urged.

In October, the position in A.C.S.E.A. was still pressing and an officer from Air Ministry (M.A.1) flew to M.A.A.F. to search for further doctors. In addition to normal requirements, it had been decided to create thirteen casualty air evacuation units in A.C.S.E.A.

In November, the shortage, now critical, was eased by flying out twenty-five medical officers to A.C.S.E.A. Intake during this period was sixty-five.

FACTORS INVOLVING THE SUPPLY OF MEDICAL OFFICERS IN 1945

In 1945 the manning position was dominated by the 'run-down' of medical officers. In the early part of the year the manning position in

A.C.S.E.A. was fairly stationary. There was a decreasing commitment in Europe. Air Disarmament Formations were created but the medical personnel for these were provided by reductions elsewhere in the Tactical Air Force.

The total strength of medical officers at January 1, 1945, was 2,690. By the end of December it had decreased to 1,890, and the rate of decrease was far from even as the following figures illustrate:

1945	Estimated releases	Numbers released
June . .	60	26
July . .	15	30
August .	22	35
September .	81	63
October .	120	157
November .	213	167
December .	350	255
Totals .	861	733

Other depletions during the period were retirements (regular) 17, invalidings 83, and resignations (mainly on compassionate grounds or to meet civilian needs) 59. The invalidings, resembling those of other branches, were largely for nervous instability. Intakes during the period numbered 92.

Now that it was becoming necessary and possible to look ahead, the importance of the inbalance caused by the suspension of permanent commissions was appreciated. However, despite a call for recommendations for such commissions both in 1944 and 1945, none were given up to the end of 1945.

CONSULTANTS AND SPECIALISTS

PRE-WAR

Royal Air Force medical officers of high qualifications and much experience were employed until 1927 in their specialised branches in one of the three medical establishments, called the Specialist Medical Establishment, the Research Laboratories and Medical Officers' School of Instruction, and the Central Medical Board, or at certain Royal Air Force hospitals. These officers were not then called consultants, but in December 1927 authority was given in Air Ministry Weekly Order No. 796 for the merging of the three establishments already mentioned into one establishment, to be known as the Central Medical Establishment, and for designating such officers as specialists. Medical personnel employed on professional work in the subjects of medicine (including tropical medicine), neurology, surgery, bacteriology and parasitology, radiology (including electro-therapeutics), anaesthetics, ophthalmology and otology were divided into three groups. The first consisted of

selected junior medical officers under training for professional posts; the second of those qualified professionally in their speciality and employed in junior posts of professional character; and the third of those filling special reserve posts, who were fully employed on professional work. In the third group were a specialist of aviation medicine and applied physiology, a pathologist, a physician, an ophthalmologist, an otologist and a neurologist, each holding either group captain or wing commander rank. The number of these appointments was limited by the needs of the Service and by the necessity for observing a similar proportion between the number of reserve posts and the officers who might fill them, and the total number of higher ranks and the rest of these in the medical services.

A medical officer holding a special reserve post was not liable for the same overseas service as were other medical officers, unless he could be employed as a full-time specialist overseas. Normally this was not possible and his name was removed from the general overseas roster, but he was still liable to be sent overseas for tours of special duty connected with his particular subject.

In November 1930, the position was reviewed and it was decided that medical officers holding certain of the reserve posts would in future be called consultants in their respective subjects. Those affected by this decision were the specialists in medicine, neurology, ophthalmology, oto-rhino-laryngology, pathology and tropical medicine, and surgery. The establishments at this time were:

Consultant in ophthalmology	Group Captain
Consultant in medicine	Wing Commander
Consultant in oto-rhino-laryngology	Wing Commander
Consultant in pathology and tropical medicine	Wing Commander
Consultant in surgery	Wing Commander
Consultant in neurology	Squadron Leader

Consultants were available at the Central Medical Establishment and at the Royal Air Force Hospitals, Halton, Uxbridge and Cranwell on certain specified days each week.

In November 1936, the consultants held the following ranks:

Consultant in hygiene, pathology and tropical medicine	Air Commodore
Consultant in oto-rhino-laryngology	Group Captain
Consultant in applied physiology	Group Captain
Consultant in neurology	Group Captain
Consultant in medicine	Wing Commander
Consultant in surgery	Wing Commander
Consultant in ophthalmology	Wing Commander

Consultants did not normally wear uniform on routine visits or when giving lectures. This privilege was reviewed in January 1939, when

Technical Training Command requested that orders should be given for the wearing of uniform by consultants on their visits. After correspondence with Nos. 21 and 24 Groups, Technical Training Command, it was decided that medical officers when attending the Medical Training Depot or other Royal Air Force units and hospitals should wear uniform. Consultants visiting hospitals could wear civilian clothes at the discretion of the officer commanding the hospital concerned.

Consultants in certain subjects were selected and appointed* from the senior and specially qualified medical officers on the active list. The appointment of additional consultants to meet war-time requirements was provided for by the grant of commissions to selected civil consultants.

All consultants were borne on the strength of the Central Medical Establishment and were available for duty within that unit, or as required. The organisation and administration of the Central Medical Establishment was changed from time to time and was completely reorganised in October 1938 as far as consultants were concerned. The administrative arrangements controlling and co-ordinating the ordinary and special duties of consultants were made by the Officer Commanding, Central Medical Establishment, who was responsible for maintaining close contact with all units and hospitals directly or indirectly concerned. In so far as the duties of a consultant affected any Command, the Officer Commanding, Central Medical Establishment, communicated with the competent medical authority of the Command concerned. Arrangements for consultations and visits and for duties of a routine nature were made, as far as possible, well in advance, so that Air Ministry and all Commands concerned might be notified in good time. The programme of routine visits was rearranged from time to time to fit in with the national emergency which existed at that date. Urgent needs for consultant services were met by using the most direct means of communication between the competent medical authority and the Central Medical Establishment. After 1600 hours the appropriate consultant was approached directly and the Officer Commanding, Central Medical Establishment, informed of the arrangements made; for this reason the location of all consultants was made available at all times and they were required to keep the Central Medical Establishment and the units visited informed of all their movements.†

Consultants were required to advise on the arrangements and facilities for work in their respective specialities. Routine visits were made to

* These were only in specialities where the work justified a whole-time consultant during peace.

† When consultants were not immediately available, officers with special qualifications posted to medical units in commands could be employed to give opinions, normally at their units, on cases from stations in the locality.

hospitals and medical units periodically on a pre-arranged programme. Any observations and recommendations which arose out of such visits were confined to technical matters affecting their specialities, and the reports were made to the Officer Commanding, Central Medical Establishment, who forwarded them in duplicate to Air Ministry. Consultants had to be available for work in their own speciality at the Central Medical Establishment and at other units as required, and to advise medical boards when necessary, either by being present on the board or by a special report which had to be included in the board proceedings. All consultants acted as technical advisers to the Director-General of Medical Services on questions relating to their specialities. In this connexion, apart from observations on routine duties, any matters which a consultant desired to bring to the attention of the Director-General of Medical Services were submitted in a report to the Officer Commanding, Central Medical Establishment, who forwarded it direct with his remarks.

The recommendation and selection of medical officers and airmen for specialised training was a consultant's responsibility. They also organised and conducted research work in their own subjects, whether such work was initiated by them or not. The nature of any proposed research, the progress made, and the results, were submitted confidentially to Air Ministry.

OUTBREAK OF WAR

Three extra consultants were appointed in the rank of group captain in the specialities of medicine, surgery and neurology on the outbreak of war.

The expansion of the Royal Air Force before and during the war, and the opening of the various general and station hospitals, created a need for medical officers with special qualifications and experience. Such officers were found among certain serving officers who had for many years in the same rank carried out the duties of specialists; these included responsibility for all medical and surgical cases in their hospitals and the giving of medical and surgical advice on out-patient cases, not only of their own stations, but also of Royal Air Force, Navy and Army units in the neighbourhood. In addition, they were often in charge of a laboratory and sometimes of the X-ray department. In the other Fighting Services medical officers in similar positions had been given the title of medical or surgical specialists and the Royal Air Force medical officers in such appointments, regarding themselves as comparable with their Army or Navy colleagues, were in the habit of describing themselves as medical or surgical specialists; this, however, was not general and there was then no authority for them to do so. They were thus put in a difficult position when dealing with members of other Services, and in

February 1941 the Air Ministry issued instructions that officers holding the ranks of wing commander and squadron leader, who were in charge of medical and surgical divisions of hospitals, or filling establishments as neurological, oto-rhino-laryngological or ophthalmological specialists, might in future sign their reports as specialists; senior specialists on the strength of the Central Medical Establishment were permitted to sign themselves as such.

Certain civilians were under special contract at the outbreak of war, and the position was summarised in March 1941 in an Air Ministry Order. There were then two group captain consultants in medicine; two group captain consultants in surgery and two group captain consultants in neuropsychiatry; a group captain consultant in ophthalmology; a group captain consultant in oto-rhino-laryngology; a group captain consultant in hygiene, and a wing commander consultant in pathology and tropical medicine. There were two civilian consultants—one in orthopaedic surgery and another in applied physiology, the latter holding a full-time appointment against a group captain post at the Royal Aircraft Establishment, Farnborough, and in addition extra civilian consultants were available when required, by arrangement through Air Ministry, in surgery, radiology, dermatology, plastic surgery, tropical disease and cardiology. The senior specialist in venereal disease, a wing commander, who had held the appointment since November 28, 1939, was the only medical officer in charge of a special branch of medicine who did not hold consultant rank; he was also adviser to the consultants in medicine on all matters connected with the treatment of venereal disease, and in view of this, authority was given on July 11, 1941, for him to receive the title of consultant in venereology.

In April 1941, the Royal Air Force requirements were reviewed, and it was estimated that there was an immediate need for a third consultant in surgery, a part-time civilian consultant in anaesthetics, a part-time consultant in physical medicine, a senior specialist in radiology and a senior specialist in gynaecology and obstetrics.

A third consultant in surgery was needed, because the two consultants then employed had not enough time to carry out their widespread visits and to perform the large amount of surgical work necessary as a result of aircraft crashes. One consultant had to be always available for duty at the Central Medical Board and to give final opinions on difficult cases at Royal Air Force Hospital, Halton. The other had to tour the country extensively and visit each of the twenty-five Royal Air Force hospitals once every two months, each sick quarters at operational stations in the United Kingdom yearly, and all Royal Air Force battle casualties, in civil and other Service hospitals, as soon as possible after the admission of such patients; particular attention was paid to injuries of special types, such as burns, fractures, and those requiring plastic surgery,

so that they might be transferred to special centres set up for the reception and treatment of such cases, usually situated in Royal Air Force hospitals, as soon as possible. The addition of the third consultant made possible the reorganisation of the duties at the Central Medical Establishment, so that one consultant could work at the Central Medical Board and Royal Air Force Hospital, Halton; the second visit the hospitals, sick quarters and battle casualties in the southern half of England and Wales; and the third visit the hospitals, sick quarters and battle casualties in the northern half of England and Wales, as well as deal with other Royal Air Force surgical arrangements in Scotland.

A part-time civilian consultant in anaesthetics was required to visit various Royal Air Force hospitals at least once a year, to advise on the suitability of the apparatus in use, to estimate the professional capabilities of those engaged in the speciality of anaesthetics at each hospital, and to advise on the particular problems in anaesthetics as they arose. There was then no one of sufficient seniority in the Service to rank as a consultant in anaesthetics, and until this was possible it was essential that a part-time civilian consultant should be appointed. It was emphasised that this recommendation was urgent, because, although the standard of anaesthetics in the Royal Air Force was in every way comparable to that in other Services, it required to be raised considerably by reason of modern research and discoveries. In addition to a civilian part-time consultant in anaesthetics, it was necessary to appoint a senior specialist in anaesthetics to assist the consultant on Service matters and to instruct medical officers and nursing staff in anaesthetics. He was also to be available to advise the Director-General of Medical Services in emergencies when the consultant was not available.

In peace-time the post of consultant in physical medicine had been held by a civilian consultant—a Royal Air Force retired wing commander—who, when he joined the Royal Air Force in a civil capacity with the honorary rank of flight lieutenant to work under the Director of Science, resigned his civilian consultant position. With the urgent need for the quick rehabilitation of all casualties it was desirable that the post should be re-filled as soon as possible. The duties of the consultant consisted of visiting the various Royal Air Force hospitals in the United Kingdom once a year to observe and report on the efficiency and suitability of the apparatus in use, and on the proficiency of the staff employed in physical medicine, including diathermy, short-wave therapy and sun-ray treatment; advice was also needed on research problems in physical medicine.

The importance of radiology in the diagnosis and treatment of common medical and surgical conditions necessitated the appointment of a serving medical officer of wing commander rank as senior specialist in radiology

at Halton Hospital. His duties were to act as adviser in radiology to medical board cases at the hospital and at the Central Medical Establishment; to instruct medical officers and radiographers, and to supervise radiological research. A need was felt at the same time for a senior specialist in radiology to undertake the mass radiography of recruits with particular attention to the elimination of tuberculous candidates. The post of specialist in similar rank in mass radiography and tuberculosis at the Central Medical Establishment was subsequently approved in November 1941.

The growth in numbers of the Women's Auxiliary Air Force gave rise to an increasing amount of medical work in connexion with the physiology and diseases of women. A senior specialist in gynaecology and obstetrics* was required to visit all Royal Air Force hospitals where women were being treated. The visits of this specialist were notified in advance, so that airwomen from stations in the vicinity could attend as out-patients on the day of his visit.

The third consultant in surgery and the part-time civilian consultant in anaesthetics were authorised in July 1941.

On May 16, 1941, the Director-General of Medical Services asked for the granting of honorary commissions to certain of the civilian consultants to the Royal Air Force who, though employed part-time, were carrying out onerous and most important duties directly comparable with those carried out by the civilian consultants to the Army, who were employed full-time and had been given honorary commissions, in most instances, in the rank of full colonel. It was Royal Air Force policy to consider the employment of civil part-time consultants preferable to their employment on a whole-time basis. It was thought that the giving of honorary rank to consultants would facilitate their entry into Royal Air Force stations, as well as their travelling on roads throughout the country under war conditions, and would give them the help of Service status to carry out their duties, both with the Royal Air Force and sister Services. These proposals were not approved, because it was not Air Ministry policy to grant honorary commissions during hostilities.

In August 1941, a request was made for the appointment of a part-time consultant in thoracic surgery to the Royal Air Force on a casual fee basis; it was calculated that under existing conditions there would be so few casualties a month requiring expert thoracic surgery that it was more economical and preferable professionally to employ a part-time consultant in thoracic surgery, than to train a special team to look after such cases. Similarly, on August 28, 1941, a request was made for a part-time consultant in dentistry in view of the numerous maxillo-facial casualties caused by flying accidents.

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* For advice on ante-natal cases until their release from the Service.

Both these appointments were approved and authority was given by the Air Ministry in November 1941.

On October 13, 1941, the only consultant not carrying a rank as high as group captain was that of the Officer Commanding, Institute of Pathology and Tropical Medicine, Halton. The upgrading of this post to group captain to bring it into line with other establishments was effected.

In 1941 and 1942 there was a need overseas for medical officers qualified in surgery, neurology and ophthalmology to advise on the disposal of an increasing number of medical cases in those specialities. Accordingly, three senior specialists were posted either to medical boards in the Middle East or to Command Headquarters to fulfil the requirements. These officers acted in the capacity of unofficial consultants until the end of 1943, when it was decided that all medical officers holding posts of such seniority were to be on the strength of the Central Medical Establishment. The three senior specialists were posted to the Central Medical Establishment in the acting rank of air commodore on January 16, 1944, for special duty in overseas commands.

A civilian statistical adviser to the Royal Air Force was authorised in March 1943; his duties were to advise the Director-General of Medical Services on all statistical matters relating to medical research in the Royal Air Force, and to be available to attend at any of the research establishments should he be required. On December 22, 1943, proposals were put forward to bring this appointment into conformity with the general policy of having civilian consultants in the more important branches of the Royal Air Force Medical Service. Accordingly, on January 16, 1944, the status of consultant was approved.

The ranks of consultants to the Army were raised during 1943 and 1944, and in order to conform with this policy, taking into consideration the relative sizes of the Royal Air Force Medical Branch and the Royal Army Medical Corps, the ranks of Royal Air Force consultants were also raised. The first step was taken in November 1943, with proposals for the upgrading of the senior specialists in venereology, gynaecology and obstetrics, mass radiography and tuberculosis, surgery, ophthalmology, and neuropsychiatry to junior consultants in the rank of group captain. The last three consultants were established overseas. All these alterations were summarised in a consolidated Air Ministry Order in December 1944.

This order authorised the following ranks for consultants:

Medicine	Air Vice-Marshal
	Air Commodore
Surgery	Air Vice-Marshal
	Air Commodore (three)*
Orthopaedic Surgery	Air Commodore

Neuropsychiatry	Air Vice-Marshal
	Air Commodore (three)*
Pathology and Tropical Medicine	Air Commodore
Ophthalmology	Air Commodore (two)*
Oto-rhino-laryngology	Air Commodore
Gynaecology	Air Commodore
Venereology	Air Commodore
Mass Radiography and Tuberculosis	Air Commodore
Anaesthetics	Air Commodore
Hygiene	Air Commodore
Radiology	Group Captain

* One being an overseas post.

In addition there were five civilian consultants under special contract in the subjects of orthopaedic surgery, orthopaedic rehabilitation, physical medicine, dermatology, and applied physiology, the last being a whole-time appointment.

There were also available for consultation when required, civilian consultants in surgery, radiology, dermatology, plastic surgery, tropical diseases, cardiology, thoracic surgery, dental surgery and medical statistics. All Service consultants, irrespective of the rank held, could be attached from the Central Medical Establishment to overseas commands as local consultants when it was considered desirable by the Director-General of Medical Services.

WOMEN MEDICAL OFFICERS

The question of appointing women medical officers for the medical care of members of the Women's Auxiliary Air Force was raised in September 1939 but not pressed, because airwomen were then serving in small numbers only at various scattered units throughout the United Kingdom.

In December a decision was reached to appoint women doctors in view of the policy to increase the size of the Women's Auxiliary Air Force. It was laid down in the conditions of service that women doctors were to be employed in the Medical Branch of the Royal Air Force for duty with units in which there were a considerable number of airwomen, but they could be called upon to undertake other duties at the direction of the Director-General of Medical Services. However, they were not employed at any time on airfields, operational training units or flying training stations, where they would in all probability have had to carry out the special examinations for aircrew. They therefore had limitations of service. Women doctors were granted the relative rank of flying officer on appointment and were eligible for advancement in their relative ranks under the same conditions as male medical officers. Relative rank

was granted solely for the purpose of deciding procedure and rates of pay and allowances, because women doctors were to be addressed by their professional or private titles and were not to be known or addressed by their relative ranks. The uniform was to be the same as that of officers of the Women's Auxiliary Air Force, with the addition of the collar badges of the Royal Air Force Medical Branch.

In March 1940 the first three women doctors were appointed, and their conditions of service were promulgated the following June in an Air Ministry Order. Further appointments were made as the necessity arose, and by the end of 1940, thirteen more had been appointed. In 1941 seventeen, in 1942 forty-two, in 1943 twenty-three, and in 1944 nineteen were appointed, a total of 117. Of this total by March 1, 1944, eighteen had left the Service for various reasons.*

Considerable dissatisfaction was felt by women medical officers throughout the first three years of the war. They had enjoyed recognition in civilian life after they had qualified, but on appointment to the Service they had been granted relative rank only and did not receive any of the privileges they felt were due to them because of their position and profession.

In April 1941 the Defence (Women's Forces) Regulations became law and women serving in the three Services were deemed to be members of the Armed Forces of the Crown. Attention was drawn in June 1941 in an Air Ministry Order to the fact that the Air Force Act was thus made applicable to women who were employed with the Medical Branch of the Royal Air Force with the relative status of officer. Women officers were granted commissions under the new regulations, but they were still to be known by their professional and not by their rank titles.

In January, women dental officers were included under the new Act, and it was reiterated in an Air Ministry Order that relative rank had been granted to them solely to define their status in relation to other women medical and dental officers. They were regarded as having authority equal to that of Royal Air Force medical and dental officers and were to be obeyed accordingly, but only in hospitals, sick quarters and other medical establishments where they were employed.

In late 1942, authority was given for women medical officers to add the title 'Medical Officer' to their signature on official documents, and in February 1943, authority was finally given by the Air Ministry for the granting of substantive instead of relative rank. From this date women medical officers were addressed and known by their rank titles, but they had to add on official documents, after their signature and rank title, the letters 'W.M.O.'.

* Pregnancy 8, compassionate grounds 2, return to civil practice 1, psychoneurosis 3, psychosis 1, intra-cranial tumour 1, and general ill-health 2.

The numbers of airwomen substituted for airmen increased considerably between March 1939 and March 1944. On September 1, 1939, the ratio of Women's Auxiliary Air Force to Royal Air Force personnel was 1 : 49·7. Two years later it had increased to 1 : 13·5, and by March 1, 1943, it had reached the maximum of 1 : 5·28. From this date until March 1, 1944, a slight decrease to a ratio of 1 : 5·73 occurred. The ratio of women medical officers per thousand Women's Auxiliary Air Force personnel was ·68 on September 1, 1940, ·40 on March 1, 1942 and ·51 two years later.

On January 1, 1943, the post of Woman Medical Liaison Officer was created at Air Ministry, after the Air Council acceptance of the recommendations for such a post made in the Markham Committee Report published in December 1942.

STATISTICAL ANALYSIS OF MAN-POWER

The compilation of medical statistical analyses is attended by many difficulties and problems. The figures themselves are subject to error in the original returns from which statistics are obtained, and frequently the methods used in recording such figures do not lend themselves to correlation with those which have to be used in the pattern of the final analysis. Inevitably, a compromise of some kind has to be made, and in consequence the final statistics become indications of the average trends only, and do not represent the true picture with extreme accuracy.

Throughout the foregoing narrative, numbers and strengths have been extracted from the various returns compiled by M.A.1 and the statistical branch of the Medical Directorate. It has been possible to cross check many of the figures given, but any cross check with the returns compiled by the Directorate of Manning had to be abandoned, not only because of their different methods used to obtain certain totals, but because of the exclusion of various strengths made from time to time for different reasons.

Total strengths of the Royal Air Force and W.A.A.F. correspond well within reasonable limits, but the only way to cross check the medical returns was to look through every individual medical officer's record card or Form 672. This entailed the examination of the serving officer's cards, as well as the cards of those who had been struck off the strength for any reason.

For the purposes of the narrative records, the statistics cover a period from the declaration of war to the end of March 1945. The numbers of women medical officers have been excluded in most instances, because they were so few. Statistics of Dominion and Allied medical officers have also been left out, except at certain dates in the main narrative where the arguments warranted their inclusion.

The method of keeping medical officers' records on their cards was simple. All changes of rank, unit and medical category were recorded on the cards by the department at Air Ministry concerned with the posting of medical officers. Decorations, honours, awards and code numbers for the type of confidential report received were also noted. The cards were kept alphabetically in files, and until a new filing system was introduced it was impossible to tell, for instance, how many medical officers in any particular command or unit were fit or unfit for overseas service without scrutinising each card separately. Separate ledgers were therefore kept for this purpose.

Each individual card was analysed to find out the numbers of medical officers unfit for service anywhere in the world at certain dates. Officers with restricted medical categories which stipulated service only in certain countries, such as Western Europe, Iceland or Canada, were recorded for the purpose of analysis as unfit for overseas service. The figures, when obtained, were further analysed to find out the percentages unfit for overseas service in various age groups. No distinction had been made between temporary and permanent unfitness for overseas service. It has been the purpose of the narrative to try and present a picture from which the medical manning position at any one time might be drawn. Officers have not been regarded as unfit for overseas service unless their disability lasted for longer than six months, or, in other words, they could be considered as an unfit unit in any one of the six-months periods chosen. The date of unfitness was taken from the beginning of the period of the disability which led to an alteration in medical category, provided there was no intervening period of duty between the onset of the disability and the change in medical category. Similarly, the date of the relinquishment or resignation of a commission on the grounds of ill-health or for any other reason, has been taken from the date the officer ceased to be employed, and not from the date of gazetting on which he left the Service. The medical returns were based on gazette notices, and because a few weeks might elapse between the cessation of employment of the officer and his gazette notice to that effect, the actual strengths shown on the medical returns were a few in excess of the true numbers actively employed at the date of the return.

Nearly 2,800 cards have been examined. The percentage of medical officers unfit for overseas service at the end of March 1944 was obtained from the examination of 2,400 cards, or 98 per cent. of the strength of R.A.F. medical officers serving at that date. Percentages obtained from such a number may be taken as representative of the Service as a whole. The results of these analyses are given in the table and graphs in Appendix C.

APPENDIX A

TABLE I

Summary of Admissions of R.A.F., W.A.A.F., Army, Navy, Dominion and Allied Air Force Personnel to R.A.F. Hospitals and of R.A.F., W.A.A.F., and Allied Air Force Personnel to Army, Navy, and Civil Hospitals during year ended March 28, 1941.

Period	Type of hospital	Admissions						
		R.A.F.	W.A.A.F.	Army	Navy	Dominion	Allied	Totals
26.4.40	R.A.F.	2,349	90	64	78	1	3	2,585
	Army	364	—	—	—	—	—	364
	Navy	186	—	—	—	—	—	186
	Civil	1,062	62	—	—	—	16	1,140
24.5.40	R.A.F.	2,011	76	39	56	1	16	2,199
	Army	381	—	—	—	—	—	381
	Navy	163	—	—	—	—	—	163
	Civil	1,256	60	—	—	—	14	1,330
28.6.40	R.A.F.	2,297	52	136	41	—	4	2,530
	Army	475	—	—	—	—	—	475
	Navy	201	—	—	—	—	—	201
	Civil	1,218	59	—	—	—	7	1,284
28.7.40	R.A.F.	2,464	75	171	24	2	232	2,968
	Army	348	—	—	—	—	—	348
	Navy	150	—	—	—	—	—	150
	Civil	1,088	93	—	—	—	19	1,200
30.8.40	R.A.F.	3,471	139	280	46	3	421	4,360
	Army	517	—	—	—	—	—	517
	Navy	232	—	—	—	—	—	232
	Civil	1,924	108	—	—	—	27	2,059
27.9.40	R.A.F.	2,985	124	193	31	4	170	3,507
	Army	544	—	—	—	—	—	544
	Navy	194	—	—	—	—	—	194
	Civil	1,912	92	—	—	—	42	2,046
25.10.40	R.A.F.	3,177	128	208	31	7	151	3,702
	Army	485	—	—	—	—	—	485
	Navy	178	—	—	—	—	—	178
	Civil	1,897	93	—	—	—	14	2,004
29.11.40	R.A.F.	4,382	211	257	51	6	190	5,097
	Army	674	—	—	—	—	—	674
	Navy	234	—	—	—	—	—	234
	Civil	2,296	111	—	—	—	32	2,439
31.12.40	R.A.F.	4,199	173	176	34	5	142	4,729
	Army	587	—	—	—	—	—	587
	Navy	158	—	—	—	—	—	158
	Civil	1,945	104	—	—	—	16	2,065

TABLE I—*continued*

Period	Type of hospital	Admissions						
		R.A.F.	W.A.A.F.	Army	Navy	Dominion	Allied	Totals
31.1.41	R.A.F.	7,202	374	259	56	9	149	8,049
	Army	751	—	—	—	—	—	751
	Navy	191	—	—	—	—	—	191
	Civil	3,040	229	—	—	—	30	3,299
28.2.41	R.A.F.	5,567	330	243	57	13	106	6,316
	Army	708	—	—	—	—	—	708
	Navy	187	—	—	—	—	—	187
	Civil	3,079	193	—	—	—	23	3,295
28.3.41	R.A.F.	5,213	265	221	47	16	141	5,903
	Army	724	—	—	—	—	—	724
	Navy	204	—	—	—	—	—	204
	Civil	2,514	145	—	—	—	18	2,677
	Totals	77,384	3,386	2,247	552	67	1,983	85,619
Percentage of totals		90·4	4·0	2·6	0·6	0·1	2·3	100·0

TABLE II

Number of Daily Sick in R.A.F. and other Hospitals and Duration of Stay in Hospital; Year ended March 28, 1941

Type of hospital	Averages	R.A.F.	W.A.A.F.	Army	Navy	Dominion	Allied
R.A.F.	Number of sick daily	1997·3	74·2	94·4	18·5	3·0	66·8
	Duration of case	16·0	13·3	15·3	12·2	16·4	14·1
Army	Number of sick daily	320·8	—	—	—	—	—
	Duration of case	17·8	—	—	—	—	—
Navy	Number of sick daily	109·6	—	—	—	—	—
	Duration of case	17·5	—	—	—	—	—
Civil	Number of sick daily	—	—	—	—	—	—
	Duration of case	—	—	—	—	—	—

TABLE III

Royal Air Force Hospitals
Bed Strengths and Establishments of Medical Officers

Name of hospital	Bedstate				Establishment					Number of beds per M.O.
	Beds equipped	'Crisis' beds	Average beds occupied daily February 1 to August 1, 1941		G/C	W/C	S/L	F/L	Totals	
General Hospitals			*Number*	*Percentage*						
Cosford	612	612	405	66	1	3	10	4	18	34
Ely (and Littleport)	552	609	373	68	1	3	7	8	19	32
Halton	736	888	431	58	1	7	7	13	28	32
Matlock	166	166	116	70	1	–	3	3	7	24
Rauceby	450	450	376	83	1	3	7	5	16	28
St. Athan	480	571	235	49	1	3	7	6	17	33
Torquay	239	239	138	58	1	2	4	4	11	22
Station Hospitals										
Bridgnorth	136	178	108	79	–	1	2	4	7	26
Compton Bassett	67	78	45	67	–	1	1	2	4	17
Cranwell	179	199	89	50	–	1	1	2	4	50
Gloucester	180	180	120	66	–	1	4	2	7	26
Hednesford	76	78	31	40	–	1	1	2	4	19
Henlow	100	150	69	69	–	1	2	3	6	25
Hereford	158	178	83	52	–	1	2	3	6	30
Kirkham	190	238	145	66	–	1	3	4	8	30
Locking	150	150	110	73	–	1	2	4	7	21
Melksham	147	178	99	60	–	1	2	4	7	25
Morecambe	178	178	128	70	–	1	3	6	10	17
Padgate	115	141	110	95	–	1	4	3	8	18
Uxbridge	125	150	82	65	–	1	2	3	6	25
Weeton	248	298	208	84	–	1	6	4	11	27
West Kirby	241	298	116	48	–	1	3	5	9	33
Wilmslow	174	268	104	60	–	1	3	4	8	33
Yatesbury	305	305	218	71	–	1	4	3	8	38
Totals	6,004	6,780	3,939	Mean 65	7	38	90	101	236	Mean 28

TABLE IV

Royal Air Force Hospitals—Employment of Medical Officers

Name of hospital	Surgeon	Physician	Anaesthetist	E.N.T.	Eye	Orthopaedic	Clinical pathologist	Registrar and administrative	Radiologist	Gynaecologist	V.D.	Neuro-psychiatrist	Infectious diseases hospital	Officer commanding	General medical duties	Totals
General Hospitals																
Cosford	3	2	1	1	2	3	1	1	1	1	1	1	1	1	–	18
Ely (and Littleport)	3	2	1	1	1	2	1	1	1	1	1	1	1	1	4	19
Halton	2	3	2	2	1	4	–	1	1	1	1	1	2	1	6	28
Matlock	–	1	1	–	1	–	–	–	–	1	1	2	–	1	3	7
Rauceby	3	1	1	1	1	2	1	1	1	1	1	2	1	1	–	16
St. Athan	3	2	1	1	1	–	1	1	–	1	1	1	1	1	3	17
Torquay	2	1	1	1	–	1	–	1	1	1	1	2	1	1	1	11
Station Hospitals																
Bridgnorth	2	1	1	1	–	–	1	–	1	1	1	–	–	1	–	7
Compton Bassett	1	–	–	–	–	–	–	–	–	–	–	–	–	–	2	4
Cranwell	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	4
Gloucester	1	1	1	1	1	–	1	–	–	–	1	–	–	1	–	7
Hednesford	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4
Henlow	1	1	1	1	1	–	–	–	–	–	–	–	–	1	–	6
Hereford	1	1	–	–	–	–	1	–	–	–	–	–	–	–	2	6
Kirkham	1	1	1	1	1	–	1	–	–	–	–	–	–	1	2	8
Locking	1	1	1	1	1	–	1	–	–	–	1	–	–	1	3	7
Melksham	1	1	1	1	1	–	1	–	–	–	–	–	–	1	–	7
Morecambe	2	1	1	–	–	–	1	–	–	–	–	–	–	1	2	7
Padgate	1	1	–	1	–	–	1	–	–	–	–	1	–	1	4	10
Uxbridge	1	1	–	1	1	–	–	1	–	–	–	–	–	1	2	8
Weeton	2	1	1	1	1	2	1	–	–	–	–	–	–	1	1	6
West Kirby	2	2	1	–	–	1	1	1	–	–	–	–	–	1	–	11
Wilmslow	2	1	1	1	–	–	1	1	–	–	–	–	–	1	2	9
Yatesbury	1	1	1	1	1	1	–	1	–	–	–	2	–	1	–	8

TABLE V

Type of Hospital—Divisions

Name of hospital	Medical	Surgical	Orthopaedic	Neuropsychiatric	Burns	Venereal disease	Infectious
General Hospitals							
Cosford	M	S	O	N	B	V	I.D.H.
Ely (and Littleport)	M	S	O	N (op.)	B	—	I.D.H.
Halton	M	S	O	N (op.)	B	V	I.D.H.
Matlock	Rheumatism	—	—	N (airmen)	—	—	—
Rauceby	M	S	O	N (op.)	B	—	I.D.H.
St. Athan	M	S	O	N	—	V	I.D.H.
Torquay	M	S	O	N (officers)	—	—	—
Station Hospitals							
Bridgnorth	M	S	—	—	—	—	—
Compton Bassett	M	S	—	—	—	—	—
Cranwell	—	—	—	—	—	V	I.D.H.
Gloucester	M	S	O	N	—	—	I.D.H.
Hednesford	M	S	—	—	—	—	—
Henlow	M	S	—	—	—	—	—
Hereford	M	S	—	—	—	—	I.D.H.
Kirkham	M	S	—	—	—	—	I.D.H.
Locking	M	S	—	—	—	—	—
Melksham	M	S	—	—	—	—	I.D.H.
Morecambe	M	S	—	—	—	—	—
Padgate	M	S	—	N	—	—	I.D.H.
Uxbridge	M	S	—	—	—	—	—
Weeton	M	S	O	—	—	—	I.D.H.
West Kirby	M	S	—	—	—	—	I.D.H.
Wilmslow	M	S	—	—	—	—	I.D.H.
Yatesbury	M	S	O	N	—	—	I.D.H.

(op. = equals out-patients)

TABLE VI

Out-patients—February 1, 1941–*July* 31, 1941

Name of hospital	Medical	Neurological	Surgical	E.N.T.	Ophthalmological	Gynaecological	V.D.	X-ray	Totals
General Hospitals									
Cosford	684	196	2,148	512	2,104	208	—	813	6,665
Ely (and Littleport)	588	330	688	871	1,186	—	231	2,745	6,639
Halton	428	111	625	387	1,085	44	40	1,257	3,977
Matlock	—	—	—	—	—	—	—	—	—
Rauceby	272	213	809	426	2,266	35	277	1,133	5,431
St. Athan	304	88	889	375	891	6	53	535	3,141
Torquay	109	69	110	84	93	4	1	233	703
Station Hospitals									
Bridgnorth	312	—	520	4	79	89	—	550	1,554
Compton Bassett	—	—	—	—	—	—	—	—	—
Cranwell	—	—	—	—	—	—	—	—	—
Gloucester	247	107	849	507	184	10	71	594	2,569
Hednesford	—	—	—	—	—	—	—	—	—
Henlow	92	25	359	285	850	—	81	868	2,560
Hereford	96	12	164	152	177	—	13	349	963
Kirkham	663	—	733	109	—	15	—	1,166	2,686
Locking	278	—	956	182	508	3	45	386	2,358
Melksham	114	62	296	—	354	—	—	416	1,242
Morecambe	307	131	476	90	582	—	—	522	2,108
Padgate	184	240	304	314	626	—	48	528	2,244
Uxbridge	303	—	461	385	1,386	37	182	835	3,589
Weeton	126	—	965	682	639	—	—	1,780	4,192
West Kirby	190	20	296	117	—	—	—	489	1,112
Wilmslow	177	82	309	145	—	—	—	410	1,123
Yatesbury	426	291	451	824	2,179	13	107	1,098	5,389
Totals	5,900	1,977	12,408	6,451	15,189	464	1,149	16,707	60,245

APPENDIX B

Medical Officers Employed on Administrative Duties

	A/V/M	A/C	G/C	W/C	S/L	F/L	Totals
Bomber Command . .	1	—	1	11	1	4	18
Fighter Command . .	1	—	1	9	2	6	19
Coastal Command . .	—	1	1	6	1	5	14
Army Co-operation Command . . .	—	—	1	2	2	1	6
Flying Training Command	—	1	1	8	5	7	22
Maintenance Command	—	1	—	5	2	—	8
Balloon Command . .	—	—	2	4	1	—	7
Technical Training Command	1	—	5	2	6	—	14
Northern Ireland Command	—	—	—	1	1	—	2
No. 44 Group . .	—	—	—	1	—	1	2
	3	3	12	49	21	24	112

APPENDIX C

Statistical Summary

Date	Total R.A.F. strength at home and overseas	Total W.A.A.F. strength at home and overseas	Total R.A.F. and W.A.A.F. strengths at home and overseas	Total medical officers at home and overseas ‡	Ratio of medical officers to total strengths W.A.A.F. and R.A.F.	Ratio of medical officers per thousand personnel	Ratio of W.A.A.F. to R.A.F. personnel at home and overseas	Total strength of women medical officers at home and overseas	Ratio of women medical officers per thousands of W.A.A.F.	Gross wastage of medical officers from all causes † ‡	R.A.F. medical officers prisoners-of-war
1.9.39	119,351	2,399	121,750	554	1 : 220·7	4·53	1 : 49·7	—	—	—	Not known*
1.3.40	229,605	8,601	238,206	739	1 : 322·3	3·10	1 : 26·7	—	—	3	Not known*
1.9.40	379,067	16,124	395,191	1,026	1 : 385·2	2·60	1 : 23·5	11	·68	13	Not known*
1.3.41	533,257	24,019	557,276	1,369	1 : 407·1	2·46	1 : 22·2	16	·67	25	Not known*
1.9.41	746,736	55,352	802,088	1,753	1 : 457·6	2·18	1 : 13·5	26	·47	41	Not known*
1.3.42	819,230	107,023	926,253	1,969	1 : 470·4	2·13	1 : 7·65	43	·40	60	Not known*
1.9.42	877,317	135,651	1,012,968	2,251	1 : 450·0	2·22	1 : 8·46	69	·51	98	Not known*
1.3.43	948,560	179,771	1,128,331	2,434	1 : 422·5	2·37	1 : 5·28	78	·43	128	5
1.9.43	982,438	180,738	1,163,176	2,505	1 : 464·5	2·15	1 : 5·43	82	·45	171	5
1.3.44	1,005,276	175,341	1,180,617	2,538	1 : 465·2	2·15	1 : 5·73	90	·51	223	26
1.9.44	1,004,990	172,748	1,177,738	2,640	1 : 446·1	2·24	1 : 5·80	97	·61	266	26
1.3.45	988,682	162,135	1,150,817	2,664	1 : 431·6	2·31	1 : 6·09	106	·60	310	26

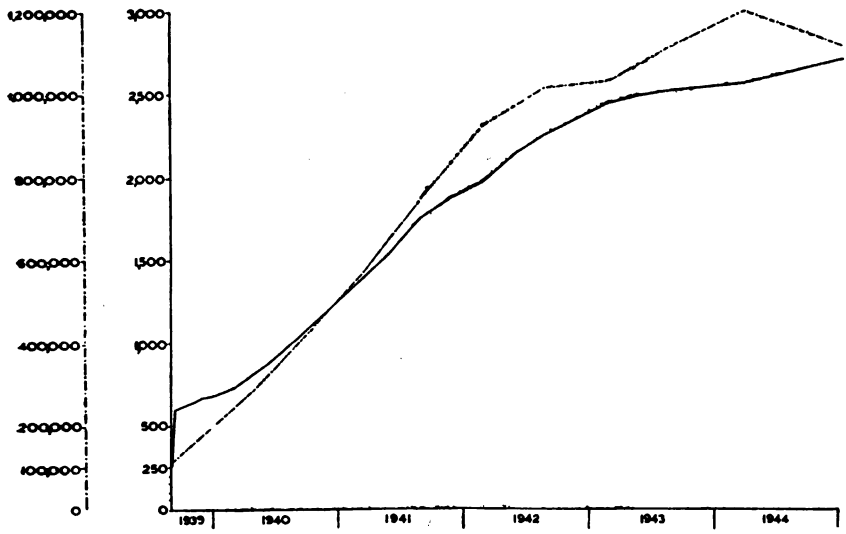
* Figures for prisoners-of-war not known up to February 1943. Numbers given have been obtained from information recently available on Far East.

† Gross wastage from: retirement, ill-health, release to civilian practice, release on compassionate grounds or hardship, compulsory resignation, and death (accidental or due to enemy action or disease).

‡ Numbers excluding prisoners-of-war.

APPENDIX C

Graph I.

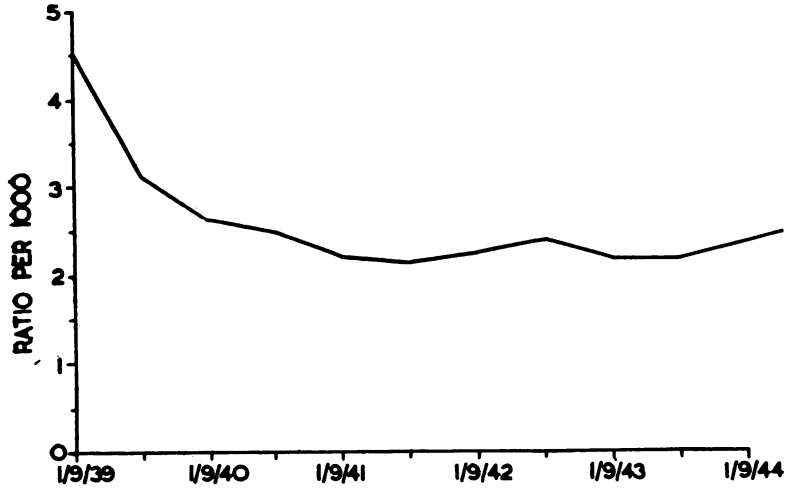


—·—·—·—Total strength R.A.F. and W.A.A.F. in the Royal Air Force at Home and Overseas.

———— Total strength of Medical Officers in the Royal Air Force at Home and Overseas.

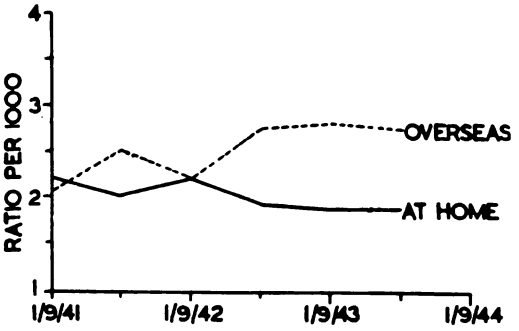
Graph Ratio 1:400

Graph II.



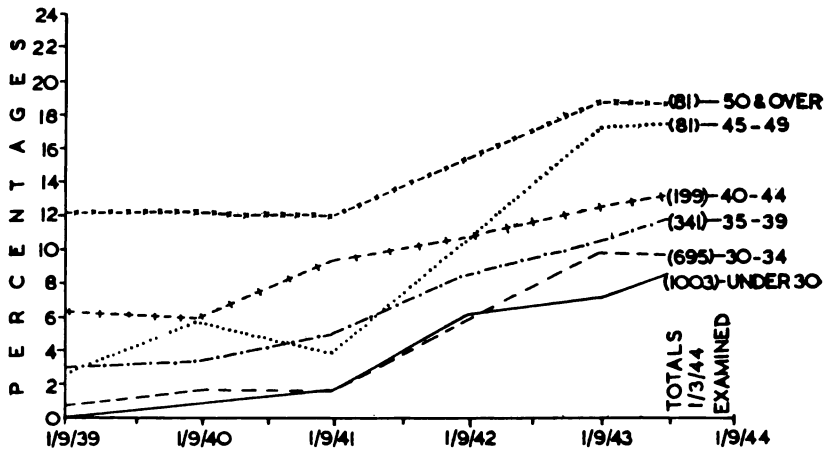
Ratio of Medical Officers per thousand personnel in the Royal Air Force at Home and Overseas.

Graph III.

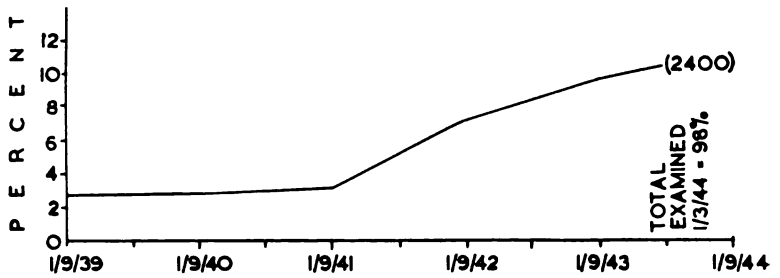


Ratios per 1000 of R.A.F. Medical Officers Overseas and at Home.

Graph IV (a) and (b)



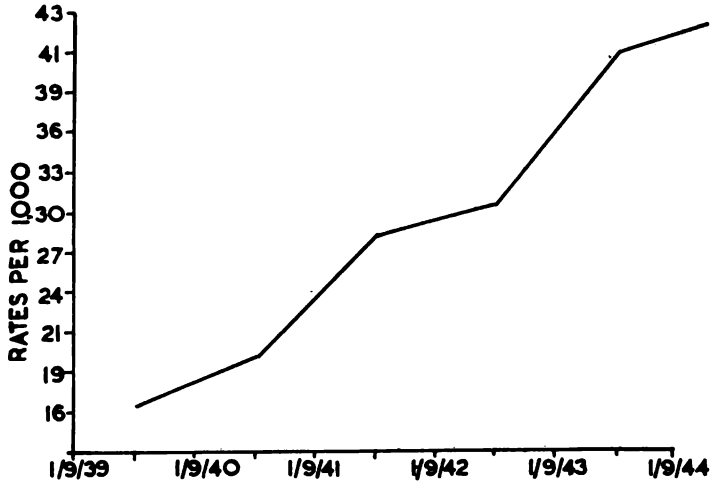
Percentages in Age Groups of Royal Air Force Medical Officers unfit for Unrestricted* Service Overseas. (Women Medical Officers excluded.)



Percentage of Royal Air Force Medical Officers unfit for Unrestricted* Service Overseas.

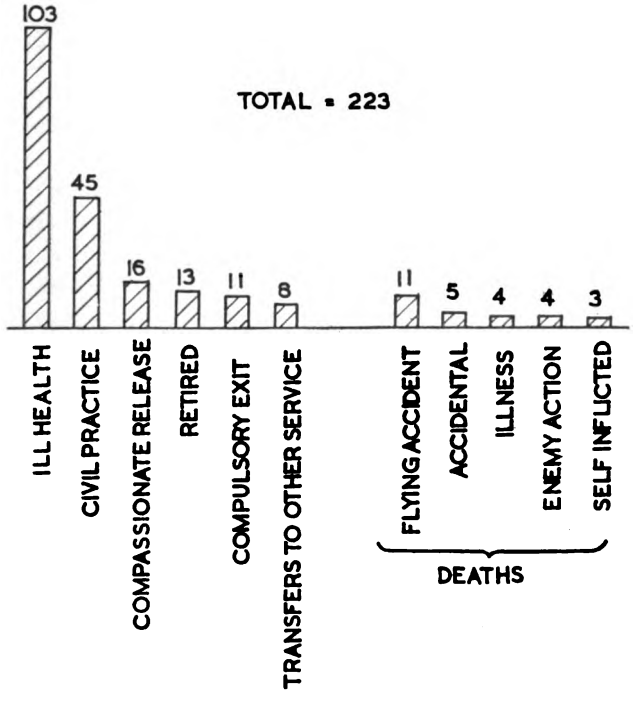
* Unrestricted = Fit for Service in all Theatres of War.

Graph V.



Royal Air Force Medical Officers Wastage Rates per 1000 from all causes.

Graph VI



Analysis of the Gross Wastage among Medical Officers in the R.A.F. between Sept. 1, 1939 and March 1, 1944. (Prisoners-of-War excluded).

CHAPTER 2

MEDICAL MANNING: NURSING ORDERLIES

POSITION BEFORE SEPTEMBER 1939

At the outbreak of hostilities in September 1939, the Royal Air Force possessed approximately 1,800 trained regular medical airmen of whom approximately 100 were mustered in the medical specialist trades. With the exception of a few sanitary assistants and hospital cooks who were allowed to specialise from entry, all these airmen had been initially trained as nursing orderlies either by the R.A.M.C. or R.A.F. Medical Training Depots and subsequently at various R.A.F. Hospitals. These figures do not, perhaps, portray the true pre-war medical airman strength since expansion of the Services commenced in 1935.

The medical specialist trades at the outbreak of war were as follows:

Dispenser
Laboratory Assistant
Masseur
Mental Nursing Orderly
Operating Room Assistant
Radiographer
Special Treatment Orderly
Trained Nurse

All these trades were filled by the training of selected airman volunteers from the trade of nursing orderly. Although all medical airman trades were included in the same pay group, the incentive to undertake the additional responsibilities of specialist employment was provided by the fact that specialist posts were usually established in higher ranks so that accelerated promotion was, in fact, the reward for specialisation. Furthermore, all nursing orderlies who specialised were sure of re-engagement for pension.

The executive control of movement of these personnel and the posting of nursing orderlies to training vacancies in the specialist trades was entirely the responsibility of the R.A.F. Record Office, while the supply of newly enlisted airmen against vacancies and future requirements in the medical trades as a whole was the responsibility of the Director-General of Manning. This control was consistent with that applied to all other R.A.F. trades. In the instance of the Medical Branch, however, there was one important difference. It was that the Training Officer (Medical) (later to be known as the Commandant, M.T.E. & D.) was

authorised by King's Regulations and Air Council Instructions to advise the R.A.F. Record Office regarding all movements of medical airmen, a provision which placed a large measure of control of the medical airmen directly in the hands of medical authorities. The value of this authority will be discussed later in this narrative.

At the beginning of the war an effective liaison between the Training Officer (Medical) and the R.A.F. Record Office had already been established. Comprehensive records of all medical airmen passing through the Medical Training Depot had already been compiled and the Training Officer (Medical), in addition to the R.A.F. Record Office, was aware of the exact location of every medical airman. The small total strength of medical airmen did not, at that time, justify any complex organisation or large administrative staff at the Medical Training Depot for dealing with movements and, in the main, all such movements were effected as a result of telephone conversations between the staff of the Training Officer (Medical) and the R.A.F. Record Office.

The peace-time standard of medical fitness required that all personnel were fit to serve in any part of the world. Such movements as 'geographical postings' were at that time unknown, and the comparatively small number of compassionate postings did not seriously hamper reasonably efficient manning. All stations received their complement of medical personnel and overseas commitments were met when required without undue difficulty.

EXPANSION ON OUTBREAK OF WAR

Such was the position at the beginning of September 1939. The intake of *ab initio* trainees just before the war averaged forty-seven per month. In the first six months of the war, however, the total intake was approximately 1,200 of which 700 were mobilised V.A.Ds. who, by reason of the experience obtained in their civil organisations, were a great asset to the R.A.F. Medical Branch. All the V.A.D. personnel were trade tested by a Medical Trade Test Board on entry and classified into groups as follows: (*a*) suitable for immediate re-mustering to nursing orderly and posting for duty, (*b*) requiring training in a hospital, and (*c*) requiring both *ab initio* and hospital training. Figures of the results of these groupings are not available, but it is known that a large number of the V.A.D. personnel were considered fit for immediate posting to nursing orderly duties and, in fact, enabled the Training Officer (Medical) to meet the considerably increased demands for nursing orderlies resulting from the immediate war expansion.

MEDICAL SPECIALIST AIRMEN

The number of posts for medical specialist airmen increased rapidly with the establishment of new hospitals and the formation of mobile

field hospitals but no 'pool' existed from which trained airmen could be taken and, except for nine V.A.Ds. who, on mobilisation, were found to be qualified pharmacists, none were forthcoming from civil life. The trades most seriously affected were dispenser and masseur, probably because the war increase in these trades was greater in proportion to that of others. Within two months of the outbreak of war it became apparent that, unless medical specialist airmen could be entered directly from civil life, it would not be possible to cover the rapidly increasing commitments and Air Ministry was accordingly requested to consider the possibility of direct enlistment. In the meantime the Record Office was asked to find out if personnel with appropriate civil qualifications were already enlisted in other trades. Their investigation did, in fact, result in a number of re-musterings to the medical specialist trades.

EMPLOYMENT OF W.A.A.F. PERSONNEL AS NURSING ORDERLIES

Until May 1940, the R.A.F. Medical Branch did not include members of the Women's Auxiliary Air Force. Although a certain number of W.A.A.F. had been enlisted as 'sick quarters attendants' and were employed in various W.A.A.F. sick quarters, they were dependent upon previous civil experience. In May 1940 the Training Officer (Medical) considered the possibility of W.A.A.F. substitution in the R.A.F. medical trades and on May 16, 1940, a conference was held at Air Ministry to explore this possibility. It was at that time thought best to limit the employment of W.A.A.F. sick quarters attendants to treatment of W.A.A.F. personnel only and not to make general substitution for airman nursing orderlies. In other trades in medical units it was considered that W.A.A.F. could be substituted on an agreed percentage. It was agreed that the W.A.A.F. sick quarters attendants should be transferred to the R.A.F. Medical Trade Group 'M' at appropriate rates of pay and that they be trained under arrangements to be made by the Training Officer (Medical). Soon, however, it was recognised that W.A.A.F. substitution for male nursing orderlies was practicable and necessary, and in fact W.A.A.F. personnel eventually provided the majority of nursing orderlies in the Home Commands. The R.A.F. Medical Branch would have been in dire straits without them.

AUXILIARY AIR FORCE NURSING PERSONNEL

So far no mention has been made of Auxiliary Air Force personnel. Even before the outbreak of war the A.A.F. possessed a small number of nursing orderlies. These had not been trained under R.A.F. arrangements but had been given instruction at the sick quarters of the station to which they had been attached. Early in the war it was decided to arrange for them to be given a course of instruction at the Medical

Training Depot, following which they were, in the main, employed at Balloon Units. Many of them subsequently became available for employment in any R.A.F. unit, and a few were absorbed into the medical specialist trades.

POSTING AND ATTACHMENT OF NURSING ORDERLIES

With the now rapidly expanding medical branch certain difficulties with regard to movement of medical personnel were encountered. For example, Group Headquarters were empowered to attach personnel within the Group concerned which, in effect, meant that on frequent occasions personnel were not actually serving at the stations to which they had been originally posted and that consequently the records maintained by the Training Officer (Medical) were not always a true picture of the actual position. An added complication was the fact that telephoned movement advices to the R.A.F. Record Office frequently went astray or were delayed because units to which posting notices were issued denied that the personnel concerned were on their strength. Much of this, of course, was due to inexperienced station administrative personnel being unable to discriminate between 'postings' and 'attachments' and consequent inability to appreciate that although personnel may be detached they still remain on the posted strength of their parent unit and that any posting notice received was quite as effective as it would be if the personnel were, in fact, serving at the parent unit. It was not easy to bring home to Command and Group Headquarters the necessity for immediate compliance with instructions for movement of medical personnel. Command and Group formations were naturally concerned more particularly with their own immediate spheres. It was difficult for them not to resent somewhat the interference of the Training Officer (Medical) who was often forced to remove personnel whom they had trained for a particular type of duty within their formation. More often than not there was little time for explanation; sometimes there were extremely good security reasons why none should be given. No doubt the Command P.M.Os. and the Group S.M.Os. felt at times that their particular formation was supplying more than its share of the overseas commitments, for instance, or that all the less noteworthy of the nursing orderlies were being allocated to them, but whatever these various authorities may have felt only a very few made their feelings known to the Training Officer (Medical).

A further complication was the occasional unwillingness on the part of units to recognise the as yet unproclaimed authority of the Training Officer (Medical) in the matter of movements. Except for the somewhat obscure paragraph in King's Regulations which authorised his close liaison with the Officer i/c Records in the matter of movements up to the time of posting from training, there was no published indication that

the Training Officer (Medical) exercised any subsequent control, nor could there be, since the matter had not been represented to higher authority. It was, however, obvious to both the Training Officer (Medical) and the Officer i/c Records that unless someone with a complete knowledge of the various aspects of medical trades was allowed to have some measure of control in the matter of their postings complete chaos was likely to result. Even in the early 1940 era the Officer i/c Records agreed with the Training Officer (Medical) that he would undertake no movements of medical personnel without the prior agreement of the Training Officer (Medical). The wisdom of such a decision was to become obvious in the later years of the war.

RE-MUSTERING. INCREASED AUTHORITY OF TRAINING OFFICER (MEDICAL)

With the rapidly increasing numbers of medical airmen and airwomen it was found in May 1940 that another complication was adversely affecting manning efficiency. This was the question of re-mustering. Up till that time only the Officer i/c Records was authorised to effect re-musterings in all trades, and those of the medical branch were authorised by the Record Office on the advice and recommendation of the Training Officer (Medical). With the pre-war regulated intakes of trainees in comparatively small numbers this system presented no problem, but with the war expansion affecting all R.A.F. trades the responsibilities of the Record Office correspondingly increased and delay in receipt of the re-mustering authority began to arise. The result of such delay was far reaching. First it meant that the posting of those trainees who had completed training could not be proceeded with despite the fact that urgent commitments existed. Secondly, and what is perhaps more important, it meant that those who had completed training were obliged to continue to occupy training accommodation with consequent delay in the commencement of training for new trainees.

It was reasonable to assume that, since the responsibilities of the Record Office were unlikely to decrease, the whole manning and training programme would be seriously affected and that the Training Officer (Medical) would find himself unable to fulfil his commitments. The obvious answer to this problem was that the Training Officer (Medical) should be authorised to effect re-musterings within the Medical Trades Group. A suggestion to this effect was made by the Training Officer (Medical) to the Officer i/c Records in October 1939, but was not agreed; this decision can scarcely be questioned since, at that time, there existed no reason for departure from a system which had hitherto worked successfully. In May 1940, however, the picture was much less favourable and necessitated further negotiations. These took the form of a discussion at the Medical Training Depot between the Training Officer

(Medical) and an officer representing the Officer i/c Records, during which the Record Office representative agreed that much time and efficiency was lost by the necessity of having to pass trade-test results to the Record Office for authorisation of re-mustering.

Largely as a result of this discussion the Training Officer (Medical) was, in June 1940, authorised by the Officer i/c Records to effect re-musterings within the Medical Trades Group. There was, however, one proviso to the delegation of authority. Re-musterings to the trade of mental nursing orderly were still to be authorised only by the Record Office. This was explained by the fact that whereas all other medical trades received the same rates of pay, that of mental nursing orderly received an extra daily 'qualification' pay of 6d. The fact that the Training Officer (Medical) was now authorised to effect re-musterings did much to speed up the intake and output of trainees and the fulfilling of manning commitments.

ACCOMMODATION FOR THE TRAINING OF NURSING ORDERLIES

There was, however, another formidable obstacle arising in these early war days. It was that of accommodation for the trainees. Until June 1940 all *ab initio* training had been undertaken at R.A.F. Station, Halton, the pre-war home of the Medical Training Depot. Expansion into various additional sites at Halton had already taken place and the Station Commander had regretfully intimated that further expansion of the unit could only be effected at the expense of other vital training and that he was not prepared to agree to this. Concurrently the Training Officer (Medical) was informed that large numbers of recruits were now awaiting training in medical trades. These recruits were, of course, being enlisted in accordance with the plans of the Director of Manning and would be expected, after the normal training period, to become productive personnel filling the commitments on which the planning of the Director of Manning was based. But the shortage of training accommodation was already extending the normal 'awaiting training' period with the result that the commitments began to exceed the numbers of available trained personnel. Further consideration was therefore necessary, and the Training Officer (Medical) decided that, since R.A.F. Station, Halton, could not possibly absorb the large number of personnel awaiting training he would ask the Officer i/c Records to distribute them to various R.A.F. hospitals and at the same time decentralise the *ab initio* training to these units. Suitable instructors were supplied to the hospitals for this purpose. From the manning point of view the situation now appeared satisfactory. More personnel were being trained than the earlier programme had envisaged. But this position was short lived, for at the end of October 1940, it was found that in spite of using the hospitals for *ab initio* training there were still 1,812

medical orderlies awaiting training. This was a large number when it is borne in mind that at this time the establishment and strength of medical airmen was as follows:

Establishment	5,132
Trained Strength . . .	3,675

There appeared to be no answer to this problem other than the re-housing of the Medical Training Depot in accommodation sufficiently extensive to absorb the larger part of the personnel awaiting training. To this end the Training Officer (Medical) held frequent discussions and inspected various sites which culminated in Headquarters, Technical Training Command authorising a further expansion within R.A.F. Station, Halton.

FORMATION OF THE MEDICAL TRAINING ESTABLISHMENT AND DEPOT (M.T.E. AND D.)

Concurrently with the approved extension of accommodation for the Medical Training Depot, a complete reorganisation of the unit took place. The Training Officer (Medical) had long been aware that the Medical Training Depot had two distinct functions. These were (*a*) the *ab initio* training of all medical personnel, and (*b*) the administrative control of the careers of all medical non-commissioned personnel, including their postings and promotions. Until December 1940, the Training Officer (Medical) was also the Officer Commanding the Medical Training Depot, thus commanding a unit from both the administrative and technical point of view while, at the same time, technically administering a much larger force in various parts of the world. It appeared necessary, therefore, in view of the rapidly expanding medical branch, to review the organisation and during December 1940, the following reorganisation was agreed:

> The unit would henceforth be known as 'The Medical Training Establishment and Depot'. The Training Officer (Medical) would henceforth be known as the 'Commandant, M.T.E. & D.' The unit would consist of a Headquarters and a Depot, the Depot to be separately commanded and to consist of an instructional section and a holding section.

Much criticism was levelled at the title of the reorganised unit, particularly the inclusion of the word 'Establishment'. Its purpose, it is believed, was to indicate the fact that the initial training of medical orderlies was not the sole function of the officer previously known as the Training Officer (Medical). It was to designate that aspect of the organisation which dealt with careers of medical airmen and airwomen after they had left the administrative control of the training units. It was, in fact, the first official recognition of the additional war-time responsibilities which the Commandant, M.T.E. & D. had undertaken.

Briefly the 'Establishment' was to be the organisation that dealt with the following subjects:

(*a*) Policy of training (*ab initio*, Part II, specialist and all other types).
(*b*) Standards for re-musterings and reclassifications.
(*c*) Manning (i.e. postings, attachments to and from training, ordinary movements necessitated by manning requirements, geographical postings, compassionate postings).
(*d*) Advice on promotions from the technical aspect.
(*e*) Records.

MANNING POSITION IN 1940

By December 1940, therefore, an organisation had been created which was considered capable of dealing with the increased war-time manning and training commitments of the R.A.F. Medical Branch. But there was already a deficiency of 1,457 trained medical personnel which represented approximately 28 per cent. of the total establishment, and there was no indication that the establishments were likely to remain static at that point. On the contrary, they were increasing out of all proportion to the number of trainees completing training. The solution to the problem lay in the acquisition of premises of a suitable size to provide adequate training accommodation. It has to be remembered that the Medical Branch was not the only branch troubled by this problem and for obvious reasons the Medical Branch could not be given priority over operational departments in the matter of training accommodation. In the circumstances there was no alternative but to continue training under the conditions of limited accommodation.

During this period, and until February 1941, medical manning had continued to function in circumstances similar to those which existed before the war. Although a new establishment had been provided within the 'M.T.E. & D.' organisation and an increased number of personnel were employed in connexion with records of medical personnel, movements were still being effected by telephonic liaison between the M.T.E. & D. manning section and the Record Office. The number of movements was, at this time, averaging 100 a day exclusive of an average monthly output of 350 trainees. There was no direct telephone tie line to the R.A.F. Record Office and both those who conducted the conversations and the telephone operators who made them possible, had to exercise an abnormal amount of tolerance and understanding in order to conform with the security regulations which were in force.

It was obvious, however, that such circumstances could not possibly be allowed to continue. The conditions were unlikely to improve. On the contrary it was apparent that they would deteriorate. The number of requests for movements to be notified to the R.A.F. Record Office necessarily increased with the ever-growing commitments.

EXTENSION OF AUTHORITY OF THE COMMANDANT. MOVE TO HARROGATE

Overtures were therefore made to the Record Office with a view to the Commandant, M.T.E. & D. being allowed to issue direct to units some kind of document which would provide the unit with sufficient authority to effect the movement of medical personnel immediately and without further reference to the Record Office. As the result of discussion it was agreed that the Commandant, M.T.E. & D. should be permitted to issue a notice of attachment, copies of which would be sent to the unit from which the personnel were being detached, the unit to which the personnel were being attached and to the Officer i/c Records. The Officer i/c Records would automatically, from the copy he received, issue drafting notices converting the attachments to postings. This procedure was officially countenanced by Air Ministry in an Order issued on February 13, 1941. It remained in use throughout the war for movements of medical personnel in the home commands. Overseas commitments were met by supplying the Officer i/c Records with particulars of eligible and suitable personnel. Since the R.A.F. Medical Branch was, by now, very largely composed of airmen who had not previously been overseas and since, at this time, it had not been possible to compile lists of seniority and eligibility for overseas service, selection was, in so far as war-time personnel were concerned at least, governed in the main by the ability of units to spare personnel at the time the commitment required to be met. There were occasional difficulties in this connexion, even in 1941. Unlike the pre-war entrants, those enlisted during the war were not necessarily of Grade I medical category and consequently were not necessarily fit for overseas service. The number of 'compassionate' postings, moreover, increased rapidly, but in 1941 no major difficulty in meeting overseas commitments was encountered. However, the constant drain upon home establishments, coupled with the restricted output of trainees resulting from limited training accommodation, had a serious effect on the manning position in home units, and the Commandant, M.T.E. & D. was obliged to reopen the question of extended accommodation for nursing orderly trainees. Discussions were held in March and April of 1941 and in May 1941, Headquarters, Technical Training Command ordered the move of M.T.E. & D. from Halton to Harrogate where it was accommodated in the Grand Hotel, Ashville College and Pannal Ash College.

ARRANGEMENTS FOR THE TRAINING OF SPECIALIST AIRMEN

In March 1941, a suggestion was made by the Civilian Consultant in Orthopaedics that certain nursing orderlies should be trained as clinical photographers for service in the orthopaedic sections of various hospitals. This suggestion was the forerunner of numerous others, as the result of

which a large number of nursing orderlies were trained in various capacities for certain specialised work. It was with the advent of these 'sub-specialists' as they came to be known, that the necessity for medical control of movements really became apparent. As the specialities were not regarded as actual R.A.F. trades and the personnel concerned were still officially designated nursing orderlies, some strict control was necessary to ensure that the specialised training was not wasted by indiscriminate movement.

The 'sub-specialist' duties included the following:

Rehabilitation Orderlies
Decompression Chamber Orderlies
Clinical Photographers
Burns Treatment Orderlies
Air Ambulance Orderlies
Anti-Malaria Nursing Orderlies
Substitute Sanitary Assistants
Clinical Secretaries
Mass Radiographers.

Each of the airmen and airwomen selected for these duties received specialised training and was then posted to the particular type of unit specialising in the appropriate branches of medicine. From the point of view of home postings they were 'screened'. Their screening from overseas postings was never agreed by Air Ministry, a decision which, although received with regret at the time by manning and training authorities of the medical branch, was unquestionably correct. It would have made the manning and training functions considerably easier at the time, but the inevitable repercussions resulting from the fortuitous position of a privileged few were quite obviously foreseen by higher authority.

Despite the fact that no official authority existed for any change in the official trade status of nursing orderlies, many of these were now, in fact, specialist airmen and airwomen. The Officer i/c Records, who was aware only of established R.A.F. and W.A.A.F. trades, could not take these additional qualifications into account. He relied, therefore, on the medical manning organisation, by which their movements could be controlled. Difficulties were occasionally encountered when units did not always recognise that particular nursing orderlies were posted for specialised duty. More particularly was this the case in the earlier days, when the personnel were actually posted for duty before the establishments authorising their employment in a specialist capacity had been promulgated. This situation suggests that it might be wise in the event of a future campaign to introduce actual trades for these personnel provided that the numbers in each sub-group are sufficient. This would obviate misemployment of valuable specialists through failure to note

added remarks on a movement order. It appears likely, however, that this seemingly slight amendment to existing procedure would create additional problems for the Record Office.

MANNING POSITION IN 1941. W.A.A.F. SUBSTITUTION

In July 1941 the state of personnel of the Medical Branch was as follows:

Establishment:		*Strength:*	
R.A.F. . . .	7,395	R.A.F. . . .	6,477
W.A.A.F. . .	1,096	W.A.A.F. . .	559

The deficiency in trained personnel of approximately 20 per cent. was apparently compensated by the fact that 2,038 airmen and airwomen were in various stages of training and awaiting training vacancies, but in actual fact this was not the case. Establishments were expanding out of all proportion to the output of trainees and it seemed probable that the deficiency of trained personnel would become larger. Fortunately, the Training Depot was now located in more spacious accommodation and provided that sufficient recruits were forthcoming it was hoped that time would resolve the problem.

By July 1941 the requirements for operational personnel were becoming fairly large, and the Commandant M.T.E. & D. was informed that, with effect from August 25, 1941, women would be recruited into the medical trades in lieu of men. Earlier in this narrative reference was made to partial substitution by W.A.A.F. Nursing Orderlies. Undoubtedly at that time discretion and the question of the propriety of employing women in R.A.F. sick quarters played a large part in the imposition of limitations on their employment.

Complete substitution by W.A.A.F. personnel necessitated some reorganisation of establishments at units. Whereas hitherto W.A.A.F. sick quarters and R.A.F. sick quarters had been completely separate entities, it was now essential to combine the two sick quarters under one officer, thus centralising the administration and allowing interchangeability of the personnel. The reorganisation was eventually authorised by Air Ministry.

When the complete substitution by W.A.A.F. personnel was first notified the Commandant, M.T.E. & D. was informed that the weekly intake would be 120. From the manning point of view this quotation was extremely encouraging. With the comparatively large number of airmen and airwomen already under training and the prospect of a steady output of 120 a week, it appeared that the many units which had long been carrying on with only a percentage of their entitled medical personnel could now be brought up to strength. The continued inability to fill all established posts was not due to any dereliction of duty on the part of the manning officer nor to any misconception of the particular circumstances obtaining at the time.

Within a matter of days of the receipt of the information regarding a weekly intake of 120 it was learned, however, that only a total of 326 airwomen were actually available for the medical branch and that of these 141 were on deferred service. The outlook was not good. Complete substitution had been introduced, but the personnel did not exist. By September 1941 the recruiting position regarding W.A.A.F. personnel had considerably improved, although, owing to the rapidly increasing commitments, it was still not possible to fulfil all requirements immediately.

MEDICAL ASSESSMENT BOARDS

Several difficulties were encountered in connexion with the initial entry of medical branch personnel. In accordance with the procedure current at that time, all recruits were initially entered at the W.A.A.F. Depots at Bridgnorth and Gloucester. Their allocation into trades or for trade training was effected as the result of interview by assessment boards and interviewing officers. There was no medical representative present at the interviews; if there had been, in the early days, diversion to other trades of numbers of recruits desirous of, and appropriately qualified for, enlistment into the medical trades would have been avoided. Interviewing officers were of course actuated by a keen desire to direct recruits into those trades which, at the time of entry, showed the greatest percentage of undermanning, or were apparently of great importance. They often failed to recognise the value of qualifications in medical auxiliary subjects. The result was that a number of civil qualified medical specialist airwomen such as dispensers, masseurs and radiographers were enlisted into lay trades for which they required a complete course of training and in which they had little interest. At the same time the medical trades, particularly the medical specialist trades, were undermanned. When the situation was appreciated, everything possible was done to straighten out the tangle. Units were circularised for particulars of appropriately qualified personnel and, as far as was possible, their re-mustering to medical trades was effected. The lessons learned in this connexion during the War of 1939–45 will be of inestimable value in the event of further large-scale recruiting, when every effort will undoubtedly be made to avoid any waste of valuable medical assistance.

By the end of September 1941, entry of airwomen into the medical specialist trades was so encouraging that it appeared that the published establishments were likely to be exceeded and to make the necessary adjustment and, incidentally, to permit the release for general nursing duties of a number of medical specialist airmen, application was made to Air Ministry for permission to re-muster such airmen to their basic

trade of nursing orderly. This permission was granted and such airmen became recognised as nursing orderlies, 'extra qualified', in whatever specialist trade was applicable. Many medical airmen so re-mustered and re-employed certainly felt that they had lost status as a result of this move. From a manning point of view it was of course necessary to keep each medical trade within the limits of its establishment and to authorise such re-musterings as were necessary to achieve this. It was not unnatural that a medical airman whose ambition had led him to climb above the status of a nursing orderly should resent a forced reversion to that status. A typical example of the kind of problem which resulted, was the case of the Service-trained dispenser serving in the rank of corporal who, following the arrival of a directly enlisted civil qualified W.A.A.F. dispenser (enlisted, incidentally, in the rank of sergeant because of her qualification) had to lose his trade status of dispenser and revert to the basic trade of nursing orderly. In handing over he had to pass on to the W.A.A.F. sergeant his acquired knowledge of medical storekeeping, an essential requirement for employment as a Service dispenser. He lost prestige, congenial employment, and perhaps some chance of accelerated promotion as a specialist airman.

By January 1942 a considerable number of W.A.A.F. personnel had been distributed throughout medical units in the home commands. Substitution had been taking place on a sliding scale. Airmen of appropriate medical categories had been withdrawn in large numbers for overseas service. There were still many home units where, for various reasons, it was considered that W.A.A.F. personnel could not be employed. But the total number of medical airmen available in the home commands at this time was approximately 500 of whom 50 per cent. were medically unfit for overseas service. The alternatives to breakdown, therefore, were that W.A.A.F. substitution should be widely accepted at home stations, or that medical trades should be reopened to airmen.

DECENTRALISATION OF THE CONTROL OF MOVEMENTS OF SPECIALIST AIRMEN

In February 1942, it was found necessary to introduce some measure of decentralisation in the matter of control of movement of medical specialist airmen and airwomen. The necessity was occasioned, in the main, by the fact that various tradesmen and tradeswomen were being employed on duties of a specialised nature within the scope of their particular trade. A laboratory assistant could not merely be regarded as available for movement, if necessary, to any unit having an establishment for a laboratory assistant. It first had to be determined whether he could be replaced by another laboratory assistant capable of performing

the same specialised laboratory duties. The complex records that would be necessary to provide such information were considered to be beyond the scope of the medical manning establishment; and accordingly it was arranged that each consultant responsible for the activities of the particular trades should be in possession of information regarding the location of the tradesmen concerned and that no movements would be undertaken by the medical manning office without prior consultation with and advice from the consultant. This arrangement worked very successfully in that it enabled the consultant to post his tradesmen to those places where the best use could be made of their qualifications and knowledge while, at the same time, any possibility of indiscriminate movement was precluded.

By this time also two new medical specialist trades had been introduced, those of chiropodist and optician orderly. Both these trades were to be filled by the enlistment of appropriately qualified personnel or by the re-mustering of civil qualified personnel already in the Service in other trades.

The specialist trades, with perhaps the exception of that of radiographer, were manned almost up to establishment by the middle of May 1942. For some reason radiographers did not seem to be forthcoming from civil life in anything like the numbers applicable to the other specialist trades. In fact the position was such that grave concern was felt by the consultant responsible and it became necessary to introduce a shortened course of instruction to provide some nursing orderlies with the knowledge to manage, under supervision, the various radiological sections.

About this time, too, another problem arose in connexion with the various sub-specialists referred to earlier in this narrative. Since these personnel were still mustered as nursing orderlies and posted to hospitals and other units for sub-specialist duties, they were, from a manning point of view, still counted against the establishment of nursing orderlies at their units. No alteration to the establishments had been effected to cover the additional duties undertaken by the personnel with the result that commanding officers were finding that a large percentage of their establishments of nursing orderlies were, in fact, not available for nursing duties at all. The matter was represented to Air Ministry who approved the addition of certain nursing orderly posts to establishments with a special notation that the personnel concerned were for employment in specialised duties.

In May 1942, the Air Ministry notified a change in the training programme. As a result of the dwindling numbers of R.A.F. medical airmen available for future overseas commitments, it was decided that as from June 1942, a weekly R.A.F. intake of fifty would be arranged, while the W.A.A.F. intake was reduced to thirty a month.

SANITARY ASSISTANTS

Although, up to July 1942, the entry of civil qualified W.A.A.F. medical specialist airwomen in most of the specialist trades had been reasonably encouraging there was still one medical specialist trade in which the manning position caused some anxiety. It was that of sanitary assistant, a trade re-introduced after the outbreak of war. There was no W.A.A.F. substitution in this trade and its manning was dependent on the entry of Fellows or Members of the Royal Sanitary Institute. Many such qualified personnel were screened from service in the Armed Forces, and thus were not available to the R.A.F. The position in the R.A.F. became so serious in 1942 that although all Group and Command Headquarters and some of the larger stations had establishments for sanitary assistants, it was only with the greatest difficulty that the post at Command Headquarters could be filled. As a result of the continued representations to Air Ministry regarding the shortage, Air Ministry authorised in July 1942 the training, as a temporary measure and on a substitution basis, of a selected number of nursing orderlies. These airmen were given a six-weeks' course at the R.A.F. School of Hygiene and promptly despatched to the various units awaiting the services of a sanitary assistant. There is no doubt that they did much valuable work, but it can never be said that they took the place of civil qualified personnel. They possessed neither the experience nor the status to be really effective as substitutes for the specialists passed out from the Royal Sanitary Institute.

ANTI-MALARIAL DUTIES

In August 1942, it became necessary to train and allocate a certain number of nursing orderlies for anti-malarial duties in malarious districts in overseas commands, and yet another speciality was added to the duties of the medical branch. Comprehensive records were necessary to ensure that the specially trained nursing orderly was actually utilised in his specialist capacity. Such breakdowns as did occur arose not so much from inadequate manning records as from the failure on the part of many units to accept, or even believe, the fact that a nursing orderly could be anything else but a nursing orderly. The Air Ministry was naturally anxious to avoid the introduction of numerous trade categories and consequently insisted that such personnel should retain their basic trade mustering and that their utilisation should be adequately controlled by the medical manning authority. It was felt, however, that too many hours were wasted in having to explain at unit level why a particular nursing orderly was not actually available for general nursing duties. Much of the difficulty was overcome by the insertion, on all movement notices, of a parenthetical 'sub-trade' against the particulars of the persons to be moved.

FINAL STRENGTH

Throughout the remaining war years the strength of the medical branch grew until at the time of V.E. Day it was in the region of 17,000 R.A.F. and W.A.A.F. dispersed in various parts of the world, but it still remained, for the greater period of the war, below establishment.

ORGANISATION AND FUNCTION OF M.T.E. AND D.

Any narrative on the subject of medical manning throughout the war years would be incomplete without some reference to the organisation and the personnel who controlled it. The organisation was within the control of the Commandant, M.T.E. & D. and was known as the Medical Manning Section. Its task was the maintenance of records of all medical personnel to cover careers and movements, the manning of medical establishments at all units within the home commands, the movement of all medical personnel for compassionate and other reasons within the home commands, nomination to the Record Office, on request, of all personnel required for overseas commitments and their consequent replacement at units within the home commands, and the provision of advice to control promotions. The staff required to maintain this organisation naturally varied with the total number of personnel for whom the organisation catered, but never exceeded a total of twenty, most of whom were W.A.A.F. personnel. No set hours of duty could be laid down. A request for a large number of personnel for an overseas commitment received at 'cease work' had often to be met before 'commencement of duty' the following day. The disposal of an output of trainees, for which no preparation could be made until the results of their trade tests were known, could not be delayed except at the expense of valuable training accommodation. It was sometimes felt that the staff was not sufficiently large, but the work was spasmodic. Only a limited amount could be foreseen and pre-arranged and a larger staff would undoubtedly have had many hours during which no work would have been available. The success of the organisation depended very largely on correct documentation and recording, on which duties the majority of the staff were employed. The information required to effect the recordings was obtained from numerous sources, including weekly returns from station sick quarters.

PROBLEMS OF PROMOTION

The narrative has not dealt with promotion up to this point, although it is true to say that during the war years the Commandant, M.T.E. & D., through his advice, played a large part in the control of promotions of medical personnel. Since promotions form an integral part of the manning organisation, such matters were dealt with by the manning section.

Before the war all promotions were, in the first place, controlled from central rosters maintained by the Officer i/c Records, and promotions were authorised periodically against vacancies in the establishments of the various trades. In the case of medical personnel, it was customary for the Officer i/c Records to obtain the approval of the Training Officer (Medical) (as he was then known) before issuing the authority for the promotion to the airman's unit. The Training Officer (Medical) was, from the records, able to determine whether or not the airman was suitable for promotion, and make his recommendations accordingly to the Officer i/c Records. This policy continued throughout the war, except that during the war period all promotions were regarded as 'temporary' and not 'substantive'. War-time conditions, of course, necessitated the introduction of additional methods for promotion. For instance, the Commandant, M.T.E. & D. was authorised to promote to temporary rank, on posting for initial duty, those medical specialist airmen and airwomen with civil qualification who successfully completed a course of Service training at the Medical Training Depot. The ranks granted in each trade were in accordance with the instructions of Air Ministry and were largely governed by the type of qualification possessed by the entrant. Since the Officer i/c Records was the eventual authority in the matter of promotions, a very close liaison with the Record Office was maintained in the matter of promotions authorised by the Commandant, M.T.E. & D.

Perhaps the most disconcerting factor of war-time promotions was 'acting rank'. Acting rank maintained continuity by the appointment locally of personnel against establishment vacancies in higher ranks pending the ability of the Record Office to post in personnel of the appropriate ranks. The Commandant, M.T.E. & D. saw the advisability of some kind of central control in the relatively small medical branch. Since he already had the control of movement of medical personnel, at least within the home commands, it seemed logical, and was often possible by adequate manning control, to minimise the necessity for fleeting appointment to higher ranks. Such appointments were, within the home commands, avoided as far as possible by the timely posting of personnel in the appropriate ranks or by the posting of selected personnel known to be due for temporary promotion to the ranks concerned. In the overseas commands the position was different. In the first place, owing to the numbers of medically unfit medical personnel in the home commands, it was not always possible to nominate airmen of the appropriate ranks for overseas service. More often than not those nominated were of junior ranks, with the result that principal medical officers in overseas commands found that a considerable number of promotions to higher acting rank was necessary if Air Ministry policy of continuity was to be observed. From the mass of correspondence received when airmen

holding acting rank were replaced by others of the appropriate rank, or when they returned to the home establishment and reverted to their normal ranks, it was clear that they had never fully appreciated the implications of acting rank. Often they did not understand why, having been, for instance, flight sergeants or warrant officers, it was now necessary to revert to a lower rank. It took much carefully considered correspondence to convince them that the appointment was not given either as a permanent measure or because they had been specially selected for the particular post, but to enable local commanders to give them, as a temporary measure, the status necessary to enable them to carry out the full requirements of their duties and thus maintain adequate productivity and continuity. In other words they were given the rank and the pay for the particular job they were doing at the time. While sympathising with those who had to remove badges and explain the reasons for reduction in rank to their relatives, it would have been most unfair to their less fortunate fellows to grant them permanently a rank achieved through chance location.

In concluding the part of the narrative which deals with the aspects of Medical Manning during the War of 1939–45, it is felt that a tribute should be paid to the R.A.F. Record Office which, against all earlier principles and practice, agreed to the transfer of initiative and executive action to an untried authority and to the Record Office becoming a secondary authority merely recording, albeit ultimately responsible for, the various activities of the medical manning organisation. In the early stages of the war any ill-considered action on the part of the medical manning organisation might easily have resulted in chaos in the records of medical personnel still being maintained by the Record Office, but no such difficulty did arise and the R.A.F. Record Office more than once expressed their satisfaction at being able to 'farm out' safely a portion of their heavy responsibilities.

TRAINING OF MEDICAL PERSONNEL

Training of Nursing Orderlies before 1939. Immediately before the outbreak of war, training of R.A.F. medical personnel was carried out at the R.A.F. Medical Training Depot and at selected R.A.F. Hospitals. The policy of training was directed by the Training Officer (Medical) with the agreement of the Director-General of Medical Services to whom the Training Officer (Medical) was directly responsible in all medical training subjects.

Airmen enlisting into the R.A.F. Medical Branch were, in the first instance, posted to a recruits centre for Service training, thence to the Medical Training Depot as medical orderlies under training. At the Medical Training Depot they were given an *ab initio* course of four months' tuition in anatomy and physiology, first aid, bandaging and

splinting, elementary medical and surgical nursing, Service routine and sanitation and hygiene. Successful trainees were then posted to selected R.A.F. hospitals for Part II training. This was of twenty-four weeks' duration and consisted of more practical experience and lectures in the subjects already undertaken in Part I training, with the additional subject of invalid cooking. At the end of the second part of their training they were trade tested under arrangements made by the Training Officer (Medical), successful trainees being re-mustered to nursing orderly and posted to units where establishment vacancies existed. Those trainees who failed to obtain the appropriate percentage of marks were either allowed to continue training or were re-mustered to non-medical trades.

Medical specialist trade training was, under the control of the Training Officer (Medical), carried out at selected hospitals or, in the case of laboratory assistants, at the R.A.F. Institute of Pathology and Tropical Medicine (I.P.T.M.) When vacancies, or potential vacancies, arose in the various medical specialist airmen establishments, selected nursing orderlies were re-mustered to 'under training' in the particular specialist trade and posted to the appropriate unit for training. The length of courses varied according to the trade, as indicated below:

(*a*) Dispenser (taken in two parts)	6 months and 3 months at hospital
(*b*) Special treatment orderly	9 months at hospital
(*c*) Mental nursing orderly	6 months at hospital
(*d*) Masseur	9 months at hospital
(*e*) Radiographer	8 months at hospital followed by 6 months for reclassification
(*f*) Laboratory assistant	12 months at I.P.T.M. followed by 6 months at hospital for reclassification
(*g*) Operating room assistant	6 months at hospital
(*h*) Trained nurse	No time limit—at hospital

All re-musterings to and from trade training were authorised by the Officer i/c Records on the recommendation of the Training Officer (Medical). The trade tests were set by the Training Officer (Medical), the papers being forwarded to the various units to be opened by the invigilating officer at the time of the examination.

Such was the position in 1939. With the advent of war and the consequent immediate demand for large numbers of trained medical personnel, radical changes in the duration of courses became necessary in order to meet the pressing demands of the manning organisation. Fortunately, with the outbreak of war, the immediate influx of mobilised V.A.D. personnel provided the necessary time to review and consider

the position and adjust the programme. The changes which took place in the training programme consisted, in the main, of reducing the length of courses according to the particular abilities of the trainees.

Training subsequent to outbreak of war. Early in the war the Air Ministry decided to cancel all written trade tests for the duration of hostilities and to introduce the system of *viva voce* examinations to be conducted by local 'specialist' officers. There was clearly the possibility of a considerable disparity of standards in the various examinations for nursing orderlies. In this connexion it should be remembered that by this time many stations had single-handed medical officers newly enlisted into the Service, who, though fully qualified medically and from the layman's point of view specialist officers in the matter of trade tests, were not necessarily sufficiently experienced in Service matters to be familiar with the actual requirements of R.A.F. nursing orderlies. Their views on this subject would be bound to differ considerably. Since, in the early days, consequent upon the vast expansions of establishments, every leading aircraftman nursing orderly was a potential corporal, it was obviously necessary to ensure that the highest standard of technical education possible under existing conditions should be maintained.

Travelling Medical Trade Test Board. The Travelling Medical Trade Test Board was therefore introduced. Air Ministry approved the scheme and a board was set up consisting of two medical officers from the training staff of the Medical Training Depot, accompanied by an instructor to assist in the trade testing and conduct the clerical work. This was in November 1939, and the board continued to operate for the greater part of the war in respect of Home Commands. It did not visit every station; this would have been uneconomical, as some stations had only one or two nursing orderlies on the strength. Visits were made to selected hospitals and large stations to which nursing orderlies from surrounding stations could travel with the minimum waste of time and transport. At each trade-testing centre, a medical officer, matron or nursing sister was co-opted as a member of the Trade Test Board. Attendance of candidates at the trade-testing centres was not left entirely to the units concerned. The records maintained by the manning organisation were carefully watched, and, where it was considered that a particular nursing orderly was being overlooked, a request was made to his unit commander for him (or her) to be presented at the next trade test to be held in the area concerned. Thus, in this way, the careers of those nursing orderlies serving in the Home Commands were safeguarded and a reasonable standard of technical efficiency was maintained.

Trade testing overseas. Such a scheme could not, of course, operate in the Overseas Commands. The responsibility for trade testing of medical airmen in Overseas Commands was delegated to principal medical officers of the commands concerned. The required standard was laid

down by the Training Officer (Medical) and trade tests were either conducted locally at units or at selected centres within the command. It is worthy of mention that after the collapse of the Japanese, the Commandant, M.T.E. & D. received results of a nursing orderlies trade test conducted in a Japanese prisoner-of-war camp! Accompanying the results was a recommendation that the reclassifications be authorised retrospectively. The results were dated some considerable time before the prisoner-of-war camp was freed.

Medical specialist personnel were, in the early days of the war, trade tested for reclassification either at the Medical Training Depot or by a specially constituted board at the unit at which the personnel were serving. In the latter part of the war such trade tests were rarely necessary, since by that time practically all medical specialist personnel were civil qualified direct entrants.

Training syllabus for nursing orderlies. With regard to the actual training periods for nursing orderlies throughout the war years the constantly fluctuating requirements of the manning organisation necessitated frequent variations in the training periods. Such changes might possibly imply a variation in the standard of training. This was not so however. The standard was maintained by concentration of the courses and continuous 'weeding' processes to segregate the more astute of the pupils. In this way it was possible to form classes of short duration while the slower pupils were given more lengthy courses. The rate of rejects from training varied but proved to be higher towards the end of the war when, no doubt, the demand for operational personnel was greater and the quality of those available for non-operational duties perhaps a little lower.

As has been stated earlier, training was carried out at various centres, dependent in the main on the amount of accommodation available. The School of Hygiene, however, remained at Halton, housed in the old M.T.D. building, throughout the war years and undertook, *inter alia*, training in water-cart duties of nursing orderlies under instruction as substitute sanitary assistants and the initial Service training of direct entry sanitary assistants. All training of medical personnel was directed by the Training Officer (Medical) (later the Commandant, M.T.E. & D.) irrespective of its nature and since the training population was sometimes fairly widely scattered, a considerable amount of liaison was necessary to maintain a steady output in the various trades and sub-trades and to ensure that training accommodation and training time was not wasted. Results of all trade tests whether conducted locally in Overseas Commands or by the Travelling Medical Trade Test Board in the Home Commands were forwarded to the Training Officer (Medical) for scrutiny and approval before authorisation and subsequent recording action.

From time to time during the war years difficulty was experienced in obtaining sufficient instructors to carry out the varied types of training required in the Medical Branch. Large classes were most undesirable. Every possible means was employed to discover and train suitable medical airmen and airwomen for instructional duties, and many of them were, through necessity, kept on instructing duties for over-long periods.

CONCLUSIONS

It is not easy to summarise the factors which influenced the many changes which occurred in the training of medical personnel throughout the war years. The requirements were manifold. It was a large-scale example of demand and supply, the means by which the supply was met varying considerably according to the type and urgency of the demand. Both manning and training of medical personnel were closely linked, the one being dependent upon the other. The fact that both organisations were controlled by one authority, the Commandant, M.T.E. & D., who could envisage the complete picture, undoubtedly resulted in maximum efficiency in training and distribution of medical personnel throughout the war.

CHAPTER 3

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

PRE-WAR HISTORY

THE creation of a separate nursing service for personnel employed on flying duties was a gradual process which ran hand in hand with the formation of a separate Air Force. The care of the sick of the Royal Flying Corps during most of the War of 1914–18 was the responsibility of the Army Medical Department, and therefore the nursing was carried out by members of the Queen Alexandra's Imperial Military Nursing Service. An Air Force Nursing Service was formed in June 1918 as a war-time measure and by 1920 consisted of 52 sisters and staff nurses who were posted to various hospitals, station sick quarters, training camps and convalescent centres. The hospitals which had a nursing sister were at Uxbridge, Salisbury, Yarmouth, Shorncliffe, Cranwell and Calshot. Four Women's Royal Air Force hostels and 8 Royal Naval air or airship stations had a nursing sister each; 10 more served at the Royal Flying Corps officers' hospital at Hampstead and a further 14 at the Blandford camp hospital. The remaining 10 were divided between the Matlock and Hastings hospitals.

The replacement of Army nurses by members of the new Service continued, and when the war was over and peace-time conditions had fully returned, the permanent Royal Air Force hospitals were staffed entirely by Air Force sisters. In 1919 there were 27 at Halton Hospital, 16 at Cranwell Hospital, 14 at the Royal Air Force Officers' Hospital, Finchley, and one each at the station sick quarters at Netheravon and Henlow; a total of 59. On January 27, 1921, the nursing service was established as a permanent branch of the Royal Air Force. The first sisters, 10 in number, of the nursing service to go overseas left England in the autumn of 1922 to staff the hospital at Baghdad. Five more embarked soon after, and in the following year another hospital was opened at Basrah. In both hospitals the replacement of Army by R.A.F. sisters was a gradual process. In 1924 the Palestine General Hospital and in 1928 the Aden Military Hospital were taken over by the Royal Air Force.

In June 1923, the name of the Service was altered by Royal consent to the Princess Mary's Royal Air Force Nursing Service (P.M.R.A.F.N.S.) and in October 1927, H.R.H. The Princess Royal opened the new hospital at Halton and gave it her name.

EXPANSION AND MOBILISATION ON OUTBREAK OF WAR

The strength of the P.M.R.A.F.N.S. remained stationary at about 100 regular members between 1924 and 1934. It had risen to 134 by 1937, but it was not until the state of emergency in 1938 that a recruiting drive was made. It was hoped to build up a reserve of 300 members, but the results were very disappointing, only 16 nurses being enrolled. However, during the next eighteen months the rate of intake was increased and at the outbreak of war there were 184 regular members, 69 reserve members and an available pool of 200 Voluntary Aid Detachment British Red Cross and St. John (V.A.D.) nurses. On mobilisation the gradual call-up of the reserve began, 39 being mobilised by October 1, 1939, and 75 by March 1, 1940. It was possible to meet all commitments with these numbers and an initial draft of 100 V.A.D. nurses. There were 43 regular nursing sisters serving abroad just before war began, but with the handing over of the Palestine General Hospital to the Army, the number overseas was reduced to 36 for the first year of the war. The total commitments when war began were the staffing of the 6 Royal Air Force hospitals at home at Halton, Cranwell, Uxbridge, Cosford, St. Athan and Padgate; the hospitals overseas at Habbaniya* and Aden and certain fifty-bedded sick quarters in the United Kingdom which later became station hospitals.

ORGANISATION

The organisation and conditions of service of the Princess Mary's Royal Air Force Nursing Service altered little during the period 1939–45. The Service consisted of a matron-in-chief, principal matron, matrons, senior sisters and sisters, and had a regular and reserve branch. Candidates for the regular branch were drawn from State registered nurses of between 24 and 35 years of age. A candidate accepted for the regular branch received a six-months' probationary appointment and was granted seniority from the date of entry if the acceptance was confirmed. Promotions in war-time were on an acting and not a substantive basis. The upper age limit for joining the reserve branch was 45 years. Regular members retired compulsorily between the ages of 55 and 57, and received retired pay according to the number of years served. Voluntary retirement after ten or fifteen years' service at the discretion of the Air Council was allowed and did not preclude the receipt of a gratuity. In peace-time, enrolment into the reserve was for a three-year period, renewable from time to time, the age limit for retirement being 60 years. Intake into the regular branch was suspended during the war and appointments to the reserve were made only for the duration of hostilities. Before entry, all candidates came before a selection board on which

* The Baghdad hospital was moved to Habbaniya; the hospital at Basrah closed in 1925 and was reduced to the status of station sick quarters.

sat the Director-General of Medical Services (chairman), the Matron-in-Chief and two matrons of London teaching hospitals. Reserve branch appointments were made from the day of enrolment, the nurse concerned remaining in her civilian occupation until called up for service. Personnel of the Nursing Branch were required to serve overseas, the period of such service being governed by the climate and conditions in the country concerned.

VOLUNTARY AID DETACHMENTS

The Voluntary Aid Detachments, administered by the British Red Cross Society and the St. John Ambulance Association and formed for the purpose of supplementing the medical forces of the Crown in war-time, provided a further source of nursing personnel. In peace-time V.A.Ds. were trained in first aid and home nursing and could elect to belong to any one of the three Services. On the outbreak of war they were mobilised by the British Red Cross and St. John authorities and posted to hospitals according to a pre-arranged plan. They were entered as Grade II nursing members and were eligible for reclassification to Grade I after six weeks' satisfactory service. In peace-time between 80 and 100 V.A.Ds. received an eight-day training course at a Royal Air Force hospital once in three years, generally at Halton, but on mobilisation these special courses were not continued.

TRAINING AND ADMINISTRATION

New members were trained in Service routine at Royal Air Force general hospitals. The training ensured that, in addition to the general knowledge of routine nursing acquired outside the Service, the newly joined nurse became familiar with ward administration and all the departments of a Service hospital. This training could also include specialist work and teaching on infectious diseases, burns treatment, rehabilitation, electro-therapeutics and thoracic surgery. The variety of the training was probably one of the chief attractions of the Service, while in addition in peace-time there was opportunity for service overseas and work arising from the care and treatment of the families of serving men.* A roster was kept for members of the P.M.R.A.F.N.S. so that appointments abroad could be arranged in rotation. Duty at station sick quarters was an important part of the work and it was customary, in the bigger stations where the sick quarters were large, for a sister to be posted to supervise the nursing and to provide the extra necessary skill required for severely ill patients.

* Male nursing orderlies were employed in hospitals and sick quarters for nursing and general ward duties, and much of their practical training was given by the sisters. The establishment for nurses was one sister to every ten beds and three or four nursing orderlies (depending upon whether waitresses were employed or not) to every twenty-five beds; thus, there were five sisters and six nursing orderlies to every fifty hospital beds.

The administration and organisation of the members, both regular and reserve, of the P.M.R.A.F.N.S. and of the V.A.Ds. was carried out by the Nursing Service Branch, a self-contained department working under the Director-General of Medical Services at Air Ministry, staffed by a matron-in-chief, a matron, and four civilians. An advisory board, consisting of H.R.H. The Princess Royal (president), the Director-General of Medical Services (chairman) and the Matron-in-Chief (deputy chairman), with the two matrons from the London teaching hospitals, met at quarterly or half-yearly intervals to review the welfare of the nurses, the service conditions, the incidence of sickness and matters of general policy.

CHANGES IN METHOD OF RECRUITING

There was no difficulty in the first two years of war in staffing the new general and station hospitals, because the Service was very popular. There were just under 6,000 applications to fill 460 vacancies between September 1939 and the end of 1941. Enrolment was entirely by selection from volunteers until June 1943 when all nurses throughout the country were registered and the system of recruiting volunteers abandoned. The reason for this alteration in policy was the acute shortage of nurses throughout the country at that time which made it essential to control and distribute them between the Services and the civilian population in an equitable manner.

There was difficulty in obtaining an adequate supply of nurses for both Service and civilian needs at the end of 1942. This situation had arisen partly on account of the general numerical shortage of nurses and partly because of their unequal distribution, mental hospitals and tuberculosis sanatoria being the most affected. It became apparent that little could be done to increase materially the number of State registered nurses and that the only possible way by which the best economy in nurses could be realised was to have some central authority to control their supply and distribution. The problems were examined by the Minister of Health for England, the Secretary of State for Scotland, and the Ministry of Labour and National Service and in January 1943 provisional plans were made. Most of the proposals concerned civilian needs, but it was stated that the system of free recruitment into the Services would have to cease and that in future the Services would have to make known their needs to the Ministry of Labour and National Service, which would be responsible for deciding the most equitable allocations after consultation with the departments concerned and any other authority which they might consult. The proposals were accepted in principle by the Services, but not without some misgiving. They emphasised that the various systems of individual selection of recruits in use would have to remain because it was important that only those nurses suited to hold commissioned rank

should be accepted into the Services. After an inter-Service consultation on March 23, 1943, a system of recruiting was determined. It was decided that nurses who volunteered for service were to apply to their Local Appointments Office where they would fill in a form of application. They were told, if they volunteered for the Navy or the Royal Air Force, that the number of vacancies in these Services was small compared with the Army and that their chances of successful application were thereby correspondingly reduced. The application forms were sent to the Ministry of Labour and National Service, who in turn sent the candidate on to one of the Service selection boards. If the candidate applying for the Navy or Royal Air Force was rejected, or if no vacancy was available in these Services, she was referred to the Army. These instructions were issued to all Appointments Offices and came into effect on May 1, 1943, and from then on the demands and allocations of nurses were made in the same way as those for medical officers and were subject to the same difficulties and restrictions. The shortage increased as the war progressed and the Service demands grew, until eventually the task of allocating nurses to the Services and deciding the numbers of each allocation was undertaken by the Lord President's Committee.

GROWTH OF THE NURSING SERVICE

The combined serving strength of the regular and reserve branches of the Service was increased from 233 on October 1, 1939, to 386 in September 1940, and in the same month of 1941 to 541. On March 1, 1942, the numbers had risen to 638, by March 1943 to 811 and a year later to 1,024. Throughout this period the numbers of regular members had slowly decreased from 184 on the outbreak of war to 126 by March 1944, which number included 12 who had retired between these dates and had been re-employed. The numbers of serving V.A.Ds. had also increased; 130 were enrolled by October 1939 and by March 1942 there were 282. Thereafter the numbers gradually decreased, so that two years later the strength had been reduced to 240. In addition to the regular and reserve members of the P.M.R.A.F.N.S. and the V.A.Ds. a few State registered nurses of the British Red Cross and St. John organisations were also employed. Fifteen were attached for duty in March 1941, but several were withdrawn later so that by March 1944 only 5 were employed. In August 1942 three members of the Royal Canadian Air Force Nursing Service were attached to the Royal Air Force for duty in certain sick quarters and hospitals where large numbers of Canadian officers and men were being treated. The number of these sisters had increased to 18 by March 1944; thus the total strength of fully qualified nurses and V.A.Ds. administered by the Nursing Service Branch was 184 when war was declared, 1,287 in March 1944, and an average of 1,390 for the year 1945.*

* *See* Appendix, Graph I.

DISTRIBUTION OF NURSING STAFF IN THE R.A.F.

There were demands on the Service other than the staffing of general and station hospitals and large station sick quarters. The provision of nursing staff was extended first to Initial Training Wings and then to Recruit Centres and some Schools of Technical Training. At the end of 1941 ten Initial Training Wings had 1 nurse each, and the 5 Recruit Centres at Bridlington, Skegness, Yarmouth, Weymouth and Bournemouth, each with a population of over 5,000, had 2 nurses established at each station sick quarters. The large Technical Training Command station at Blackpool, with a population of over 27,000 in December 1941 had at first 4 sisters in the sick quarters, and later, when the male beds had increased to 85 and there was also a 50-bedded W.A.A.F. sick quarters, 8 sisters were established. Sisters were also posted to the 50-bedded W.A.A.F. hospital at Uxbridge.

The W.A.A.F. created a special problem owing to their increasing strength on all stations and to the introduction in 1940 of W.A.A.F. sick quarters attendants,* whose relative inexperience caused a lack of expert nursing at stations with a large W.A.A.F. population. Plans were made during 1941 to post 2 sisters to each W.A.A.F. sick quarters having more than 50 beds, and 1 sister to all home stations having a W.A.A.F. population larger than 350. The aim was to improve the general standard of nursing, help in the training of W.A.A.F. sick quarters attendants and effect a saving in the number of women medical officers needed. The nurses were also able to visit W.A.A.F. sick in billets, assist at out-patients and F.F.I. (free from infection) inspections and to act as health confidantes to the airwomen. These plans were extended, and in March 1942 welfare sisters were appointed to cover groups of stations throughout the United Kingdom. Twenty-four sisters were employed in this work by September 1942 and the number gradually increased to 63. The scheme was abandoned when the invasion of Normandy began and more nurses were required for active service clinical duties.

LIFTING OF THE MARRIAGE BAR

In the spring of 1941 it was realised that many nurses were resigning from the Service because of the regulation that a member of the P.M.R.A.F.N.S. could not remain in the Service after marriage; this regulation was responsible for 41 of the 47 resignations of members of regular and reserve branches between September 1939 and March 1941.† It was therefore decided in July of the same year that nurses who married could still be retained in the Service. At first the desired results were not obtained; out of 16 sisters who married between July and the end of December 1941, five had already applied to resign by March

* The term used at the time for the W.A.A.F. trade of nursing orderly.
† *See* Appendix, Graph II.

1942, after a lapse of time varying from six weeks to five months after marriage. Two of these sisters were on overseas stations and there was difficulty over their replacement. Later, however, many married sisters remained in the Service on full duty, although 77 resigned between July 1941 and September 1944 for compassionate reasons.

APPLICATION OF THE DEFENCE REGULATIONS

All women who were enrolled in the Women's Auxiliary Air Force were declared to be members of the Armed Forces of the Crown by the Defence (Women's Forces) Regulations, published on April 25, 1941, and at the same time W.A.A.F. officers were granted commissions. Other women serving with the Royal Air Force Medical Service who were affected by these regulations were women medical officers, P.M.R.A.F.N.S. nurses, V.A.Ds. serving with the P.M.R.A.F.N.S. and W.A.A.F. personnel belonging to the Group M trade. The status of women medical officers has already been discussed,* and it is intended to give here a description of the application of the Defence Regulations to the nurses serving under the Nursing Service Branch at Air Ministry.

Members of the Army Nursing Service already held relative rank to other Army medical officers and they were being granted commissions under the scheme then being introduced after the publication of the regulations. The Director-General of Medical Services requested on May 1, 1941, that members of the P.M.R.A.F.N.S. be given the same treatment as the Q.A.I.M.N.S. by the granting of commissions and relative ranks. It was proposed that this should be established as stated below:

Nursing Service Title	*Air Force Relative Rank*	*Army Relative Rank*
Matron-in-Chief	Group Captain	Colonel
Senior Matron (at general hospitals and Air Ministry)	Wing Commander	Lieutenant-Colonel
Matron (station hospitals)	Squadron Leader	Major
Senior Sister	Flight Lieutenant	Captain
Sister	Flying Officer	Lieutenant
Staff Nurse	Pilot Officer	Second Lieutenant

The granting of the relative rank of group captain for the Matron-in-Chief was tentative because the demand for such a rank depended to a large extent upon the policy adopted by the War Office for the relative rank of the Matron-in-Chief of the Q.A.I.M.N.S. It was visualised that members of the P.M.R.A.F.N.S. would wear similar rank badges to those of other officers of the Royal Air Force, but that they would still be called by their professional titles and not by their relative ranks.

* *See* Medical Manning, Chapter 1.

PLATE I. Fox-hole as living accommodation in Normandy.

PLATE II. Sister on duty in Burns Centre.

Meanwhile, the Director-General of Medical Services had asked for the posts of Matron at the Air Ministry and the Royal Air Force General Hospital at Halton to be upgraded to that of Principal Matron because of their increased responsibility. This request affected the original proposals for the relative ranks of nurses, and on May 22, 1941 further amendments were suggested and are given below:

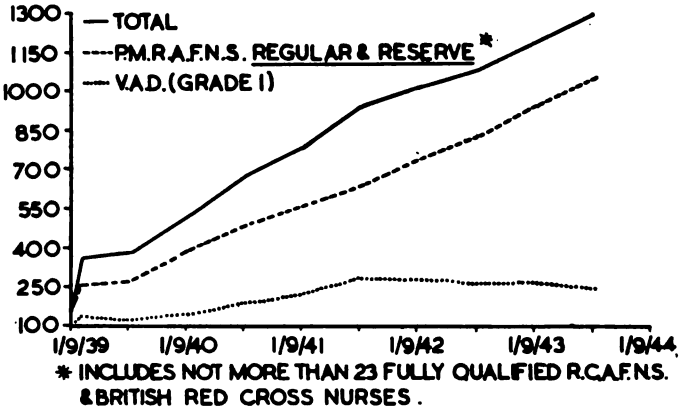
Nursing Service Title	*Air Force Relative Rank*
Matron-in-Chief	Air Commodore
Principal Matron (general hospitals)	Wing Commander
Matron (station hospitals)	Squadron Leader
Senior Sister	Flight Lieutenant
Sister	Flying Officer

The Treasury agreed to the granting of the relative rank of Air Commodore to the Matron-in-Chief on December 24, 1942, provided that their agreement would not be made the basis of a claim for the grant of an increase in emoluments. As soon as this approval had been obtained, authority was given in an Air Ministry Order for the granting of emergency commissions to members of the P.M.R.A.F.N.S. On March 6, 1944, the Treasury approved the appointment of a Chief Principal Matron with the relative rank of Group Captain to assist the Matron-in-Chief to keep adequate supervision of the Nursing Service in the Middle East and North Africa. Badges of relative rank were to be worn, but nurses were to be addressed and known by their professional titles and were regarded as having authority equal to officers of the Royal Air Force Medical Branch and in consequence were to be obeyed accordingly. From this date a member of the P.M.R.A.F.N.S. received officially the compliments and respect which were due to an officer of equivalent rank in the Women's Auxiliary Air Force.

Plates I and II illustrate phases in the life of an Air Force nursing sister.

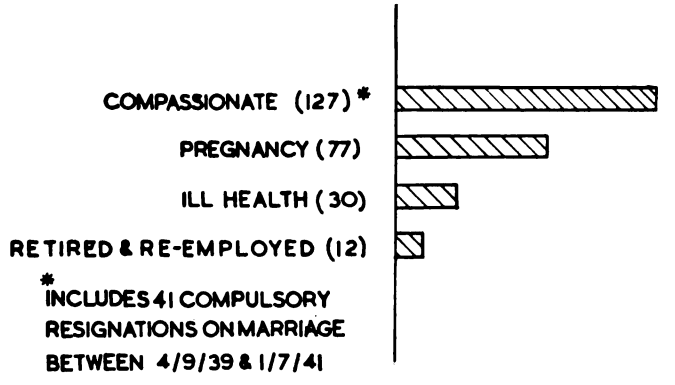
APPENDIX

Graph I.



Strengths of Nurses employed in the R.A.F.

Graph II.



Total Wastage of Regular and Reserve Members of the P.M.R.A.F.N.S.

CHAPTER 4

THE ROYAL AIR FORCE DENTAL BRANCH

HISTORICAL SURVEY: 1914–39

THIS is an account of the formation, development and work of the Royal Air Force Dental Branch.

Detailed descriptions of dental research carried out by the Dental Branch under the auspices of the Flying Personnel Research Committee, and of certain aspects of clinical dentistry, have been omitted from this account as they will form a separate narrative.

During the War of 1914–18, R.F.C. personnel received dental treatment under arrangements made by the Army medical authorities. Dental surgeons were commissioned on the general list and were employed under contract and attached to the R.A.M.C. for duty. Re-organisation of the dental services after the war was delayed while the Mond Committee of 1919 investigated the proposals formulated for the amalgamation of the medical and dental branches of the Armed Services. At that time the R.A.F. was still in the process of organisation and, as R.A.F. dental treatment was provided by twelve dental surgeons seconded from the Army, the D.M.S., R.A.F. favoured amalgamation. The Navy, however, made strong and valid objections to the proposals and the Mond Committee subsequently recommended the continuation of separate services.

Re-organisation of the dental services of the Army and Navy began after the publication of the report and ended in 1920 with the formation of the Royal Naval Dental Service, and in 1921, of the Army Dental Corps (A.D. Corps). The R.A.F. establishment originally consisted of 12 seconded A.D. Corps officers but during the next five years the number rose to 27, 16 of whom held permanent, and 11 temporary, commissions. These officers served with the R.A.F. for four years and were employed either whole-time on certain large R.A.F. stations or looked after several smaller stations, visiting them at regular intervals. Army uniform was worn.

These arrangements were reasonably satisfactory as an interim measure, while the strength of the R.A.F. was small, but as it increased certain disadvantages became apparent. The constant change of officers at short intervals, due to the termination of secondment, prevented the establishment of a cadre of officers with long-term experience of the particular needs of the new service. The R.A.F. was unable to select or

promote officers, or to retain those who wished to remain or were suitable for retention; this divided control resulted in inter-departmental correspondence disproportionate to the number of officers involved. It was inevitable that with such short-term service there should be a preponderance of officers comparatively inexperienced in R.A.F. dental requirements, and in Service conditions generally. In fact, half those serving with the R.A.F. had entered the A.D. Corps direct from civilian life. These objections to the existing arrangements were made, among others, in a minute to the Air Member for Personnel from the D.M.S. on March 2, 1925, in which proposals were put forward for the formation of a separate R.A.F. Dental Service. An Air Ministry committee, formed in July 1925 to investigate the proposals, recommended the formation of a separate service, its soundest argument being the estimated saving in cost. It was proposed that the new service should have a nucleus of officers with permanent commissions and that the others should be commissioned on a non-regular basis. By organising the service in this manner a considerable economy would be effected, because most of the seconded officers were regulars, and it was the intention of the Army to give all of them permanent commissions in due course.

During the next five years these proposals were investigated and amended and, though approved, were not put into action for various reasons. Delay was caused by the political and financial situation and by the need to await the recommendations of the Fisher Committee. Apart from the estimated saving in cost, there was never a very strong argument for a separate dental service, other than on the grounds of Service sentiment, so long as the strength of the R.A.F. remained low and policy was based on the assumption that there would be no war for ten years. The R.A.F. had its own medical and nursing service and, being newly formed and proud of its tradition, it wished to have its own dental service as well. The employment of officers in Army uniform on R.A.F. stations, however satisfactory the personal liaison of the officer concerned with the R.A.F. personnel, was regarded as an anomaly to be corrected. It is probable that War Office sympathy with the unexpressed sentiment behind the desire for a separate dental service had its basis in the acute appreciation of the factors involved, because the existing D.G.A.M.S. had been the first D.M.S., R.A.F., before his appointment as D.G.A.M.S. in 1926. Much of the difficulty in obtaining official approval for the new service was due to the contention that sufficient chances for promotion were lacking, but after much discussion with the Treasury, the War Office and the British Dental Association, the new branch was finally formed on July 1, 1930, with a strength of 27 officers, 3 of whom held permanent commissions, 2 full-time civilian dental surgeons, 27 dental clerk orderlies and 5 dental mechanics. Thereafter

the Chief Dental Officer at Air Ministry, who held the rank of wing commander, became responsible for the general policy, organisation, administration and postings within the service.

Under the new regulations dental officers formed a separate branch of the R.A.F. and were administered as part of the R.A.F. Medical Service. The total establishment was for twenty-seven officers, seven of whom could hold permanent commissions. The highest rank was that of wing commander, but it was proposed in due course on subsequent expansion of the service to raise it to group captain. The regulations governing age and entry, registration of qualification, etc. were similar to those of the medical branch.

On entry all officers were appointed to non-permanent commissions in the rank of flying officer for a period of three years extendible to five. Provision was also made for further extensions in certain cases up to ten years. All such non-permanent service was followed by four years in Section i of Class D of the Reserve of Air Force Officers. Ante-date of the date of commission up to six months before entry was also granted provided the officer had been employed in a full-time appointment at a recognised civil hospital. Permanent commissions were to be granted by selection provided that the total number did not exceed that necessary to maintain the posts held by officers of squadron leader rank and above.

Non-permanent officers holding a ten-year appointment were eligible for three months' study leave during their service and officers with permanent commissions seven months' study leave in the first sixteen years of service.

Officers were eligible for promotion to the rank of flight lieutenant after two years' service and those holding permanent commissions were normally granted the rank of squadron leader, irrespective of establishment, after ten years of service. Promotion within establishment to wing commander or higher rank was by selection.

Gratuities of £300, £600 and £1,200 were payable to officers holding short service commissions who had completed three, five and ten years' service. Pensions were provided for permanent officers on scales similar to, but slightly lower than those of the medical branch.

At first regulation R.A.F. uniform was to be worn without a branch distinguishing badge. Such a badge was not introduced for the Dental Branch until May 1937. The official badge was designed by the Chester Herald, Royal College of Arms and consisted of a laurel wreath with the letters D.B. in the centre and flanked on either side by heraldic wings.

The formation of the R.A.F. Dental Branch preceded the publication of the Fisher Committee's report by three years, but was in accordance with paragraph 178 of the report which was written in July

1926 and stated 'After careful consideration we do not recommend the introduction of a short service system of recruitment for dental officers serving with the Army. If in the future, however, it should be considered desirable to create a separate dental branch for the R.A.F. the committee feels that, in this case, the arguments for the constitution of such a branch on a short service basis, comparable to that now obtaining in the medical branch, carry much weight and would deserve careful consideration'. The committee did not examine the dental and nursing services in detail in their final report but recommended that the proposals regarding the medical service could with advantage be applied to them with appropriate modifications. The Air Ministry agreed to implement the recommendations for better conditions of service for the R.A.F. Medical Branch. It was realised that 'it would take some time for the promotions recommended to be effected in the proportions stated to be most beneficial, but until it was possible to obtain this theoretical maximum every attempt would be made to adhere to the character of the recommendations'. This proved to be the case even in the Medical Branch which was several times the size of the Dental Branch: in fact only four more permanent commissions were granted to dental officers between 1930 and 1938 and it was not until 1937 that the post of Chief Dental Officer was upgraded to the rank of group captain, and 1938, that a full-time Inspecting Dental Officer, Home Commands, was appointed in the rank of wing commander because general expansion had made it impossible for the Chief Dental Officer to maintain his dual role of administration and inspection. It was practically impossible to implement the proposals because of the limitations imposed by the small size of the service and the few officers established in higher ranks. The inability to introduce the recommendations of the Fisher Committee led to the non-cooperation of the British Dental Association just at a time when the Royal Air Force was beginning to expand and more recruits would have increased the strength of the service sufficiently to implement in part the promotions recommended.

The British Dental Association began to make representations to the Air Ministry in 1935, and, because they were unable to obtain the satisfaction they demanded, they refused to accept advertisements for vacancies for the R.A.F. Dental Branch in the *British Dental Journal*. The Association also advised the teaching hospitals to recommend students to consult the Association before applying for commissions in the Dental Branch. Such students were invariably informed that the conditions of service in the R.A.F. were not acceptable to the Association and that either of the other two Services offered better prospects to those who wished to make a permanent career. Reconciliation between the Air Ministry and the Association was not obtained until February 1939.

Meanwhile, plans were being made to develop reserves of officers for the whole service in common with other branches and the Volunteer Reserve Dental Branch was formed in June 1939 with an establishment of 125 officers and conditions of service similar to those of the Volunteer Reserve Medical Branch. However, recruitment was slow, and by August only 27 officers had been enrolled.

In September a further 10 officers were granted permanent commissions making a total of 16* out of an establishment which had risen to 45 officers and 51 civilian dental surgeons.

ALLOCATION OF DENTAL MAN-POWER

Some of the difficulties which might arise in time of war were foreseen by the three main dental associations in 1938 when they obtained approval from the Ministry of Health to establish, in January 1939, a Central Dental Emergency Committee to take over and re-form a National Service Register which had been compiled in several parts from questionnaires issued to every dentist practising in the United Kingdom. This committee developed a national organisation by arranging the formation of District Dental Emergency Committees in England, Wales, Northern Ireland and the Isle of Man. The Central Dental Emergency Committee for Scotland, which was formed at the same time, undertook similar duties in that country.

When war began, the Central Dental Emergency Committees became the Dental War Committees, created by the Ministry of Health and the Department of Health for Scotland at the request of the Committee of Imperial Defence, and took over the complete district organisation; they also became responsible† for the supply of personnel for the Dental Branches of the Armed Forces, the Emergency Medical Services and the filling of certain war-time appointments established by local authorities.

At the outbreak of war, the dental profession was included in the Schedule of Reserved Occupations with the proviso that volunteers could be accepted in a professional capacity at any age.‡ In the first few months the number of volunteers for Service commissions greatly exceeded the demand and a register of those desiring commissions was compiled from which all Service demands were met successfully until May 1940. The small demand for commissioned candidates in the early months of the war was due, in the main, to the fact that both the Royal Naval Dental Service and the Army Dental Corps had certain pre-war reserves upon which to call, and even the Royal Air Force Dental Branch, whose reserve had only been approved in June 1939, continued

* One of the original permanent officers had died.

† No definite terms of reference were promulgated, but the functions of the committee were resolved at its first meeting.

‡ It was unusual to accept applicants above the age of 41 years.

for several months to fill its authorised establishment by direct recruitment. There was a waiting list of over 500 applicants in February 1940, but it was not until April and May of that year that Service demands were increased substantially. An inquiry, then addressed to everyone whose name was on the list of volunteers, revealed that many who had originally desired commissions were no longer available, either because practices which had slumped at the outbreak of war had revived, or because those once free to enlist had obtained new employment. The sudden increase in demand coincident with the unexpected decrease in the available reserve revealed that an adequate supply of dentists for the Forces could not be maintained by voluntary means. The Dental War Committee, therefore, informed the Ministry of Labour and National Service, and in June 1940, the reservation covering the dental profession was removed on the understanding that the transfer of those registered under the National Service (Armed Forces) Act from civilian to Service employment was to be regulated by the Dental War Committee.

The method adopted for obtaining personnel was to allot to each District War Committee a quota which they had to fill, leaving them to select from practitioners in their areas registered for service those who could best be spared from civilian practice. Opportunities were provided for appeal both to the district Dental War Committee and to the central Dental War Committee against any decision to recommend a name for commissioned service.

The difficulties which had arisen after May 1940 in the supply of dental officers for the Services had been due in part to the fact that dentistry was a reserved occupation. However, even after the decision of the Ministry of Labour in June 1940 to remove the reservation, certain difficulties inherent in the profession remained. Before the passing of the Dentists Act in 1921, there were two classes of practitioners providing dental services to the community. The first class was entitled to registration under Section 6 of the Dentists Act of 1878 and consisted of those who had been in practice in July 1878, and of persons who had received training in dental surgery at a recognised dental school. The second class consisted of those who, without academic qualification or registration, were practising dentistry. The Dentists Act of 1921 widened the basis of registration and admitted to the register both those previously registered and, subject to the satisfaction of certain conditions, those previously unregistered whose principal occupation was the practice of dentistry, and who had attained the age of 23 years. An amending Act of 1923 permitted the registration of a small number of practitioners who were 21 years of age in 1921. As the right to practise dentistry depended upon registration, however obtained, the result of the Act of 1921 was to abolish unregistered practice and thereby create a closed profession. One effect of the Act was to bring on to the register

in 1922 and subsequent years some 8,500 dentists, the great majority of whom were over the age of 23, and many of whom were relatively older men. The number of licentiates in dental surgery in 1921 was a little below 6,000. Largely in consequence of this, the profession had a disproportionately large number of members above military age when the war began.

A table of age distribution among the profession is given below:

Age Distribution among the Dental Profession

	L.D.S.	Dentists Act, 1921	Totals
Born before 1880 . .	805	810	1,615
Born between 1880–89 .	984	1,461	2,445
,, ,, 1890–99 .	1,617	1,878	3,495
,, ,, 1899–1900	196	39	235
,, ,, 1900–01 .	225	1	226
,, ,, 1901–02 .	193	Nil	193
,, ,, 1902–03 .	204	Nil	204
,, ,, 1903–04 .	241	Nil	241
Born after 1904 . .	2,266	Nil	2,266
Totals	6,731	4,189	10,920

The number of men qualifying in dentistry per annum below the age of 40 was estimated to be between 250 and 300 and of men of over 40 years of age approximately 20. In addition there were between 40 and 60 women of all ages qualifying each year.

It became more difficult for the Dental War Committee to maintain an equitable balance between the needs of the Services and the civilian population as the number of dental officers required by the Services increased. In fact, the committee had had to refrain from nominating for commission a certain number of practitioners within the age groups covered by the National Service (Armed Forces) Act, simply because their withdrawal would have deprived sections of the population of a reasonable opportunity of obtaining dental treatment. It was realised that a review of the situation was necessary, and in March 1941 the committee formed a man-power sub-committee to prepare a memorandum on dental man-power for early submission to the Ministry of Health. The sub-committee issued its report in August 1941 and was of the opinion that officers in the Dental Branches of the Fighting Services were fully occupied and that there was no solution to the man-power problems in that direction. However, they recommended a greater use of civilian practitioners in part-time service, and consideration by the Services of the possible employment of any registered dental practitioner whether qualified or unqualified but registered under the provisions of the 1921 Act, subject to the suitability of the candidate in question. They also recommended a review of the policy of limiting the maximum age of entry into the Services, a modification in the amount of conservative

treatment necessary for enrolled personnel, and the employment of women dental officers in certain posts.

As far as the Royal Air Force Dental Branch was concerned some of the recommendations had already been accepted as policy; for instance, 140 civilian practitioners were employed part-time on a fee basis for treatment of personnel for whom no Service dental facilities were available. The part-time employment of civilian practitioners at dental centres, or the extension of the system of free treatment to aircrew recruits between medical examination and call-up, was not favoured because it was estimated that very little reduction in the amount of work of dental officers would be achieved, as control of the amount and type of work considered necessary would be difficult. Experience of the system in use had shown that much of the work done on deferred aircrew candidates, particularly of a conservative nature, had to be repeated after entry into the Service.

The Dental Branch was prepared to select candidates above the age of 41, and had been doing so if they had been proposed by the Dental War Committee. It was estimated that if the compulsory age limit was raised, a fair proportion of the men made available would be fit for commissions. It was considered important, however, to stress that the conditions of service applicable to younger men would also apply to older men and that they could not expect to be granted commissions in a higher rank purely because of their age. The Dental Branch did not agree that the regulation that a commissioned officer must hold a degree in dental surgery issued by a recognised licensing body should be amended, as it was considered that dentists without qualifications were unsuitable for the requirements of the Service.

The R.A.F. Dental Branch had already issued instructions defining, as far as possible, the amount of conservative treatment which it was possible to give with the resources available. The employment of women dental surgeons had already been under consideration and following the committee's report several* had been commissioned in the Royal Air Force for service with the Dental Branch, and not, as in the case of men, in the Volunteer Reserve.

The report of the man-power sub-committee showed that until more newly qualified practitioners were available the Forces would have to employ some dentists registered under the Act of 1921. There were many potent Service objections to the commissioning of such dentists, the main being that in the absence of a diploma or licence there was no evidence of their fitness to carry out the full duties of dental officers.

The Ministry of Health felt unable to support the Services in their objections, the more so as no Public Service at that time, except the

* Five in January 1942. The maximum strength of 21 was attained in July 1944.

London County Council who were reconsidering their decision, excluded the employment of dentists registered under the Act of 1921.

Eventually, the three Services agreed to the principle of the employment of dentists registered under the Act of 1921, provided that suitable candidates were vouched for by the Minister of Health as possessing the necessary degree of skill and experience. The Ministry of Health offered the recommendations of their Regional Dental Officers in this connexion. Finally in the autumn of 1943 it was agreed that the Services would select suitable candidates from those submitted by the Dental War Committee provided that each Service commissioned a determined quota in direct proportion to the established strengths of the various dental branches.

The decision to recruit these dentists was not, however, implemented, because soon after the acceptance of the policy the Service demands for dental officers decreased. As far as the R.A.F. was concerned all authorised establishments were filled by the spring of 1944 and it was even possible to release certain of the older officers to their former practices because the number of practitioners qualifying each year had risen to the predicted figure of between three and four hundred.

ORGANISATION AND ADMINISTRATION

AT HOME

When war began the organisation and administration of the Dental Branch was still undertaken by the Chief Dental Officer from a medical advisory department within the Medical Directorate at Air Ministry, and the duties of inspection by the I.D.O. (Inspecting Dental Officer), Home Commands, who also supervised the posting and training of dental airmen on behalf of the Commandant of the Medical Training Establishment and Depot.* The system was satisfactory because the strength of the Branch was small. Dental officers and civilian practitioners corresponded directly with the P.M.Os. of the Commands in which they worked on professional matters but all other correspondence went through the usual channels of communication. Dental treatment was provided by dental officers at stations or units, or by civilian dentists employed full-time under contract with Air Ministry.

In November 1939, when there was a general decentralisation of authority throughout the R.A.F., the duties of the I.D.O. Home Commands were confined to the training commands, and additional I.D.Os. were appointed: one to Bomber Command to undertake the dental arrangements in that command and in Maintenance and Army Co-operation Commands, and one to Fighter Command, who became responsible as well for dental arrangements in Coastal and Balloon

* Known until December 1940 as the 'Medical Training Depot'. (*See* Medical Manning: Nursing Orderlies—Formation of the Medical Training Establishment and Depot).

Commands. Dental officers of similar area duties to those of Senior Medical Officers of Groups were not established, and on purely professional matters station and unit dental officers communicated with the I.D.O. of the Command in which they were established.

In the first quarter of 1941 the Home Commands had increased to such a level that further I.D.Os. were appointed, and by July of the same year each command carried an I.D.O. on the headquarters staff and, to supervise dental training, the I.D.O. Technical Training Command was appointed Training Officer (Dental) of the Medical Training Establishment and Depot. Later an Assistant I.D.O. in the rank of squadron leader was appointed to Technical Training Command. Each I.D.O. was responsible for the dental requirements of the stations under his jurisdiction. Separate arrangements were made for Northern Ireland in August 1941, by the establishment of an I.D.O. in the rank of squadron leader to look after the various stations of the different commands. Before this date each Command I.D.O. with commitments in Northern Ireland had to make a special journey which occupied time out of proportion to the number and importance of the stations to be visited. Senior Dental Officers were also established in part-time administrative posts in the rank of wing commander at Uxbridge and Blackpool, and later at Halton, Cranwell, St. Athan and Henlow.

In September 1941 a Civilian Consultant in Dental Surgery was appointed to advise the Chief Dental Officer on matters of professional policy and treatment, particularly the care and specialised treatment of patients with maxillo-facial injuries. This consultant was also the Consultant Dental Surgeon to the Emergency Medical Services and was able in his dual capacity to arrange the post-graduate training of selected officers of the Services in the treatment of these injuries.

In October 1941, the dental department at Air Ministry became the Directorate of Dental Services with a Director (D. of D.S.) established in the rank of group captain. In November of the same year the post of assistant to the D. of D.S. was established in the rank of squadron leader. This post was up-graded to the rank of wing commander in February 1943 and five months later the rank of the D. of D.S. was raised to that of air commodore.

OVERSEAS

In September 1939, the only R.A.F. stations overseas provided with dental officers were Heliopolis, Aboukir, Aden and Singapore with one dental officer each, and Habbaniya with two. A seventh officer had just been posted to Abu Sueir but had not arrived when war began. The Army Dental Corps was responsible for providing dental treatment for the R.A.F. in India and it was agreed that, when hostilities began, they

would also be responsible for all R.A.F. personnel abroad, except at those stations which had R.A.F. dental officers. There was no need, therefore, for R.A.F. dental officers in administrative posts overseas. The disadvantage of relying almost entirely upon the Army Dental Corps became apparent in the first French campaign, when it transpired that they had accepted commitments which they were unable to fulfil conscientiously because of the very large numbers of men requiring dental treatment in their own Service. Additional R.A.F. dental officers were therefore posted as they became available to establishments abroad. In August 1941, the post of I.D.O. on the staff of Middle East Command was established, this being the first occasion on which the R.A.F. Dental Branch undertook the administration of its own service overseas.

The geographical area for which the I.D.O. Middle East was responsible was extensive and consisted of Egypt, Transjordan, Iraq, Palestine, Aden and Malta. Before long it became essential to decentralise to some extent and Senior Dental Officers of the rank of squadron leader were appointed to subsidiary formations to supervise and be responsible to the I.D.O. for the dental arrangements in their areas. These officers were not, however, equivalent to Senior Medical Officers of Groups abroad; their main function was professional rather than administrative.

These arrangements were adequate for the forces in the Middle East until the North-West African campaign in 1942, when it was realised that the dental arrangements necessary for the invasion forces could not be supervised adequately either from the United Kingdom or Middle East Command. Accordingly, a Senior Dental Officer with the rank of squadron leader was established for this purpose. In the West African Command a similar post was approved but in this instance an I.D.O. was not appointed, although the geographical area was great, because the number of dental officers serving in that Command never exceeded eleven.

In October 1943, the post of I.D.O. Middle East was up-graded to group captain and the post of S.D.O., N.W.A.A.F. up-graded to I.D.O. with the rank of wing commander. Early in 1944 the N.W.A.A.F. was embodied into the newly formed M.A.A.F. Command which included certain units formed in Middle East Command which became subordinate to M.A.A.F. in all matters of policy. Consequently, the responsibilities of the I.D.O., Middle East, diminished as those of the I.D.O., M.A.A.F. Command increased, and in March 1944, the posts were re-established as wing commander and group captain respectively. When Command Headquarters, M.A.A.F. moved from Tunis to Italy an additional S.D.O. was appointed for North Africa to supervise dental arrangements for the Transport Command units in that area.

In India, the Army Dental Corps made every effort to adhere to their programme to provide dental treatment for the R.A.F. but by May 1942

the commitments of their own Service had increased to such an extent that Air Ministry was requested to arrange for the treatment of R.A.F. personnel by R.A.F. dental officers. The original establishment authorised by the Government of India provided for an I.D.O. in the rank of wing commander but, as elsewhere, when large areas had to be administered, it became impossible for one officer to be responsible for every unit and in July 1943 the post of S.D.O., Calcutta, was established. In the autumn of the same year, five S.D.Os. were appointed, one to each Group, with similar duties to those already established in the Middle East. A month after the formation of S.E.A.C., in September 1943, an I.D.O. was posted to the Command in the rank of wing commander. In May 1944 the establishment was up-graded to group captain. When Headquarters A.C.S.E.A. moved to Singapore in 1945 the post of I.D.O. India was down-graded to wing commander.

When the 2nd Tactical Air Force was formed, the dental arrangements provided an I.D.O. in the rank of wing commander and a S.D.O. in the rank of squadron leader for each independent Group. The establishment of S.D.Os. for the Groups was ruled not so much by the distance involved as by the need to ensure against the possible difficulties of communication under active service conditions in Europe. Each S.D.O. was responsible for a team of mobile dental surgeries and a mobile dental laboratory, and was not established on the staff of the Group Senior Medical Officer.

ADDITIONAL COMMITMENTS

The Dental Branch was also responsible for arranging the dental treatment for numerous small forces scattered throughout the world. Normally only one or two dental officers were required for each commitment—for instance, Iceland, Gibraltar and the Azores.

Flying personnel trained under the Empire Flying Training Scheme in the Dominions or the U.S.A. received dental treatment from the dental services of the country in which they happened to be, with one exception—Nassau—in the Bahamas where two R.A.F. dental officers were provided.

ESTABLISHMENTS AND STRENGTHS

DENTAL OFFICERS

The establishment of dental officers at home had been assessed since 1936 on the basis of an overall ratio of 1 dental officer to 500 recruits and 1 to 2,000 fully trained personnel. Establishments abroad were arranged according to the needs of the overseas commands. The authorised war-time overall ratio was 1 dental officer to 1,500 personnel. Soon after war began it was considered necessary to adopt a more

generous scale to maintain even a reasonable standard of dental fitness for duty. Heavy arrears of work had accumulated owing to the rapid increase in the size of the force, the frequent postings of personnel, the changes in disposition of units, and the absence of any dental standard on entry. Approval was obtained in June 1940 for an increase in the overall ratio to 1 dental officer to 1,250 personnel, this scale to be reviewed at the end of the year or when strengths reached 250. This ratio remained in force with various amendments as to strengths as a basis for the calculation of demands until January 1943, when it was reduced to 1 dental officer to 1,375 personnel, at which figure it stayed till the end of the war.

The calculation, by means of an overall ratio, of the number of dental officers required was a simple administrative method of assessing future demands but it was a difficult one to apply to the actual needs of units and stations. When these were collectively located the dental manpower requirements were easily assessable, but where stations were isolated and perhaps had strengths of about 1,000 personnel, dental officers had to be established although the overall ratio was being exceeded by a considerable margin. Until 1940 dental personnel were carried on local station establishment, but this was found unsatisfactory when dental officers had to be moved to stations without establishments for them. It was therefore decided that all dental personnel would be carried on a block establishment at the Air Ministry and be allocated to stations by the Chief Dental Officer. A directive was then issued stating that units should henceforward regard notices posting dental personnel as temporary amendments to the local establishment. This arrangement proved satisfactory except in India. The usual procedure adopted was to calculate the total number of dental officers for a command on a strength basis and not on individual unit and station establishments, though this in fact was necessary to some extent when the I.D.O. arranged the distribution of dental officers throughout the command. At home it was possible for each I.D.O. to provide treatment for about 90 per cent. of the strength of the command with the available dental officers, and to arrange for the remaining 10 per cent. to obtain treatment either from mobile dental surgeries, by other means such as reciprocal aid with other Commands and Services, or on a casual fee basis with civilian dentists. Overseas, however, there were not the same facilities to cater for the residual 10 per cent. of personnel, and it was always difficult to provide them with regular dental attention. In addition, the overall ratio did not take into account the man-days wasted in the movement of dental officers to and from overseas posts. When the Mediterranean was open, the loss in man-days was comparatively small, but after the establishment of the sea route *via* the Cape, it was common for dental officers to be unavailable for work for about three months on the outward

journey, if the time is assessed from the date of beginning embarkation leave in the United Kingdom to the date of resuming duties at a station or unit abroad. A similar period of time was occupied on returning home to the United Kingdom to begin duty after disembarkation leave. The man-hours lost in movements, leave and sickness were often considerable. For instance between March and December 1944 the time lost in M.A.A.F. Command was as follows:

Cause	Days lost
Leave	326
Sickness	535
Movements	991
Total	1,852

The total time lost was equivalent to the work of 1 dental officer over a period of more than six years, a loss of 6 dental officers out of a total strength of 44, or a loss of 15 per cent. of the established strength.

The strength of dental officers holding permanent and short service commissions when the war began was 45. A further 13 dental officers

Date	Type of commission	Totals	Ratio of D.Os. per 1,000 R.A.F. and W.A.A.F. personnel	Establishment ratios
September 1, 1939	P.C. 6 S.S.C. 39 C.D.P. 51	96	1 : 1830	1 : 1500
January 1, 1940	P.C. 7 S.S.C. 40 R.A.F.O. 13 R.A.F.V.R. 118	178	1 : 1255	1 : 1500
January 1, 1941	P.C. / S.S.C. 38 R.A.F.O. 19 R.A.F.V.R. 215	272	1 : 1879	1 : 1250
January 1, 1942	—	654	1 : 1400	1 : 1250
January 1, 1943	—	809	1 : 1367	1 : 1375
January 1, 1944	—	882	1 : 1339	1 : 1375
January 1, 1945	—	909	1 : 1278	1 : 1375
July 1, 1945	P.C. 11 S.S.C. 6 R.A.F.O. 36 R.A.F.V.R. 842	895	1 : 1246	1 : 1375

P.C., Permanent Commission
S.S.C., Short Service Commission
R.A.F.O., Reserve of Air Force Officers
R.A.F.V.R., Royal Air Force Volunteer Reserve
C.D.P., Civilian Dental Practitioner.

held commissions in the R.A.F.O. and 51 civilian dentists were employed full-time under contract to the Air Ministry. Twenty-seven officers had been granted commissions in the Dental Branch of the Royal Air Force Volunteer Reserve, which had been formed the previous June, and a further 63 applications for such commissions were under review. These 63 with 48 of the 51 civilian dentists under contract were gradually absorbed into the Volunteer Reserve between September 1939 and October 1940. The three remaining civilian dentists were retained under contract as they were medically unfit for commissions.

The strengths of dental officers commissioned in the Dental Branch at certain dates are tabulated opposite.

The total wastage for the period of the war is shown below:

Killed or died on Active Service	7
Invalided	62
Prisoners-of-war	3
Transferred to Medical Branch	2
Resigned	40
Other causes	3
Total	117

The overall ratios shown in the table are for specific dates only, and, because they do not take into account the varying rates of intake at different times, they cannot be regarded as depicting the exact working rates on which the distribution of dental officers had to be arranged. They do, however, give an indication of the success of the method of assessing future requirements when it is remembered that this had to be calculated on estimated future strengths which were invariably different from the actual strengths on the dates for which the calculations were made.

Training. Dental officers were posted on entry to the Medical Training Establishment and Depot for a preliminary course of instruction on Service life and procedure which, until August 1939, lasted six weeks and was taken in conjunction with that of newly joined medical officers. Instruction on purely dental technical administration was given by the Senior Dental Officer of the Dental Centre at Halton. The average number on each course before the war was two or three, but the intake was increased when war began to an average of about eight dental officers per course, and at the same time the length of each course was reduced to a fortnight and then to one week. After completion of the course, officers were posted for duty to large dental centres for a period varying between three and twelve weeks to become familiar with the

work in the Service, after which they were liable to be posted as officers in dental charge of small stations.

Until sufficient equipment could be obtained, the complement of officers at certain multi-surgery dental centres had to be increased beyond authorised establishments. Dental officers worked in shifts which resulted in the extended use of each surgery, but, conversely, each dental officer was unable to work a full day. The posting of newly joined officers to such centres increased the working capacity of each centre, while it provided time for extra instruction to be given by the Senior Dental Officer and his staff.

Maxillo-facial injuries. Dental officers were able to attend, by arrangement with the War Office, the course of instruction lasting ten days at the Army School of Dental Instruction and the Military Hospital, Aldershot. The first three officers to attend such a course were posted for instruction in October 1940. In later courses the average number of R.A.F. dental officers attending was raised to five, and by the spring of 1944, when the school ceased instruction on the approach of D-day, 337 R.A.F. dental officers had attended.

In August 1941, selected medical and dental officers were attached for a fortnight's course to Queen Victoria E.M.S. Hospital, East Grinstead, so that on subsequent posting they could treat the minor maxillo-facial injuries which were not of sufficient severity to be transferred to the already established maxillo-facial units of the Queen Victoria Hospital, East Grinstead, Hill End Hospital, St. Albans, and Park Prewitt Hospital, Basingstoke.

Meanwhile, the policy of providing maxillo-facial centres at the R.A.F. General Hospitals at Ely, Halton and Cosford was under discussion and in February 1942, approval for the formation of the centres was obtained. Arrangements were made to attach selected medical and dental officers to the Queen Victoria Hospital, East Grinstead, and later to St. Albans and Basingstoke Hospitals for a long course of training lasting between six and nine months. Teams consisting of a plastic surgeon, a dental specialist, an anaesthetist and a specially trained dental mechanic were stationed at each R.A.F. hospital mentioned above on a mobile basis, for treating casualties in their own and other R.A.F. hospitals within a reasonable distance when it was impracticable to move the patient to a special centre. The first R.A.F. maxillo-facial centre was opened at Ely on June 13, 1942. The centres at Cosford and Halton opened in October of the same year.

As an interim measure the short two-week course of training at East Grinstead was continued and was found so successful that further courses were held until, by the spring of 1944, two hundred and twenty-five officers had received instruction. During the operations in Europe the courses lapsed, but three dental officers were attached in December

1944 for more advanced training, and in January 1945 the short courses restarted and were continued until June 10, 1945, when 44 more officers had received training.

Dental prosthesis. The standard of denture work among newly qualified dentists in the Service was found to be lower in war-time than that usually demanded under peace-time conditions. The principal cause was the limited clinical experience of such officers due to the evacuation of the dental schools to less populous areas and the consequent smaller number of patients available to students. This in itself might have necessitated the introduction of some form of training in denture work for those relatively inexperienced, but the introduction of acrylic resin and the new procedures necessary for the manufacture of dentures in this material made some form of instruction essential even for experienced dental practitioners. Accordingly, on June 30, 1942, a course in dental prosthesis lasting one week was instituted at the Dental Centre and Central Dental Laboratory at Uxbridge. Four officers were trained at a time and, by the end of 1944, 368 had attended the courses.

Anaesthetics. Courses lasting fourteen days began on May 19, 1942 for selected officers and were held at various R.A.F. hospitals and at the Radcliffe Infirmary, Oxford; ninety-three officers had received training in anaesthetics by the end of 1944.

Hospital dentistry. A course, lasting one week, in hospital dentistry was started in late 1945 at R.A.F. Hospital, Cosford, to acquaint dental officers, particularly those in charge of large dental centres, with the more recent advances in minor oral surgery. Forty-three officers in all attended these courses.

Advanced prosthesis. This course was held at Uxbridge and was complementary to the post-graduate course in dental prosthesis. Instruction included advanced dental prosthesis, the technique of in-lay and bridge work, the construction of jacket crowns and other dental surgical technique. The first course was held shortly after V.E.Day and was attended by six officers; a further 115 officers received instruction thereafter.

DENTAL MECHANICS

Pre-war there was no definite establishment for dental mechanics, the numbers being decided on the amount of work to be done. In 1935, when the strength of the Royal Air Force was approximately 35,000, with 25,000 of this number in the United Kingdom, nine dental mechanics were employed at the Central Dental Laboratory, Uxbridge. During the expansion period the intake was one dental mechanic to approximately 3,000 personnel. When war began the strength of this section of the Dental Branch was 20, including 3 who had been recalled from the Reserve.

Before the war only those who had completed their apprenticeship and had achieved a high degree of skill, including proficiency in metal work, were accepted as dental mechanics in the Royal Air Force. On entry a trade test lasting several days had to be undertaken by all would-be entrants and those who were successful were enlisted and mustered as A.C.2 in trade Group 'M' and reclassified the following day as A.C.1. After a three-months' disciplinary course at Uxbridge they were reclassified if satisfactory as L.A.C. Promotion to corporal was made after twelve months' satisfactory service provided the rank of L.A.C. had been obtained on the previous reclassification.

A similar system was followed for the first few months of the war, except that the trade test was simplified, and as the establishment was increased new Auxiliary Dental Laboratories were opened. The standard of would-be entrants fell steadily until it became very difficult to obtain men with sufficient skill and experience. The standard within the Service had to be maintained, but to safeguard it, and at the same time obtain sufficient men, presented a problem because it was difficult to re-muster mechanics if later they were found to be unsatisfactory after they had been accepted in the trade. To overcome this difficulty a new trade of 'Dental Mechanic under Training' was introduced in June 1941, when less than 10 per cent. of would-be entrants were found competent to pass the prescribed trade test on direct entry. Those who failed to obtain the necessary marks for direct entry were classified as either suitable or unsuitable for training. The majority of the Dental Mechanics under Training improved so rapidly with competent supervision that they could be re-mustered as full dental mechanics after an average period of about two months' training. The amount of work of which these men were capable was relatively small until they had gained further experience. It was the policy of the Branch to let them improve their output in their own time, as experience has shown this to be the most profitable procedure in the long run. In 1944 promotion to corporal was awarded only after twelve months' satisfactory service as L.A.C.

The number of dental mechanics in the Branch at various dates is tabulated below:

Strengths of Dental Mechanics

Date	R.A.F.	W.A.A.F.
September 1, 1939	20	—
January 1, 1940	26	—
January 1, 1941	77	—
January 1, 1942	137	—
January 1, 1943	258	—
January 1, 1944	320	—
January 1, 1945	332	2
July 1, 1945	325	2

DENTAL CLERK ORDERLIES

Before the war dental clerk orderlies entered the Service by direct recruitment, enlistment being for nine years, at the end of which extension could be obtained for a further three years or for the full period of twenty-four years to qualify for a pension.

On entry men were classified as dental clerk orderlies (under training) and were posted to the Medical Training Establishment and Depot at Halton for a three-months' course on discipline and general administration. After completing this course they were posted to Uxbridge for special training in work in a surgery and in dental centre routine for a further period of five months at the end of which they were trade tested and, if found satisfactory, re-mustered to dental clerk orderly.

The career offered and the rates of pay given varied from time to time as the trade was incorporated in Groups III, IV and V at various dates. In October 1936, the conditions of service and pay were improved by the formation of a separate Group—Group 'M'—including all medical and dental trades. When war was declared all new entrants were enlisted in the Royal Air Force Volunteer Reserve.

The establishment of dental clerk orderlies was based on a figure of one for each dental officer or civilian dental surgeon, and two for duty with the Chief Dental Officer at Air Ministry, but because of the manning deficiency in the trade, vacancies were filled by the employment of civilians.

In August 1939, when it was realised that the man-power situation was likely to deteriorate further with the rapid expansion of the Service, it was decided to include the trade of dental clerk orderly among W.A.A.F. trades and to fill establishments over and above the basic male establishment of 150 by full W.A.A.F. substitution at the rate of three W.A.A.F. to two R.A.F. dental clerk orderlies. In the autumn of 1941 the ratio was decreased to a one to one basis.

It was naturally inexpedient to continue training on peace-time standards after war began and the course for male orderlies was therefore reduced to one month. After the move of the Medical Training Establishment and Depot to Harrogate in June 1941, the School for Dental Clerk Orderlies was opened as an integral part of the establishment, training being divided into two parts. Part 1 training was given at the School, and consisted of lectures on dental administration and the casting of impressions and the construction of bite blocks. The length of Part 1 training for the first five months after the School opened was two weeks, but in November 1941 it was increased to three weeks and the School was enlarged to take three classes each of twelve trainees. When the School moved to Sidmouth and became the Dental Training School only one course was held at a time with a maximum of sixteen trainees. From this date until June 1945, when the School moved back to Halton, the

three-week period of training was maintained, but afterwards, because of demobilisation, it became necessary to shorten the course to two weeks and increase the number of trainees on each course to thirty-two, two classes being run concurrently. It was soon realised, however, that the two-weeks' course was insufficient to train men for their Part 2 training and in September of the same year it was re-established at three weeks.

On completion of Part 1 training at the Dental Training School, orderlies were posted to the large dental centres for their Part 2 training which consisted of practical work in a surgery and general dental routine and administration. This training lasted for five weeks at the end of which the men were trade tested, and if satisfactory, re-mustered.

When W.A.A.F. personnel were first enlisted there were no facilities for their training. Most of those originally selected had been dental surgery assistants or dental receptionists in civilian life, while others had been selected at W.A.A.F. Recruiting Depots as suitable for the trade. At first, these airwomen were posted to the large dental centres where they were given *ab initio* training, usually for about three months, before being trade tested. Ultimately, when the intake was large enough, a regular course of training for W.A.A.F. dental clerk orderlies was instituted at Uxbridge lasting one month. After the move of the Medical Training Establishment and Depot to Harrogate both W.A.A.F. and R.A.F. received similar training.

All trainees were re-mustered from dental clerk orderly (under training) to dental clerk orderly in the rank of A.C.2 or A.C.W.2. Reclassification to A.C.1 or A.C.W.1 was made after three months' satisfactory service as a dental clerk orderly subject to sufficient marks being obtained at the local trade test board. Reclassification to L.A.C. or L.A.C.W. was made by district trade test boards which were convened as necessary by the Training Officer (Dental).

Dental Clerk Orderlies (Service and Civilian)

Date	Male	Female	Totals
September 1, 1939 .	53	4*	57
January 1, 1940 .	64	96†	160
January 1, 1941 .	151	128‡	279
January 1, 1942 .	165	468	633
January 1, 1943 .	135	635	770
January 1, 1944 .	253	677	930
January 1, 1945 .	290	657	947
July 1, 1945 . .	292	594	886

* Shown as dental orderly
† Shown as dental surgery attendant
‡ Shown as dental clerk orderly

On September 1, 1939, there were fifty-three dental clerk orderlies and four W.A.A.F. dental clerk orderlies. The total strengths employed in this trade at various dates are shown opposite.

In the spring of 1942 it became obvious that the increased commitments of the Dental Branch overseas, the necessary replacement of tour-expired personnel, and the manning of mobile dental surgeries could not be met with a basic male establishment of 150 and the figure was therefore increased to 225. Later it was also found necessary to employ W.A.A.F. dental clerk orderlies on mobile dental surgeries and it was stipulated that in these cases a W.A.A.F. driver was also to be employed. This proviso was removed in 1944.

In June 1943, it became necessary to increase the establishment to 325* but even with this increase there was insufficient male man-power to fill establishments overseas. Many who entered for training as dental clerk orderlies were found unfit for overseas service, or unsuitable for training for some other reason. It was pointless to train those male personnel who were unfit when replacements were required essentially to meet overseas commitments. An attempt to meet the deficiencies was made in the Middle East by the local recruitment and training of women. The experiment was unsuccessful and only four were enlisted. Few women with the requisite standard of intelligence or education were available because most of them had already enlisted in other branches of the W.A.A.F. or in the other Services. In June 1944 authority was obtained for the drafting of W.A.A.F. personnel to the Middle East and in October of the same year to India. Unfortunately, these airwomen could only be employed on stations where other W.A.A.F. personnel were already established and this restricted the number which it was possible to post to these countries. In addition, as W.A.A.F. could not be posted to the less congenial stations, it resulted in male dental clerk orderlies spending an undue portion of their tour in uncongenial localities. This had to be accepted but it gave rise to discontent among male personnel in the trade.

When the establishment was raised in June 1943, it was agreed that dental clerk orderlies could be obtained by re-mustering from the trade of A.C.H./G.D. but this was stopped in the summer of 1944 because that trade was also under-manned. This decision was later reviewed and relaxed provided that volunteers for re-mustering were fit for overseas service. Direct recruitment had for some time been confined to personnel who were not above the medical category of Grade 2. Recruiting in the trade was stopped altogether in November 1944, although a certain number of re-musterings from the trade of A.C.H./G.D. were still permitted.

* The increased establishment allowed for an extra dental clerk orderly for each I.D.O., multiple surgery dental centre and dental laboratory.

DENTAL HYGIENISTS

The employment of dental hygienists to carry out minor dental treatment, such as the scaling and polishing of teeth, and to provide instruction in the care of the gums and general oral hygiene has long been recognised in America, where special courses of training, lasting between one and two years, have been provided by many Dental Schools for those who wish to obtain a diploma as a dental hygienist and to practise under the general supervision of a registered dental surgeon.

In the United Kingdom the Dentists Act of 1921 forbade the practice of dentistry by anyone not duly registered, but Clause 1, paragraph 3 (*c*) of the Act states:

> 'Nothing in this section shall operate to prevent . . . the performance in any Public Dental Service of minor work by any person under the personal supervision of a registered dentist and in accordance with conditions approved by the Minister of Health after consultation with the Dental Board to be established under this Act.'

In 1928–9 the Dental School of University College Hospital instituted a course of training for 'dental assistants' with a class of twelve women. After passing the prescribed examination some of them were employed by a few County Councils in their school clinics. However, the scheme was abandoned because of opposition within the dental profession itself and the difficulty of interpreting what constituted 'minor dental work' within the meaning of the 1921 Act.

In 1941, the arrears of work for dental officers were so great that the Consultant in Dental Surgery suggested the employment of dental hygienists in the Royal Air Force. A plan of training was prepared by the Training Officer (Dental) and forwarded to Air Ministry. It was proposed that selected W.A.A.F. dental clerk orderlies should be given a special course of training in the scaling and polishing of teeth and in demonstrating to patients the principles of oral hygiene, after which, if a sufficiently high standard of competence had been acquired, they would be re-mustered as dental hygienists and work in dental centres under the supervision of a dental officer.

The plan received the warm approval of the D.G.M.S. and was forwarded to the Minister of Health for sanction to implement the scheme. It transpired that the Act of 1921 did not bind the Crown, and therefore formal sanction was unnecessary. It was suggested, however, that the dental societies should be informed of the plan and their reactions ascertained. Accordingly, a conference was convened at Air Ministry at which the Minister of Health, the British Dental Association, the Public Dental Services Association, and the Incorporated Dental Society were represented. Discussion at the meeting was concerned mainly with the interpretation of the phrase 'minor dental work', the safeguards to be observed, and the details of training. After further

consideration the British Dental Association and the Public Dental Services Association expressed great interest in the scheme and stated that they were not opposed to the introduction of dental hygienists within the Service and asked that they might at a later date see the training in process. The Incorporated Dental Society did not favour the introduction of semi-skilled personnel in the profession, but stated that in view of the legal position they did not propose to offer any active opposition to the inception of the scheme.

These preliminary discussions, and the formation of the new W.A.A.F. trade of dental hygienist, took longer than had been expected and it was not until December 1942 that the provisional establishment of fifty dental hygienists in the rank of sergeant was approved. It was proposed to train these women at the rate of twelve every three months. Personnel were to be selected from fully trained W.A.A.F. dental clerk orderlies holding L.A.C.W. rank. The first course began in January 1943, trainees being selected by a special board consisting of the Consultant in Dental Surgery, the Training Officer (Dental), the Officer in Charge, Dental Training School and the Senior Dental Officer, Uxbridge.

The syllabus of the course provided for tuition in anatomy, physiology, dental anatomy and physiology, first aid, nutrition and dietetics, pathology, dental surgery, X-rays, oral hygiene and the theory and practice of scaling and polishing teeth. After the necessary degree of skill in the manipulation of instruments had been obtained by preliminary experience in wax carving and the scaling and polishing of teeth in dummy heads, practice was continued by the scaling and polishing of each other's teeth. Further practical experience was obtained on volunteers from personnel on the station. Throughout training there was strict supervision by the Inspecting Dental Officers. After a twelve-weeks' course trainees were examined in theoretical and practical work and if found satisfactory re-mustered and promoted to the rank of sergeant.

The first five trainees to be re-mustered set a very high standard. This standard was maintained for subsequent courses irrespective of the numbers who failed for one reason or another. The work of the new trade proved very valuable to the Service, not only in its practical application but also in promoting among personnel an appreciation of the importance of oral hygiene and its relation to general health.

The numbers of dental hygienists employed at various dates is given below:

Dental Hygienists

Date	Strength
July 1, 1943 .	5
July 1, 1944 .	25
July 1, 1945 .	39

ACCOMMODATION

Until 1939 Halton, Cranwell and Uxbridge were the only three R.A.F. stations with multi-surgery dental centres. At Halton there was a separate dental block consisting of four surgeries; at Cranwell there were two dental centres, one with one surgery and one with two. Uxbridge had a modern dental centre which had been completed in 1938 comprising ten surgeries and the necessary administrative offices, stores, waiting and X-ray rooms, and the Central Dental Laboratory which had bench space for fifty dental mechanics and contained ancillary rooms for plaster work, polishing and processing. On nearly all other R.A.F. stations a dental surgery was incorporated in the station sick quarters building. The equipment and facilities provided were up to date and of excellent quality.

Further multi-surgery dental centres were under construction at large stations such as Cosford, Hednesford, Kirkham, Padgate, Weeton and St. Athan which were being built to accommodate the increasing intake of personnel into the Service consequent upon the expansion schemes. These centres were sometimes attached to, or were placed near, station sick quarters or station hospitals and consisted of five surgeries each with the necessary offices.

The construction and design of dental surgeries during the war was governed by the amount and quality of building materials available, and by the policy concerning the layout of the various types of station. Those constructed before the war and those completed in 1940 and 1941 were usually placed in buildings with brick cavity walls. When materials were scarce and hutted stations consisting of various types and designs of huts were built, the surgeries were usually constructed of the same materials used for other accommodation on the station. The various types of huts used, though of a temporary nature, were generally satisfactory, and usually of easy access to patients. Surgeries installed in Nissen type hutting were less satisfactory because the curved shape of the building limited the size of the dormer windows which were used. Later in the war, type design dental centres were made of single brick or breeze block construction and were satisfactory except for their siting. The acceptance of the policy of dispersal on stations often resulted in centres being placed away from the communal or working sites for distances up to three miles. Attendance for dental treatment at such stations inevitably caused considerable wastage in man-hours and also probably resulted in a falling off in voluntary attendance because of the distances involved. This difficulty was never satisfactorily overcome, as approval to build new dental centres on the communal or technical sites could not be obtained unless the distance between station sick quarters and the technical site exceeded three miles. Where this condition did not apply and the siting of the dispersed dental centre was really

unsatisfactory, it was occasionally possible, as a measure of expediency, to convert a portion of the medical inspection room to dental use.

Dental accommodation was normally provided on a basis of a one-surgery dental centre for a station with a strength of up to 2,000 personnel, two surgeries for a station with 2,000–3,000 personnel, and three for stations with strengths between 3,000 and 4,500, but until construction kept pace with demand these ratios could not be realised. When a dental centre could not be built before the station was occupied, requisitioned houses were often converted for use, as on certain Technical Training Command stations. Extra accommodation in addition to an already existing dental centre was often obtained in this manner because it was not always possible to enlarge these centres, as at Halton, where two more surgeries were added. Occasionally, married airmen's quarters were converted into additional dental surgeries, as at St. Athan, Henlow and Ford.

Dental accommodation overseas depended upon the permanency of the station and the facilities available. Surgeries on the well-established stations were of the same high quality as those to be found in the United Kingdom. During mobile warfare it was possible with the equipment provided to establish a surgery in almost any locality. It was customary to use requisitioned buildings or huts and, when such accommodation was not available, tents. Both at home and overseas use was also made of mobile dental surgeries and laboratories* either of standard type design or of local manufacture. Descriptions of some of these units will be found in Appendix A.

DENTAL EQUIPMENT

The standard dental equipment in the Royal Air Force was an efficient and comprehensive outfit which contained all the essentials that might be required by a dental surgeon. Unfortunately, when war began, the reserve of supplies was insufficient to meet more than a part of the increased demands. This, followed by the transfer of skilled tradesmen employed on the manufacture of dental equipment to war industry, resulted in an acute shortage of equipment until 1942–3.

For the first three years of the war supplies were purchased by the Medical Stores Department (M.A.3) of the Medical Directorate on the advice of M.A.6. Demands were sent by M.A.3 to the Medical Stores Depot at Hartlebury, which held and dispensed all medical and dental equipment. In January 1942, a dental quartermaster was established in the rank of warrant officer† at Hartlebury to supervise the administration of supply and despatch of dental equipment.

* Mobile dental surgeries were known as Mobile Dental Units (M.D.Us.) and mobile dental laboratories as M.D.Ls.

† This post was upgraded to flying officer in August 1943 and to flight lieutenant in 1945.

On the formation of the Ministry of Supply in 1942, a special Directorate, the Directorate of Medical Supplies, was established within that Ministry to undertake the purchase of all medical and dental equipment for the military and civilian services, and for the Dominion Governments. Demands, after receiving financial approval, were forwarded to the Ministry of Supply where bulk demands were prepared for all services and governments, tenders requested and contracts arranged. Small items of specialised equipment, or demands which were not likely to be repeated, up to a value of £100, or in particular instances £250, were still obtained by local purchase by M.A.3.

The centralisation of all demands gave the Ministry of Supply a difficult administrative problem to solve because of the great variety of equipment requested. At one time no less than 3,000 patterns of dental equipment alone were being demanded. Early in 1942 a conference attended by representatives of the bodies concerned discussed the adoption of a standardised scale of as few varieties of instruments as possible. After further talks between the three Services agreement on a standard scale was obtained. This scale was very similar to the scales of dental equipment already in use in the Royal Air Force and little amendment was necessary. The particular needs of each of the Services were supplied over and above this agreed scale through the power of local purchase held by the respective Service departments. The immediate result of such an agreement was an increase in the output of equipment, which, with the more balanced distribution possible under central control, enabled most demands to be met in full in 1943. As far as the Royal Air Force was concerned, the increasing supply of equipment enabled the Dental Branch to discontinue altogether the 'shift' system of working and thereby utilise more fully the man-power available.

Even though a standardised scale was approved, certain items of equipment formerly obtained from overseas, for example: caulks crownforms, were unobtainable. The scarcity of contra-angle hand-pieces was also a real problem for the whole profession. Manufacturers were unable to supply them in sufficient quantity, or to obtain suitable materials of pre-war quality to guarantee that those they supplied would stand up to Service use. Furthermore, they were unable, without considerable delay, to undertake the repair of hand-pieces. It was decided therefore, to undertake the repair of hand-pieces in the Service and a repair shop was opened at the Central Dental Laboratory, Uxbridge, under the supervision of a non-commissioned officer who had received special training in the workshops of the Amalgamated Dental Company and the Dental Manufacturing Company.

New equipment was added to existing scales from time to time; for instance, in March 1942 an emergency outfit for the first-aid treatment

of maxillo-facial injuries was designed with the assistance of the staff of the E.M.S. Maxillo-Facial Unit at East Grinstead. Later the equipment was packed in a canvas satchel and adopted as a standard part of the field scale of equipment. Dental bone-operating instruments were also supplied for large dental centres and a small emergency dental case was designed for troopships which carried no dental officers, and on which emergency dental treatment was provided by a medical officer who had received a short course in emergency dental treatment before being employed on trooping duties.

The new scales were as follows:

Scale D.1. —Dental surgery equipment.
Scale D.1a.—Dental surgery equipment for a dental hygienist.
Scale D.2. —Dental anaesthetic equipment.
Scale D.3. —Dental laboratory equipment.
Scale D.3a.—Extra laboratory equipment for a maxillo-facial laboratory.
Scale D.4. —Field dental surgery outfit.
Scale D.5. —Field dental mechanical laboratory outfit.
Scale D.6. —First-aid maxillo-facial outfit.
Scale D.7. —Scale of X-ray equipment.

Up to 1944 the scales of dental equipment included scale D.1, for dental surgeries, and scale D.2, dental anaesthetic equipment. Scale D.3 for dental laboratories had been prepared but not incorporated in A.P.132.* The field dental outfit and the field mechanical outfit were based on the A.D. Corps scale of equipment and were also not incorporated in A.P.132.

The equipment for static dental centres overseas was based on the home scales. Equipment for mobile dental centres was based on the A.D. Corps field equipment scales. The field dental outfit consisted of a number of wicker and canvas panniers and one wooden box. It was found that the equipment was unsatisfactory in hot humid climates and in South-East Asia a very large proportion of all equipment was found unserviceable on arrival. The main reason for this was the poor off-loading facilities at the ports of discharge which resulted in a maximum amount of manhandling by inexperienced stevedores, the occasional immersion of whole cases of equipment in sea water, bad storage conditions, high humidity and depredation by termites. It was realised that a new tropical scale of equipment was needed and in 1944 an investigation was carried out at Royal Air Force Physiological Laboratory, Farnborough, into the whole question of the packing and preservation of various items of equipment. Information on serviceability was obtained from the Canadian Dental Quartermaster, the War Office, various manufacturers, dental practitioners and dental officers who had worked in the Tropics, and the Ministries of Supply and Aircraft Production. A

* *See* Chapter 8.

new outfit called the 'Tropical Field Dental Outfit' was designed. Some of the equipment provided in the 'Field Dental Outfit' was omitted but equipment for treating maxillo-facial injuries was added. The whole outfit consisted of four wooden cases, each capable of being manhandled in the jungle, and every perishable item was specially treated before being packed in a transparent waterproof covering. (See Appendix B.)

The equipment for static dental centres overseas was based on the home scales. Equipment for mobile dental centres was based on the A.D. Corps field equipment scales and was known as the 'Field Dental Outfit', and the 'Field Dental Mechanical Outfit'. Initial issues of stores and equipment for dental units overseas were made from Royal Air Force sources in the United Kingdom. Subsequent supplies were obtained from Army Medical Supply Depots. Such an arrangement was satisfactory so long as the number of Royal Air Force dental units abroad was small, but as the strengths increased, as in the Middle East in 1942–3, small errors in the preparation of demands were often made by newly joined officers who, though familiar with Royal Air Force procedure, had yet to master the Army system of accountancy. Forms incorrectly rendered were returned for correction through both Services. This was normally time-consuming; and when units were on the move new situation reports of Royal Air Force units seldom arrived in time at the Army Supply Depots for the equipment demanded to be despatched to the new addresses. In such circumstances the provision of supplies tended to be difficult. The Army authorities endeavoured to maintain a satisfactory service but the system of administration of supplies by the method of individual demands became unwieldy. It was decided, therefore, in February 1943, to open a Royal Air Force Stores Sub-depot whose function was to receive from the Army bulk supplies of dental stores and to issue them as necessary using the Royal Air Force system of accountancy. The most convenient sites from the point of view of transport could not be used and the depot had to be established at No. 22 Transit Centre, Almazar, in semi-permanent buildings. The depot opened in March 1943 and despite difficulties of transport and accommodation proved to be a most efficient organisation. The experience gained in the operation of such an intermediate stores organisation demonstrated the advisability of establishing similar sub-depots elsewhere and in May 1945 one was opened in Calcutta for the Royal Air Force units in S.E.A.C. From the view-point of the dental officer the result of having an R.A.F. stores depot on which to draw was to make him independent of the fluctuating supplies in the Army Depots.

The sub-depot at Almazar functioned without incident until May 1945 when it was flooded, with a large area of the surrounding desert, to a depth of three feet. However, by the end of May the damage had been repaired and the depot re-opened.

Equipment which could not be obtained from Army sources was obtained by air from the United Kingdom. The only items of local manufacture that were used were burrs made in Palestine, and plaster-of-paris produced in Egypt. Neither of these was satisfactory; the burrs were made of steel without a tungsten content and did not stand up to any wear, and the plaster-of-paris was friable and could not be used in the processing of dentures on models.

DENTAL NARRATIVE

GREAT BRITAIN

It was not possible either during the war or in the immediate pre-war years to ensure that all R.A.F. personnel were made dentally fit and maintained in that condition. The facilities at the disposal of the Dental Branch were limited, and the choice lay in providing a uniform service for all personnel, or in concentrating on the maintenance of a higher standard of dental fitness among flying personnel at the expense of ground personnel. As a higher standard of general fitness was required by aircrew the latter policy was adopted. However, every endeavour was made to provide ground personnel with sufficient treatment to eradicate oral sepsis.

At the beginning of the war it was at first impossible to provide the full amount of treatment required even by flying personnel. This resulted in complaints from operational training units that the necessity for carrying out further dental treatment was interfering seriously with training. To overcome this the system of providing treatment for deferred flying personnel was introduced in July 1940, and it was provisionally agreed that each of the Initial Training Wings was to have a five-surgery dental centre with a senior dental officer of squadron leader rank in charge. The system of providing treatment for deferred aircrews was not wholly successful because as much as 30 per cent. of the work completed outside the Service had to be re-done after entry. The plan for the provision of multi-surgery dental centres at Initial Training Wings could not be implemented until the end of 1942 because of the shortage of man-power and equipment.

In addition to the establishment of these new centres, the centre at No. 3 Air Crew Reception Centre, at Regent's Park, was expanded until eleven dental officers and four dental hygienists were employed. It was found possible at this centre to do all necessary extractions and to provide satisfactory treatment for a proportion of those requiring urgent attention.

A similar state of affairs to that pertaining to aircrews existed among ground personnel who arrived at operational stations with arrears of dental work still to be done. This difficulty was overcome by the provision of multi-surgery dental centres at recruit centres. Multiple centres

were also provided at all the large stations in Technical Training Command.

During the period in which the above facilities were being established it became very difficult to ensure that personnel posted overseas were dentally fit before embarkation. The movement of troops was kept most secret and the posting of men for overseas service was often sudden. Although in later years any necessary treatment had been largely completed before posting to an operational unit, it frequently happened in the first two years of the war that drafted men had to be retained to complete treatment. In order, therefore, to avoid any dislocation of troop movements, it was decided that no one would be held back from an overseas draft on account of dental disability unless, in the opinion of the dental officer, the disability was likely to have a detrimental effect on the general health of the person concerned within a reasonably short period.

The general organisation and administration of the branch at home was satisfactory. The introduction of special centres and of post-graduate courses of instruction enabled dental officers to obtain specialists' or consultants' opinions without difficulty, and, at the same time, be trained in the treatment and recognition of certain types of injuries. However, outside the normal organisation there were many small isolated units for which dental provision was difficult to arrange. These units were seldom close to Service dental centres, nor were they often within reasonable distance of a civilian practitioner. As the strength of the R.A.F. increased and more small units were formed, particularly in No. 60 Group, it was decided that the only method of providing dental treatment for such units was by regular visits from a dental officer equipped with a mobile surgery.

The first Mobile Dental Units were introduced into the Service in February 1941, the first six being established in No. 60 Group. These provided units with dental treatment at least twice a year. All prosthetic and denture work was carried out centrally at the dental laboratory at Henlow. As more M.D.Us. became available I.D.Os. were instructed to review the requirements of their commands and to list those units which would benefit from visits by the mobile surgeries. The reports showed that so long as the M.D.Us. were established on a command basis there would be duplication of itineraries and a wastage of man-power. Accordingly, in November 1941, it was decided that the administrative control of all M.D.Us., other than those in No. 60 Group, would be the responsibility of the I.D.O., Maintenance Command. A year later those of No. 60 Group were also placed under his control.

At first M.D.Us. were established at stations most suitable for their servicing irrespective of commands. This system resulted in much inter-command correspondence and in mid-1942 all units were established on

a geographical basis at salvage units of No. 43 Group, Maintenance Command. The maximum number of M.D.Us. employed in the Command was twenty-seven, but the average number in constant use varied between twenty-one and twenty-five.

The difficulty of providing dental treatment for small units was overcome, but commitments were increased elsewhere. Visits were made to each unit at least twice a year and the number of persons for whom dental treatment was made available in this way varied between 30,000 and 35,000. The total amount of work done each year by the dental officers on circuit was comparable, except for denture work, to that accomplished by other officers in the branch. However, as the average strength of each small unit varied between 80 and 200 personnel and the overall establishment of dental officers was authorised at ratios between 1 : 1,250 and 1 : 1,375 personnel, emergency treatment and treatment for those reporting dentally sick for the remaining thousand-odd personnel during the periods between visits had to be provided by other means. The extra work which had to be undertaken in this manner was not taken into consideration in computing establishments on the basis of an overall ratio.

MIDDLE EAST

When war began there were only five dental officers in the Middle East, an area which included Egypt, Transjordan, Palestine, Aden and Malta. This number gradually increased and by the summer of 1944 the established strength was over 100. However, this increase in strength was insufficient to keep pace with the expansion of the Service as a whole in this theatre of war. The general shortage of personnel throughout the Dental Branch was reflected to a greater degree in overseas commands, and in the Middle East in 1941 the ratio of dental officers to all personnel was 1 : 4,000. In such circumstances the provision of dental treatment had necessarily to be confined to essential requirements, and, even then, large distances had often to be travelled by patients requiring treatment. For instance, until a dental centre was opened at No. 107 M.U., in the Canal Zone, it was not unusual for patients to travel eighty miles to Abu Sueir for treatment. By the end of 1942, the ratio had improved to 1 : 2,000, and by November 1943 to 1 : 1,500 personnel. Unfortunately, when the ratios of dental officers to personnel became reasonably satisfactory there was a shortage of dental clerk orderlies and dental mechanics, and some officers had to work without orderlies. In consequence, full benefit could not be derived from the increased number of dental officers.

After the establishment of the post of Inspecting Dental Officer to the Command in August 1941, senior dental officers were appointed to

Nos. 203, 207 and 214 Groups, and later to Nos. 201, 206 and 216 Groups. By December 1942 all the larger units had dental clerk orderlies and three dental mechanical laboratories were operating at Heliopolis, Kasfareet and Aboùkir, and a fourth, at Almazar, was opened early in 1943.

The campaign in the Middle East after Italy entered the war had three main phases: the winter offensive of 1940 which resulted in the destruction of the Italian Army in Africa; second, the winter offensive of 1941 which ended in the withdrawal to El Alamein; and third, the offensive of October 1942 which, with the invasion of North-West Africa, culminated in the destruction of enemy forces on the African continent.

During the first phase shortage of personnel and equipment precluded the provision of adequate dental facilities. As the offensive developed forces were scattered over an area which extended from Alexandria, some 700 miles west to Benghazi. There were only two dental officers to provide treatment, one with No. 21 M.R.S. and the other with the light bomber squadrons near rear headquarters.

The A.D. Corps provided emergency treatment for patients of Royal Air Force units but dental provision in the Army at that time was also severely affected by the rapidity of the advance and of the subsequent retreat. The shortage of dental personnel continued and little further provision could be arranged for the winter offensive of 1941 except for a mobile dental surgery and laboratory which had been loaned by the South African Medical Corps in November 1941 to provide dental treatment for the South African squadrons which were operating with the Royal Air Force. This was the first occasion that a mobile dental surgery and laboratory were used in the Middle East. At the same time the dental officer with No. 21 M.R.S. was provided with a three-ton lorry to move his equipment among the fighter squadrons in the forward areas. This was the first instance in which a Royal Air Force dental officer was provided with his own transport in the Middle East. Meanwhile, arrangements were made to modify an Albion ambulance for use as a dental surgery. This vehicle was completed in June 1942 and sent to No. 22 M.R.S. with the personnel and equipment from No. 21 M.R.S. whose vehicle was returned to Base for similar modifications. An additional dental officer was sent to Daba to provide treatment for units of the medium bomber squadrons in that area. Before this, personnel had to travel to Aboukir for treatment, a distance of over 100 miles. An attempt was also made to establish a dental laboratory in the forward area by sending a mechanic with a set of field equipment to No. 22 M.R.S., but the experiment was a failure as the unit was nearly always on the move and the full equipment could never be unpacked for long periods. No further dental facilities could be afforded at that time. Many

personnel who required dentures had therefore to be flown to those areas where facilities were available.

The retreat to El Alamein followed soon afterwards but by then additional personnel were arriving in the Middle East in reasonable numbers, although there was usually considerable delay in receiving equipment because the cargo vessels had to sail *via* the Cape from the United Kingdom. The position slowly improved and in preparation for the El Alamein offensive the dental facilities were considerably extended. A senior dental officer was appointed to the Desert Air Force and by the target date he had five other dental officers each with an M.D.U. and an M.D.L.

As the offensive proceeded, it was possible in the main to space the M.D.Us., so that most units were within reasonable distance of a dental officer. A second M.D.L. became available in January 1943, thereby improving considerably the facilities available for the provision of dentures. At the same time a dental laboratory was also opened at the hospital at Benghazi which had been taken over by No. 22 M.R.S.

Meanwhile, arrangements had been completed for the landing in North Africa. When plans had been drawn up for this campaign it was decided to include dental facilities in the follow-up services with the establishment of fourteen dental officers, including a squadron leader senior dental officer, fourteen dental clerk orderlies, and eight dental mechanics. As this was the first occasion on which the R.A.F. Dental Branch had been called upon to provide new facilities under actual campaign conditions as distinct from the build up of existing organisations, the provision of equipment caused a certain amount of anxiety. It was realised that the campaign would be fluid and that part at least of the dental service would have to be mobile, but the only M.D.Us. available at that time were of the trailer type which experience had already proved completely unsuitable for use over rough tracks. However, these had to be used. The force eventually consisted of 6 M.D.Us., 2 of which were modified to include a small dental laboratory, 4 home scale dental surgery outfits, 4 dental outfits, and 4 field mechanical outfits for each 2 dental mechanics. Unfortunately, the full number of personnel was not available at the date of sailing and when the original party left on January 20, 1943, the strength consisted of the senior dental officer, 13 other officers, 8 dental clerk orderlies, and 7 dental mechanics. This force arrived at Algiers without incident on February 1, and proceeded to the transit camp at Hussein Dey area, four miles away, where they had to wait three weeks for the arrival of their equipment. Accommodation for dental officers not equipped with M.D.Us. was provided in station sick quarters or requisitioned buildings and the necessary alterations, such as plumbing, were carried out either by the French Works Services or the Army Garrison Engineer.

There was considerable delay in providing dental facilities after disembarkation because of shortage of materials and because the standard mains current throughout French and Italian territory was 110 volts and that of the M.D.Us. 220 volts. In consequence, until transformers had been installed, the electrical equipment of the M.D.Us. could not be used.

Despite these initial setbacks no special problem of dental interest arose except for the trouble experienced in using trailers of unsuitable design. A system of reciprocal aid between the Royal Air Force Dental Branch and the United States Army Dental Corps was fostered, which assisted the provision of dental treatment during the build-up phase of the invasion.

At the conclusion of the campaign in North Africa and the line-up of the forces from the Middle East, the Desert Air Force and other units were placed in the North-West African Air Force and the post of senior dental officer upgraded to Inspecting Dental Officer with the rank of wing commander.

The M.D.Us. and M.D.Ls. of the Desert Air Force then needed considerable attention after their services in the Desert Campaign. By the time of the invasion of Sicily on July 10 a dental party with transport consisting of a 15 cwt. truck, an M.D.U. and an M.D.L. from Middle East Command, 3 prime-mover M.D.Us. and 2 prime-mover M.D.Ls. were available for embarkation early in August. After the opening of the Italian campaign most of the dental personnel from Sicily were transferred to the mainland and were reinforced as necessary by personnel from the Middle East. After the capitulation of Italy there was a period of reorganisation which resulted early in 1944 in the embodiment of the North-West African Air Force in the newly formed M.A.A.F., which also included certain units formerly in the Middle East Command. By the end of 1944 there were only seven dental officers and orderlies in North-West Africa, and a senior dental officer to supervise dental arrangements on behalf of the Inspecting Dental Officer M.A.A.F. The Principal Medical Officer and his staff moved to Italy at the end of March 1944 and established a headquarters at Caserta.

Other dental commitments during the latter half of 1944 were Corsica and Sardinia where large numbers of R.A.F. personnel were stationed in preparation for the invasion of southern France, and the Balkan Air Force, most of whose units were stationed along the east coast of Italy. A dental officer also visited the Island of Vis and another was posted to Athens. These arrangements, subject to the necessary movements as various campaigns progressed, remained substantially the same until September. During this and the following months Headquarters M.A.A.F. was disbanded and gradually amalgamated with Headquarters Middle East to form Headquarters Med. M.E. with a

subsidiary headquarters at Caserta (A.H.Q. Italy). The senior Inspecting Dental Officer post was established in the rank of group captain at Headquarters Med. M.E. and the wing commander post was transferred from the Middle East to Air Headquarters Italy. It was possible in spite of all the difficulties of shortage of personnel to maintain satisfactory dental facilities throughout the very extensive areas covered by the various formations in the Middle East. A slight improvement in the establishment of dental clerk orderlies occurred early in 1944 with a posting of six W.A.A.F. orderlies to Middle East Command, but the manning position continued to deteriorate when the repatriation of tour-expired personnel began and no replacements were provided.

INDIA

It has already been described how in May 1942 the Royal Air Force accepted the responsibility of providing dental treatment for its own personnel in India. It happened by accident that at that date there were two dental officers and three dental orderlies in Ceylon. One officer and two orderlies had been evacuated from Singapore *via* Java, and the other officer and orderly had been on the establishment of No. 23 M.R.S. which was on its way to Malaya and was diverted to Ceylon after the collapse of Singapore.

It was decided, after negotiations with the Indian Government, to send M.D.Us. with their equipment to India. Their maintenance after arrival was to be the responsibility of the Indian Government. The authorised initial establishment consisted of twenty dental officers, twenty dental clerk orderlies and twenty dental mechanics and an additional unit of a dental officer, a dental clerk orderly and a dental mechanic for each 2,000 Royal Air Force personnel posted to India. It was proposed to organise the dental laboratory facilities by the formation of four laboratories, each with an establishment of five dental mechanics, rather than attach a dental mechanic to each dental unit.

All dental personnel were carried, as for other Commands, on block establishment at Air Ministry but this fact was overlooked in the initial negotiations with the Indian Government. It was not at first realised that all amendments had to have Government approval, neither was it appreciated that there would be a proportion of N.C.Os. among the first drafts. The confusion which resulted was overcome by abandoning the system of holding dental personnel for India on block establishment at Air Ministry. Thereafter establishments were arranged in India by the P.M.O. and I.D.O. after negotiation with the Indian Government. The first draft, consisting of eleven dental officers, eight dental clerk orderlies and eight dental mechanics, sailed for India on July 27, 1942, in two ships, one of which arrived in Bombay with most of the equipment on September 20. The other was delayed in Durban and did not

arrive until October 22, by which time the original draft had been reinforced by a further five dental officers who had arrived on another troopship. The splitting of the original draft resulted in an uneven distribution of personnel and equipment. For instance, the more senior dental officers who were to open the dental units at the locations chosen by the I.D.O. and P.M.O. were delayed on the second boat with the remainder of the equipment. The equipment for the extra five dental officers had been shipped by freighter and it was some weeks before it was located at Karachi. Not only was there delay in obtaining the initial equipment but it was found also that packing-cases had been mixed so that further sorting of equipment between units was necessary before work could begin.

By the end of the year dental centres had been established on a geographical basis to provide treatment for a maximum number of men. Royal Air Force dental officers were not posted to districts in which dental treatment could be provided by the A.D. Corps. Scales of dental equipment conforming with those used by the Army were issued, with detailed instructions regarding accounting procedure which was quite different from that to which Royal Air Force dental officers were accustomed.

It was soon realised that more than four dental laboratories would be needed. The distances between dental units and laboratories were great and the postal services of indifferent and uncertain quality. Accordingly the existing laboratories were divided and by the end of 1943 nine had been established, one at each of the following towns: Calcutta, Chittagong, Colombo, Digri, Lahore, Secunderabad, Bombay, Karachi and Cawnpore.

Meanwhile, in July 1943, the overall establishment of dental officers and personnel was amended to 1 : 1,250 and a Senior Dental Officer in the rank of squadron leader was authorised for the Calcutta area. On October 2, 1943, the overall ratio was reduced to that of the home scale (1 : 1,375) and senior dental officers were established in each Group.

Mobile Dental Units were first used in India in March 1943, when two were provided for a small detachment of the Canadian Dental Corps which had been posted to provide treatment additional to that authorised by the Royal Air Force for Canadian personnel. One unit was established in Ceylon and the other, after much travelling, was based finally at the Canadian Base Personnel Depot at Bombay. Reports received on the operation of the M.D.Us. in the hot weather were not encouraging. The working temperatures inside were very high even when the metal sides of the trailers were protected from the sun by an additional canvas roof. Similar trouble was experienced when the first twelve M.D.Us. were allotted to the Royal Air Force. The recommendations made as a result

of the experience gained in their use could not be put into effect before the war was ended.

A dental officer, a dental clerk orderly and a dental mechanic were included on the establishment of the Mobile Field Hospitals sent to India. Nos. 61, 62, 63 and 64 M.F.Hs. were posted in July 1943 and although the personnel arrived in September their equipment was considerably delayed and for some time after their arrival they were employed on routine work within the Command until the hospitals could open. By the end of 1944, a further nine M.F.Hs. had arrived in the country and the strength of dental officers rose to over seventy. Unfortunately, owing to the acute shortage of dental clerk orderlies, dental officers could not be employed to their full capacity as they had to undertake clerical duties when no orderlies were available. In contrast, however, to this shortage of man-power, the supply of dental mechanics was generous, not because there was no work for them to do but because they could not be provided with equipment. Some were misemployed as dental clerk orderlies and, except for the twenty-six in the command, the remainder were sent to the Middle East to replace tour-expired personnel in that theatre of war.

The posting of W.A.A.F. dental clerk orderlies to India offered only temporary and limited relief. As elsewhere, their postings overseas were confined to a few selected stations, which released only a few male orderlies for work elsewhere within the Command. When demobilisation began the shortage became acute and the ratio of dental clerk orderlies to dental officers fell to about one to two.

The reorganisation of the Command upon the formation of A.C.S.E.A. has already been described and did not affect in any way the working of the dental units, which operated without incident during the invasion of Burma and the relief of Malaya and Singapore.

WEST AFRICA

In the latter half of 1940 an aircraft ferry service and air supply line was established, which began at Gambia (Bathurst) and proceeded *via* Sierra Leone (Freetown), the Gold Coast (Takoradi), across Nigeria and the Chad territory to Fort Ismay on the desert border, then to Khartoum and Egypt. The main R.A.F. strength was established at Takoradi and in January 1941 the first dental officer was posted there to provide treatment for the 1,500–2,000 personnel on the station, and for any transit personnel. The R.A.F. station was incomplete when the first dental officer arrived and the dental centre had yet to be built. The original consignment of equipment was lost at sea and it was over two months before further equipment could be supplied. Meanwhile a temporary surgery was set up in a corner of the verandah of the Takoradi European Hospital with the assistance of the Government Medical

Officer who loaned a small amount of equipment and drugs sufficient to provide emergency treatment. In the late spring the dental centre was completed.

As the ferry service developed and the R.A.F. strength increased the dental commitments became too numerous for the dental officer to visit the staging posts along the route and attend to personnel coming for treatment at the dental centre. A second officer was posted to West Africa in November 1941 and in the meantime the A.D. Corps provided emergency treatment. Three more officers were posted in February 1942 and by the end of the year the strength had increased to seven. Dental centres were established at Bathurst, New England, Jui, Waterloo, Takoradi and Ikeja, a further dental centre and laboratory opened at Yundum and an extra dental surgery was opened at Takoradi. By September 1943 there were nine officers in the Command. Visits were made to the staging posts at regular intervals by officers carrying field equipment; for example, Accra was visited from Takoradi and Maiduguri from Kano.

At the end of September 1943 it was considered that the dental commitments required the supervision of a Senior Dental Officer and one was posted who arrived in December of the same year but owing to the vast size of the country and the large distances between dental centres some degree of decentralisation was necessary and officers of the outlying stations were brought under the temporary jurisdiction of the Wing Medical Officers.

The standard of work remained satisfactory even though there was a physical deterioration among dental officers who were nearly tour-expired. The dental health of the R.A.F. caused no anxiety, though it was noticed that, although ulcero-membranous stomatitis was almost non-existent, tartar formation and chemical staining of the teeth was much heavier than at home, and the exposure of cementum due to recession of the gums, whether in the presence of tartar or not, most marked.

By the summer of 1944 the importance of the African ferry route diminished and the commitments decreased as personnel were moved to other theatres of war. The centre at Yundum was closed in July and that at Waterloo in October. In February 1945 the laboratories at Kano and Takoradi were closed down and by June the strength of dental officers was reduced to three. As the strength diminished further, the dental centres and the remaining laboratory were closed down after arrangements had been made with the A.D. Corps to provide full routine treatment for the personnel left.

Throughout the time the R.A.F. operated a dental service in West Africa, close liaison existed with the United States Army Dental Corps. On several stations reciprocal aid was given and the Americans provided

emergency treatment for the R.A.F. detachments at Libreville, Pointe Noire, and at Banana in French Equatorial Africa the services of a French Government dental surgeon were available.

LIBERATION OF EUROPE

ORGANISATION

General. The 2nd T.A.F. was formed on June 1, 1943, on the dissolution of Army Co-operation Command. The Force was under the control of Fighter Command and later came under the direction of the Allied Expeditionary Air Force on the latter's formation on November 15, 1943; on which date also Fighter Command was renamed Air Defence of Great Britain. (See Volume II, Chapter 10).

The 2nd T.A.F. was originally planned to consist mainly of two composite groups, Nos. 83 and 84, No. 2 Group, and various other wings and formations. The composite groups contained fighter and reconnaissance squadrons for the support of the 1st Canadian and 2nd British Armies. No. 2 Group was a light bomber force transferred from Bomber Command. Each group consisted of a Rear and Main Headquarters, a reconnaissance and three fighter wings and the necessary supporting units. Each wing operated from two airfields. Further details of the organisation and expansion of the force can be found in other accounts.

Dental Organisation. During the build-up of the force dental treatment was provided at static dental centres on the stations at which various units were formed. In No. 83 Group however, additional facilities were provided by the loan of two M.D.Us. (Trailer) from Maintenance Command.

It was clear from the composition of the force that its dental service would have to be planned on a completely mobile basis. Arrangements were made, therefore, to supply it with M.D.Us. of the new Tender type because the Trailer type was considered unsuitable, and it was the policy for as much transport as possible to be of the prime mover variety. The M.D.Us. (Tender), although on order, could not be produced in sufficient quantity until August 1943, so, to avoid the loss of valuable experience in the field, it was decided to issue M.D.Us. (Trailer) as an interim measure.

The original establishment of M.D.Us. (Tender) was sixteen, which were to be distributed among the groups. It was decided, however, because of the uncertainty of the ultimate size of the force, to hold the units on the establishment of Headquarters, T.A.F., and to allocate the vehicles as necessary. Four Mobile Dental Laboratories (M.D.L.) were also approved, one for each group of four M.D.Us. The establishment of each M.D.U. was a dental officer and a dental clerk orderly, and of each M.D.L., two dental mechanics, one being an N.C.O.

On June 17, 1943, the first six M.D.Us. (Trailer) were established in No. 83 Group. These, with the static dental centres and units of the Canadian Dental Corps, provided treatment for the force until August 27, 1943, when the first M.D.U. (Tender) was sent out from Headquarters Tactical Air Force. As the other groups became mobile, M.D.Us. were transferred to them from No. 83 Group and were identified permanently with certain units of each group so that they could be fitted into a phasing plan for movement to the Continent. The M.D.Us. attached to Main and Rear Headquarters were responsible for Headquarters personnel and other units in the vicinity, and those attached to Wing Headquarters were responsible for the personnel of two airfields in each wing. M.D.Ls. were allocated at Rear Headquarters and at No. 484 Group Control Centre. In December 1943 an M.D.U. was also authorised for each M.F.H.

Dominion and Allied Dental Services. A mobile detachment of the Canadian Dental Corps was attached to each R.C.A.F. Airfield Headquarters as it was formed. Application was made in December to R.C.A.F. Headquarters for these attachments to be numbered and classified as M.D.Us. The establishment for each M.D.U. was similar to that in the R.A.F. Arrangements were made for the reciprocal treatment of Canadian and British personnel according to the siting of the M.D.Us. A Czech Mobile Dental Unit was also attached to No. 134 Czech Airfield from Technical Training Command and treated personnel of the Czech squadrons, but this unit was not included in the establishment of 2nd T.A.F. and was merely on attachment from another Command.

Dental Services, 2nd T.A.F., January 1944. There were twenty M.D.Us. and four M.D.Ls. dispersed throughout the Command. Each M.D.U., in addition to being responsible for the formation on which it was based, had allotted to it a certain number of smaller formations so that all units were in the dental charge of one M.D.U. or another. In the next few months before the invasion, 2nd T.A.F. was expanded by the addition of two wings, three Group Support Units with their ancillary units, and an M.F.H. This expansion necessitated a corresponding increase in the dental services and nine further M.D.Us. and four M.D.Ls. were formed. The dental requirements of No. 52 M.F.H. had been provided from Canadian resources with the consequent release of three R.A.F. M.D.Us. for service elsewhere. Two new Canadian Dental Sections were also provided. It was found that the allocation of an M.D.U. to each two airfields of No. 2 Group was inadequate as each of these airfields had a strength of approximately 1,500. Three further M.D.Us. were formed to correct this deficiency and by April 20 the dental re-organisation was completed. The re-organisation of 2nd T.A.F. which occurred on this date did not affect the composition of the dental

units except to illustrate that laboratory facilities would have to be provided for those M.F.Hs. moving into the Continent early, because M.D.Ls. were not scheduled to move in until some time later. Accordingly dental laboratory facilities were provided and the extra issue of a 160 lb. tent approved.

Establishment of Senior Dental Officers. As the phasing of the invasion was finally determined it was realised that the composite groups would be on the Continent for a considerable period before Rear Headquarters 2nd T.A.F. would arrive and that the dental service overseas would consequently be out of close touch for an indeterminate period with the Inspecting Dental Officer. A squadron leader senior dental officer was requested for each Group to supervise the dental service and act for the Inspecting Dental Officer. Although it had previously been contrary to policy to have senior dental officers for Groups as such, it was eventually agreed that in this case it was essential and the establishments were authorised. The senior dental officers were expected to carry out supervisory and administrative duties only when a Group was out of contact with Headquarters 2nd T.A.F.

Allocation of Formations to M.D.Us. in the United Kingdom. Provision of dental treatment for all units was difficult to arrange when they were continually on the move and the units were small. It was impossible to allocate units to specific M.D.Us., and to overcome this each M.D.U. was allocated units within a certain area, and *pro formae* notifying the alteration of locations of units were issued to the M.D.Us. whenever a unit moved.

Equipment. Between January and June it became apparent that the addition of various items of equipment to the scale already authorised would be of advantage to the dental service. Each M.D.U. was provided, therefore, with a supply of Portex and a flask and clamp so that very urgent repairs might be undertaken in the field by the dental officers themselves if contact with an M.D.L. was difficult. Supplies of pentothal and cycloton were also provided and the laboratories were supplied with clocks and extractor fans.

Supplies for the dental service while in the United Kingdom were forwarded by M.S.D. Hartlebury to the Forward Equipment Unit at Bicester, which was always in possession of the latest statement of location of units and was responsible for forwarding stores to the M.D.Us. and M.D.Ls. Arrangements were made with the A.D.D.S. to 21 Army Group for routine supplies on the Continent to come from Army sources. All dental services were instructed to carry a twelve months' supply of stores to the Continent.

Training. All dental officers had received a course in maxillo-facial injuries at East Grinstead before posting to 2nd T.A.F., and additional lectures were also given from time to time.

Reserves. Reserve personnel and equipment were held in No. 85 Group and consisted of three M.D.Us. and one M.D.L. Arrangements were made with Air Ministry for a reserve of five dental officers but it was not considered necessary to hold them in a special pool. Similar arrangements were made with the Training Officer (Dental) for a reserve of dental clerk orderlies and dental mechanics to be held at Royal Air Force Station, Henlow.

INVASION

No. 83 Group was the first group of 2nd T.A.F. to move to France and only those vehicles and units considered absolutely necessary moved with them. The dental sections of the group were due to be phased in on D-day plus 19, but they were delayed until D-day plus 34. However, No. 50 M.F.H. with its dental surgery and laboratory moved in on D-day plus 6 and No. 52 M.F.H. on D-day plus 14. These units provided dental treatment and laboratory facilities until the arrival of the rest of the dental personnel. The dental sections of Nos. 84 and 2 Groups and No. 34 Wing, were phased in with their parent formations, and the majority of those of No. 85 Group in due course.

Reorganisation of Nos. 83 and 84 Groups. From the experience gained under conditions of actual warfare Nos. 83 and 84 Groups were reorganised by the disbandment of three sectors and two wings in each group on July 12, with the result that the remaining eight wings of each group were increased in size. It became impossible to provide adequate dental facilities for these wings, unless the dental services were also reorganised, and in August 1944, M.D.Us. were attached to each wing. The additional M.D.Us. necessary were provided by the establishment of field dental surgeries for the more static units and the transfer of the M.D.Us. normally attending such units to the more mobile operational wings. This organisation remained in force for the rest of the campaign and resulted in each major formation having its own dental officer. The minor formations not attached to a major formation were looked after by the dental units attached to the mobile field hospitals.

No. 85 Group. Dental Services. No. 85 Group began to form in A.E.A.F. early in 1944, but it was not until August 22, after Headquarters 2nd T.A.F. was established on the Continent, that No. 85 Group was placed under its control. The group was originally designed for base defence and lines of communication but such units as Airfield Construction Wings, Embarkation Units and Night Fighter Defence Wings were later attached to it. The dental services of the group were organised on lines similar to those of other groups in 2nd T.A.F., but they were provided with M.D.Us. (Tenders) which had been modified in the light of experience on the Continent. Dental formations in the United Kingdom were under the control of the Inspecting Dental

Officer, A.D.G.B. and only on transfer to the Continent did they become the responsibility of the Inspecting Dental Officer, 2nd T.A.F.

During November and December the number of new formations placed in No. 85 Group grew to formidable proportions. The first of these was S.H.A.E.F. Headquarters at Versailles and there were other R.A.F. formations in Paris. Increasing strengths soon made it necessary to open first a branch surgery at Le Bourget and second a dental centre at Versailles. The former was equipped with field dental equipment flown from the United Kingdom and the latter with full home service equipment.

No. 72 (Special Signals) Wing was also placed in No. 85 Group and consisted of a large number of small separate units scattered from Eindhoven in the north, through the British sector, into the centre of France. The dental provision for these units was difficult and was met by drawing on two M.D.Us. which had been held in the reserve pool. A further M.D.U. was also required to look after the Balloon Squadrons providing the balloon barrage for the defence of Antwerp against V.1 flying-bombs. As no more M.D.Us. were available it was decided to form static dental centres at Brussels and Ghent to release the M.D.Us. with Headquarters 2nd T.A.F. and Headquarters No. 85 Group. Dental officers were also required for the Base Convalescent Depot and the Base Personnel Centre at Blankenberghe. As it was not certain whether these units would require a full-time service dental officer, No. 4 F.D.S. was released from Headquarters No. 2 Group by the formation of a third dental centre at that Headquarters.

Considerable modification of buildings in which the permanent dental centres were established was necessary. The equipment for these centres arrived by fast steamer. The establishment of each centre consisted of two dental officers, two dental hygienists and a laboratory with six dental mechanics, except at No. 2 Group Headquarters, which was a surgery only.

No. 8 R.A.F. General Hospital. No. 8 R.A.F. General Hospital was formed in the United Kingdom in March 1944, and had a dental staff consisting of a maxillo-facial surgeon, a dental mechanic trained in maxillo-facial work, and a dental clerk orderly.

The hospital moved to Normandy in August and set up under canvas in the Bayeux area. The dental department had been equipped entirely with field dental equipment, but it was intended that as soon as the hospital moved into permanent quarters full home-service scale of equipment would be provided. After a short stay at the Brugmann Hospital, Brussels, in September, it moved into the St. Gillie's Hospital, Brussels, where the first maxillo-facial injuries were treated. No maxillo-facial injuries were admitted during the hospital's stay in Normandy.

Supplies on the Continent. As already stated all M.D.Us. held a twelve-months' supply of equipment except for such perishable stores as plaster-of-paris. It was found, however, that the expenditure of stores was very much higher than had been expected, because dental officers were very fully employed on routine dental treatment and stores required replenishment from Army sources shortly after the arrival of units in Belgium and Holland. However, owing to the rapidity of the Allied advance from Normandy to Holland the supply depots in the forward areas could not be stocked sufficiently with medical and dental stores to meet R.A.F. as well as Army requirements. Arrangements were then made with M.S.D. Hartlebury for a weekly consignment of dental stores to be sent by air to Brussels to Headquarters 2nd T.A.F. to meet the more urgent needs. The Army was able to meet all demands by the end of October. The air lift from Hartlebury was continued for a short while to build up a stock of dental supplies either not available or very scarce in the Army.

DENTAL TREATMENT

The amount of dental treatment provided in the United Kingdom by the M.D.Us. fell little short of that usually carried out by dental officers working in static dental centres. The M.D.Ls. and the laboratories of the M.F.Hs. were able, without difficulty, to complete all the denture work required to the end of March, but in the last two months before the invasion the amount of denture work suddenly increased. Two additional mechanics were supplied and arrangements were also made with the Central Laboratory at Uxbridge to undertake a certain amount of work to relieve the pressure. All outstanding work was completed before the movements of units to the concentration areas.

Before the invasion it was expected that during operations the amount of routine dental treatment needed would be small. It was thought that dental officers would be largely engaged in carrying out the early treatment for maxillo-facial injuries, providing emergency treatment and assisting the medical staff by giving anaesthetics. In practice, conditions were very different and in the early stages of the invasion an enormous amount of repair work for dentures which had broken, or for filled teeth which had collapsed, had to be undertaken. The principal cause of all this damage to teeth and dentures was undoubtedly ration biscuits. A certain number of replacement dentures had also to be supplied for men who had lost their own through sea-sickness, though the issue of vomit bags reduced the losses considerably. In the two months following the arrival of the dental services on the Continent the number of dentures requiring repair was 60 per cent. greater than in the preceding months.

During the period from June 6 to December 31 all M.D.Ls. were making dentures to capacity limit. The demand for dentures was heaviest

among personnel of the Airfield Construction Wings and R.A.F. Regiment units. As soon as 2nd T.A.F. moved into winter quarters extra mechanics were obtained and laboratories enlarged.

During the Normandy Campaign practically no cases of maxillo-facial injury among R.A.F. personnel passed through the hands of R.A.F. dental officers. Later, during the winter months when units were located in northern France, Belgium and Holland a certain number of these cases occurred but they were very rarely due to enemy action.

Work done during 1944:

Fillings	42,811	New dentures	3,264
Extractions	13,512	Re-makes	767
Scalings	11,706	Repairs to dentures	1,688

Seventeen cases of fractured jaws were treated.

The total number of attendances of personnel for treatment was 78,275.

The total number of personnel made dentally fit was 18,670.

The total strengths of dental officers, excluding the I.D.O., increased from 19 in January 1944 to 41 by the end of the year. The average annual strength was 29 dental officers. The average amount of work done per dental officer was:

Fillings	1,476
Extractions	465
New dentures	112
Re-makes	26
Repairs	58
Number of attendances	2,700
Number of personnel made dentally fit	643

In addition to this very large amount of work done by dental officers of 2nd T.A.F. much work was also done by dental officers of other commands before the invasion.

CLINICAL NARRATIVE

INTRODUCTION

The general improvement in living conditions and the introduction of free or State-assisted dental treatment under various National Health Insurance and other schemes, has undoubtedly resulted in an improvement in the dental health of the population during the twentieth century, but statistics are not available to illustrate it. Recent investigations show that despite the valuable work that has been done the general standard of dental health is still poor. This can be demonstrated by the results of an investigation into the dental health of persons employed at three Royal Ordnance Factories during the war, in which the classification of 'dentally fit' meant that no dental treatment was required. It was found that if denture wearers were excluded only 1 per cent. of those examined could be so classified, and about 10 per cent. if denture wearers

were included. Ninety-three per cent. of single women of an average of 25 years were found to be in need of treatment; and the men examined, their average age being 44 years, had a mean of less than four natural teeth in their mouths. The percentage of fit persons was greater in the higher age-groups because of the increasing number of denture wearers in those groups.

The material for this investigation may be regarded as selected, as it excluded a large young male section of the population which was called up during the war, but the existence of a similar deplorable standard of dental health commensurate with age among young and adolescent men is shown by the statistics of the amount of dental work required for recruits entering the R.A.F. between 1934 and 1936. At that date a minimum standard of dental fitness was required of recruits, and a system of measurement of masticatory efficiency was used. A candidate was credited with two points for each molar and one for each pre-molar, canine and incisor provided that there was a sound or saveable opponent tooth in the other jaw. A score of less than eleven points resulted in rejection, except of certain men who were entered as skilled tradesmen. The table below shows the number of airmen recruits rejected for loss or decay of teeth between the years 1934 and 1936:

Year	Number rejected per thousand examined	Number rejected per thousand rejected for all causes
1934	148	310
1935	141	379
1936	133	374

In 1937 the eleven-point standard was abandoned because, with the expansion of the Service, it was found impossible to obtain sufficient recruits if it were continued. From this time onward candidates were not rejected solely for dental reasons. It will be observed that in 1934 about one man in every seven was rejected on the eleven-point standard or in other words, because he had insufficient teeth to provide adequate mastication of his food. Further, of the potential recruits rejected almost one in every three were not accepted for dental reasons. The next commonest causes for rejection were deformities of the feet (187 per thousand rejected), and poor physique (130 per thousand rejected). These two together approximate to the number of dental rejections per thousand rejected. There is no means of telling how many of those rejected for other reasons would have failed for dental causes.

All recruits were dentally examined as soon as possible after entry. It was found that only 3·5 per cent. of aircraft apprentices and 4·1 per cent. of airmen recruits were caries-free. The average number of fillings

required to make each man fit on entry was 5·1, and of extractions 0·6. The oral hygiene of 20 per cent. was noted as being neglected, and that of only one in three as good.

It may be asked why young men who were managing quite well in civilian life should be regarded as unfit for service as airmen. The R.A.F. originally required a high standard of dental fitness because, firstly, a denture wearer is always a potential casualty,* and secondly, because airmen may have to serve at stations a long way from the nearest dentist. At home there was always sufficient dental provision, but overseas field service may demand the location of troops in isolated districts where the provision of dental facilities might be difficult.

The need for a dental standard among the Services was first appreciated in the nineteenth century, when recruits of a certain regiment had to possess sound incisor teeth to enable them to remove the wrappings from their cartridges. When a different cartridge was introduced it was no longer necessary to use the teeth to remove a covering and the military dental requirements became less exacting. During the Boer War, however, when a large number of men were sent to base hospitals for invaliding, dental affections of one kind or another were among the most important causes of medical boarding. It is a recorded fact that mincing machines were sent to the forward areas to prepare the food of men whose teeth were bad or insufficient for mastication. Although such circumstances were most unlikely to occur in modern warfare, the conservation of man-power remained just as important and one of the measures taken to maintain the effectiveness of a force was the adoption of a high standard of dental fitness.

However, even in peace-time when the R.A.F. had a definite standard of dental fitness on entry, the Dental Branch was unable to make and maintain all personnel dentally fit. For instance, in 1934 the number of teeth filled during the year was approximately equal to the strength of the Service. If it is assumed that one filling per head per year is the minimum of treatment sufficient to maintain in dental health a number of persons in youth and middle age, it will be seen that no dental provision can theoretically be made for the 1,500 recruits enlisted, for whom, on the figures quoted, 7,500 fillings would be required. In effect, of course, the recruits received treatment at the expense of the Service, but the total legacy of arrears of treatment was cumulative.

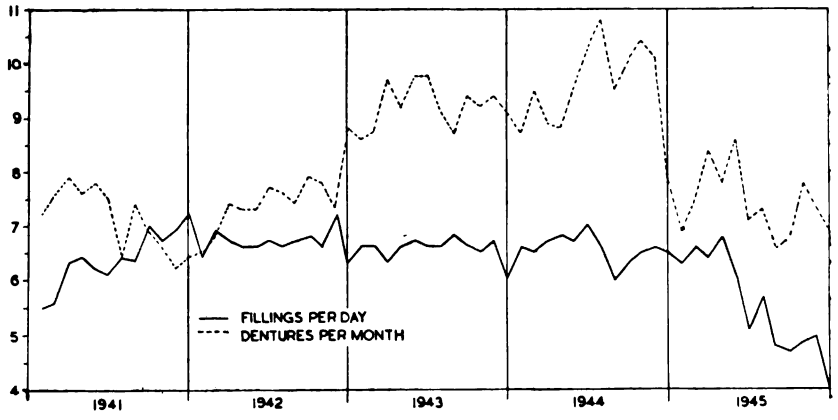
After 1936 no statistics of the amount of treatment required by recruits are available, because of the abolition of the dental standard. There was little value in accumulating masses of figures for treatment that could not be given. It is possible to assume, however, with reasonable accuracy the amount of treatment that would have been needed,

* A man with a broken denture is as much a non-effective member of his unit, until his denture can be repaired or replaced, as a man who is injured or ill.

basing the calculations on the figures that have been quoted for the years 1934–6. In the last complete pre-war years 29,000 recruits were accepted for the Service. If the very large amount of treatment that must have been needed by approximately 4,000 of these who would have been rejected as possessing inefficient dentition is disregarded altogether, the remaining 25,000 would have required 5·1 fillings and 0·6 extractions per head. This total of over 125,000 fillings and 1,500 extractions is in addition to any routine treatment that might have been required by the 73,000 personnel already in the Service.

The number of dental surgeons available to the R.A.F. to carry out this enormous amount of treatment was 84, of whom 40 were civilian dentists on full-time contract. Of the total, 2 were employed on administration, leaving 82 for the necessary operative work. It is considered that a dental officer of average competence should make 500 patients dentally fit each year. The maximum number that it was possible for the united efforts of the whole branch to make fit was 500 × 82, or 41,000. The strength of the R.A.F. at this date was 102,000.

If the figures are re-considered from the angle that an average dental officer completes about 150 fillings a month, or 1,650 per year, allowing for one month's leave, the 82 dental officers can do 135,000 fillings during the year. It will be observed from the figures above that this amount of treatment would have been little more than enough to make dentally fit only those recruits who would have passed the dental standard, if it had been in existence. These calculations, it should be emphasised, make no provision for any treatment for those already serving at the beginning of the year, nor for those recruits who would have been rejected solely for dental reasons in 1936. It can be stated, therefore, that the Dental Branch was hopelessly undermanned and that, for reasons beyond its control, the dental health of the R.A.F. deteriorated progressively year by year.



The graph opposite shows the average number of fillings done per day and dentures fitted per month by each dental officer in the United Kingdom for the years 1941–5. The 'average' assessment includes time occupied by leave, sickness, movements and courses of instruction.

When war began recruits were enlisted at a very rapid rate. The task of the Dental Branch would have been difficult enough if it had expanded proportionately with the rest of the Air Force, but as this did not occur, for reasons already described elsewhere in the narrative, it was not until the end of 1942, when sufficient equipment was available and the 'shift' system of working could be abandoned, that full use could be made of dental man-power.

AMOUNT OF TREATMENT PROVIDED DURING THE WAR

Before the war the term 'dentally fit' as used in the R.A.F. indicated a clean and healthy mouth in which all carious teeth had been filled and serious deficiencies of teeth had been made good by the fitting of dentures.

This standard of dental fitness was maintained throughout the war so far as flying personnel were concerned, but for non-flying personnel the conception of dental fitness was considerably modified. It was possible only to make these personnel dentally fit for their duties and not dentally fit according to pre-war standards. Essential work was carried out at recruit centres and this was augmented by more thorough treatment at schools of technical training and other units. The degree of treatment carried out depended upon local conditions and the guiding principle was, first to render and maintain flying personnel 100 per cent. fit, and second, to spread treatment for the remainder in such a way as to render the greatest good to the largest number. When the number of men and women enlisted into the Service began to decrease, the pressure of work was not so great and relatively more treatment could be carried out at recruit centres. The accepted standard of what constituted 'dental fitness' therefore tended to rise. The statistics giving the number of persons rendered 'dentally fit' during the war must be interpreted with these reservations in mind.

The total amount of dental treatment given to all personnel during the war is tabulated below:

Dental Treatment, 1939–45

Fillings	7,020,815
Scalings	1,348,183
Extractions	2,799,068
Dentures supplied	278,783
Personnel fitted with dentures	187,147
Repairs to dentures	109,841
Dentures remodelled	60,941
Number rendered 'dentally fit'	2,303,778

It was not found possible to differentiate between the amount of treatment given to personnel of various age-groups, nor to distinguish between the sexes. The statistics show the number of dentures fitted and the number of patients fitted with dentures. No information, however, as to the number of teeth on each of the dentures supplied is available beyond the fact that they were necessary for mastication. A few dentures were supplied to personnel wounded or injured on duty, or to facilitate clarity of speech on aircraft inter-communication systems.

Fillings. The average number of fillings completed per patient made 'dentally fit' per year is tabulated below:

Year	Fillings per patient made 'dentally fit'
1939	7·12
1940	4·22
1941	3·27
1942	2·36
1943	2·72
1944	2·96
1945	2·71

'Dental Fitness.' The percentage of all personnel rendered 'dentally fit' each year is tabulated below:

Year	Per cent.
1939	11·1
1940	31·3
1941	50·2
1942	44·0
1943	53·6
1944	47·1
1945	33·6

Dentures. The total number of denture wearers in the R.A.F. and W.A.A.F. must have been considerable. An analysis of the percentage of persons wearing dentures on entry into the Service cannot be made, but an indication can be given from the number of persons requiring prosthetic treatment in 1944. In this year over 38,000 persons had a denture repaired at public expense, a ratio of one in 430. In addition, 60,232 new dentures were supplied and 17,138 remodelled. About one person in twenty-eight was fitted with dentures to provide adequate mastication, and about one in ten was either supplied with dentures or had his own repaired or remodelled. These figures exclude those persons wearing dentures for whom no treatment was necessary.

Scalings. The percentage of personnel whose teeth were scaled increased progressively from about 10 per cent. in 1939 to nearly 25 per

cent. in 1944. The increase was first noticed in 1941, but a much larger increase occurred after the introduction of the trade of dental hygienist. The number of dental hygienists in the Service was too small to account for the increase, which was probably due more to their propaganda value in publicising the need for a higher standard of oral hygiene.

The above statistics are summarised in Appendix C.

APPOINTMENT OF THE CONSULTANT IN DENTAL SURGERY AND OF DENTAL SPECIALISTS

It was policy in the Dental Branch not to have officers graded as specialists. Officers with particular experience or specialised knowledge were usually established in posts where they could be most usefully employed. When the R.A.F. began to expand rapidly, and there was an increase in the number of patients requiring either special dental treatment or a second opinion, it was decided to obtain the services of a Civilian Consultant and to create establishments which would centralise the specialist facilities available. Difficulty had already arisen over the fitting of obturators and an experienced dental officer, not at first recognised as a specialist, had been established at the Dental Centre, Uxbridge, where it was decided, because of the excellent laboratory facilities, to centralise all prosthetic work requiring a high degree of skill.

A summary of the work done at the Dental Centre, R.A.F. Uxbridge, for the years 1943–5 will be found at Appendix D.

In September 1941 the appointment of a Civilian Consultant in Dental Surgery was approved and arrangements were made for him to visit the dental centre at Uxbridge, where patients requiring a consultant's opinion were to be referred if possible. The consultant was also on call to visit any R.A.F. hospital where his services might be needed. In addition to these duties he visited R.A.F. dental centres throughout the country and gave the benefit of his wide clinical experience to dental officers in the course of their routine work. During these visits officers were selected for training as specialists in oral surgery, to treat those patients who needed special treatment not of sufficient difficulty to require an exceptional degree of operative or diagnostic skill. Officers possessing special aptitude were also selected and trained at the Queen Victoria Hospital, East Grinstead, under the guidance of the Consultant, in the treatment of maxillo-facial injuries, after which they were posted to certain R.A.F. hospitals where, in addition to their particular duties as part of a maxillo-facial team, they were responsible for the treatment of cases which could not be undertaken at an ordinary dental centre.

The Consultant was also largely responsible for the introduction of the trade of dental hygienist into the Service and for advice on their syllabus of training and selection. Although the number of dental hygienists was small, their propaganda value helped to make the average airman and

airwoman conscious of the need of oral hygiene and so led to an increase in the desire for positive dental health throughout the Service.

The value of a consultant in dental surgery was amply demonstrated in numerous ways during the war and the basic value of the appointment itself was considerably enhanced by the personality of the consultant whose efforts to attain as high a standard of treatment as possible were reflected throughout the Service.

SOME ASPECTS OF THE DENTAL TREATMENT PROVIDED

General. The war caused the first serious attempt to render dentally fit very large numbers of the adult population. In the Royal Air Force the treatment offered, although less than the branch wished to provide, was nevertheless an improvement on anything that the majority of persons experienced in civilian life. It is seldom appreciated, for instance, that, besides being free, treatment is normally carried out during working hours and results in no loss of pay for loss of time, nor is it necessary to ask for time off to have treatment, because personnel are inspected at regular intervals during which, if it is desired, treatment can be given and arrangements made for it to be completed. Lastly, but perhaps most important of all, patients have merely to acquiesce in any arrangements made for them instead of taking the initiative themselves. Whatever the reasons, it is a fact that complete treatment was accepted by large numbers of persons who previously had received nothing but emergency treatment when forced to do so by acute symptoms. In the circumstances it was not surprising that most of the treatment provided in the Service was of a routine nature.

Conservative Work. Conservative work was based on methods well known in the dental profession. Few new materials or methods were introduced during the war. A small number of acrylic resin inlays were fitted but the material used was found to be not entirely suitable, though it had an application in the manufacture of jacket crowns.

Ulcerative Gingivitis. Acute ulcerative gingivitis had been uncommon in the Royal Air Force before the war and those cases which occurred were treated by scaling of the teeth and the application of chromic acid and hydrogen peroxide. Resistant cases were sometimes given intravenous N.A.B. The importance of being prepared for outbreaks of this disease, when personnel were living under war-time conditions, was realised. The difficulty of deciding what constituted an outbreak was met by requiring all unit dental officers to report if seven or more persons in any one week developed the disease. Vigorous measures were planned to control outbreaks and a special team consisting of a dental officer experienced in the treatment of diseases of the gums and two dental hygienists was formed ready to be sent to any station on which an outbreak had been reported. Extra dental hygienists were available if

required. As this team was only formed in 1943, however, treatment before that date was undertaken by unit dental officers with such extra assistance as could be provided. Fortunately, outbreaks were so seldom encountered that on only four occasions was the team required. At the beginning of the war there was a tendency among recently qualified dental officers to under-rate the importance of thorough scaling of the teeth and to rely too much on chemotherapeutic agents. One of the most successful treatments used was irrigation with a preparation containing hypochlorite of sodium, a form of treatment which could be undertaken by dental hygienists.

Anaesthetics. Local anaesthetics were nearly always used if conditions permitted. Nitrous oxide, administered by the nasal route, was the usual anaesthetic, and basal narcotics, alone or in combination with other inhalation anaesthetics, were used for more extensive surgery. The only difficulty which arose was that of supply. In the United Kingdom the maintenance of an adequate supply of nitrous oxide in cylinder form was satisfactory, but overseas, and especially on active service, the transport and distribution of cylinders was often very difficult. For example, during the Italian Campaign in 1943–4 there were periods when nitrous oxide was almost unobtainable. A lighter storage cylinder, or a method of compressing gas more highly for a given weight of cylinder, would have been a great advantage.

Prosthesis. The rapid enlistment of personnel resulted in an increase in the amount of denture work required, not only in total volume but in the percentage of personnel needing dentures. In fact, many Class E Reservists were found on mobilisation to be edentulous and without artificial teeth. It was difficult at first to keep pace with the demand because of the shortage of dental officers, dental mechanics and suitable laboratories, but the position eased after the introduction of the trade of Dental Mechanic under Training.

It was proved by experience in the United Kingdom that larger laboratories were capable of producing a higher output of work per mechanic. This was demonstrated after a system of measuring the output of each mechanic had been evolved in which points were allotted on a basis of one per denture set up, and one per denture flasked, packed and finished. Fully trained mechanics were expected to produce a total of twenty points per week evenly divided between two types of work. This figure represented the maximum amount of work which the average mechanic could complete and yet maintain a sufficiently high standard. Attempts were made in some laboratories to increase output by mass-production methods or by incentives. In the former, the experiment was a failure because mechanics disliked a system which eliminated pride in craftsmanship. The standard of work deteriorated and there was difficulty in assessing the responsibility for defective workmanship. In the

latter experiment a target figure higher than the twenty points referred to above was set, and if this figure was reached before the end of the week, the mechanic was allowed week-end leave. This method, though popular, could not be officially adopted as it would have constituted discrimination between dental mechanics and members of other trades.

The output per man at the larger laboratories was higher because the figures were less adversely affected by non-productive work, such as the issuing of teeth, and clerical work of one kind and another, because whatever the size of the laboratory a man had to be detailed for these duties. At the larger laboratories there was sufficient clerical work to justify the establishment of a clerk (G.D.), whereas at smaller laboratories such work had to be undertaken by the senior mechanic. Experience also showed that under active service conditions overseas it was desirable to have a higher ratio of mechanics to dental officers than that in the United Kingdom because concentration of work at a few central laboratories was unsatisfactory in countries where communications and postal facilities were poor.

Prosthetic Materials. Until early 1942 nearly all dentures in the R.A.F. were made of vulcanite. A small number of dentures had been made in gold for cases of close bite and a few experimentally in the then new acrylic resin. After the collapse of Allied strength in the Far East a shortage of rubber was inevitable. The Dental Branch, therefore, investigated other materials which might be suitable for the making of dentures. Methyl methacrylate had first been used as a thermoplastic material in 1931, but difficulties in processing prevented it from becoming popular. Various proprietary brands were manufactured but most of them needed special apparatus for processing. The repair of dentures made in these materials was also a difficult procedure. In 1941, methyl methacrylate was produced in the form of a polymer and monomer which, when mixed together to a dough-like consistency, could be flasked in the ordinary way and processed by boiling in water. Such a material offered great possibilities. The advantages over vulcanite were greater unit strength weight for weight, improved appearance and simpler processing. The dentures were also much easier to keep clean and did not stain. The initial disadvantages were that the material was liable to shrinkage, to result in raised bites, be porous and bleachable, and to fracture porcelain teeth in processing. In addition, the liquid monomer tended to solidify on storage. All these disadvantages, and others, were gradually overcome and a year after its introduction acrylic resin was adopted as the standard material for all R.A.F. dentures.

Teeth were made experimentally of acrylic resin at the Central Dental Laboratory at Uxbridge, where they were processed in metal moulds designed specially for the purpose. In other laboratories acrylic teeth were also made in temporary plaster moulds. These teeth were invaluable

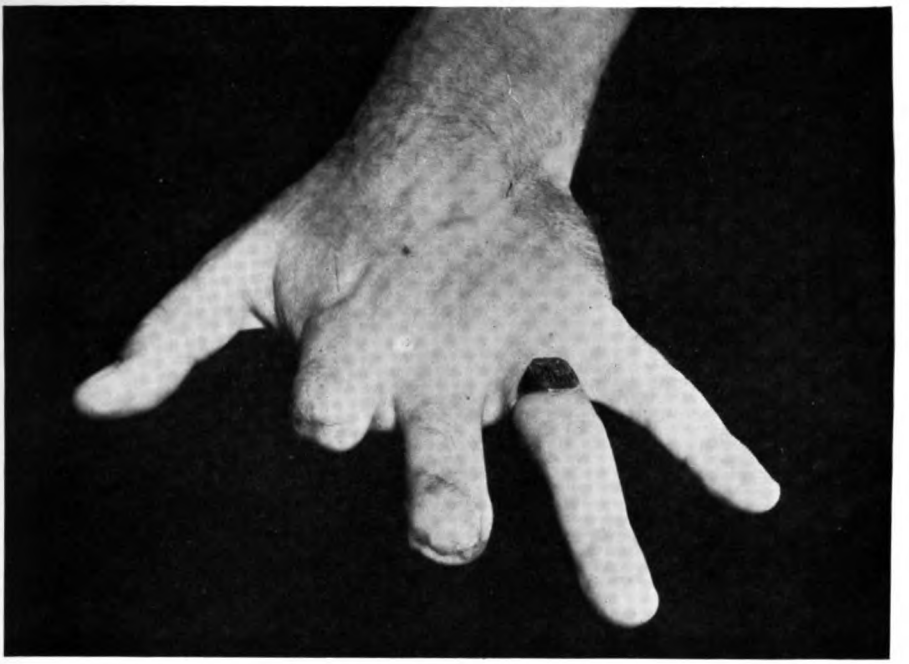


PLATE III. Photo showing injury.

PLATE IV. Acrylic prosthesis on stumps.

[*facing p.* 172

in cases of close bite and made the use of a metal plate unnecessary. Acrylic resin was also used for other purposes such as splints and jacket crowns, obturators and various other prostheses.

The far-sighted policy which enabled the Dental Branch to obtain early experience in the technique of using acrylic resin paid dividends when the change from vulcanite to the new material as the standard denture base became necessary; otherwise the change-over from one material to another would have been a greater difficulty.

Special Prostheses. Before the war a man with a permanent cleft palate would have been rejected, but after the war began, this disability was not a bar to acceptance provided that a satisfactory obturator was worn or could be constructed. An officer specially experienced in such work was posted to Uxbridge to treat patients with cleft palates and during the first six months nineteen special prostheses were manufactured. Acrylic resin was the material of choice because of its light weight and hygienic properties, but there was an initial difficulty in arranging a satisfactory substitute for velum rubber. Eventually, this problem was solved by the use of a hinge. Special oral prostheses were also made for patients who had lost considerable amounts of maxillary tissue as a result of wounds or aircraft accidents. In 1943, an experimental department was opened at the Central Dental Laboratory at Uxbridge to develop the use of acrylic resin for the construction of artificial eyes, ears, fingers, noses, etc. An example of the type of prostheses made from acrylic resin is shown in Plates III and IV.

Artificial Eyes. By March 1944, the manufacture of acrylic eyes had become so advanced that all difficult cases requiring artificial eyes were referred to Uxbridge by the Consultant in Ophthalmology, as it had been found that acrylic eyes had many advantages over those made of glass, apart from the fact that each eye was 'tailor made' to fit the eye socket. The light weight of the material also added to the degree of mobility possible and as each eye was made individually a perfect colour match could be obtained. Eyes made of acrylic resin were little affected by temperature change and in consequence resulted in less 'weeping' than eyes made of glass. The greater strength of the material and its chemical inertness were added advantages. The results obtained were excellent and it was even possible to produce an eye which appeared to accommodate.

Maxillo-facial Injuries. The importance of the early treatment of maxillo-facial injuries by surgeons, both general and dental, with specialised knowledge was first appreciated in the War of 1914–18. The problems presented by these injuries received much attention from leading members of the dental profession in the inter-war years, but advances were slow, largely because of the lack of opportunity to treat a sufficient number of cases. Peace-time injuries consisted mainly of

fractures, usually of the mandible, sustained in road accidents and mishaps at games. It was expected that in the event of another war there would be an increased demand for surgeons specialising in the treatment of maxillo-facial injuries.

Maxillo-facial injuries were classified broadly into four main groups:

(i) *Civilian type injuries*, caused by kicks, blows, falls, etc., in which the condition of the patient was usually satisfactory.

(ii) *Crush injuries*, caused by car and aircraft accidents, in which the extent of injury and the condition of the patient varied according to the degree of trauma.

(iii) *Gunshot wounds*, in which the fractures were always comminuted, and the patient shocked.

(iv) *Air-raid type injuries*, which often resembled groups (ii) or (iii) according to the nature of the object causing the trauma. The injury was often associated with considerable shock.

During the war a high proportion of injuries in group (ii) were undoubtedly due to war causes, such as aircraft accidents, but the resulting injury was not related solely to hostilities because it could occur in peace-time as well. Only those injuries classified in groups (iii) and (iv) may be considered as war injuries.

The training of selected dental officers in the treatment of maxillo-facial injuries has already been described. Those officers who were selected to receive comprehensive training were subsequently established on the staffs of the Royal Air Force Hospitals at Ely, Halton and Cosford in 1942. Dental specialists were also posted to a number of Royal Air Force General Hospitals overseas, and one officer was established on the strength of the Royal Air Force Hospital at Foggia, Italy, but was not graded as a specialist. A further specialist was also provided for No. 8 Royal Air Force General Hospital, 2nd T.A.F.

The maxillo-facial unit at Cosford opened in 1942 and by the end of the war had completed almost exactly three years' work. The amount and type of work undertaken by this unit is summarised at Appendix E. The preponderance of mandibular fractures was marked, as was the high proportion of civilian type injuries, *viz.* 91 out of 123. Cast cap-splints with inter-maxillary fixation were used in the treatment of 95 of the cases. Roger Anderson pins were not often used in the R.A.F. because most of the patients with fractures were young and still had many sound teeth; in fact, of 160 patients treated by various methods in 1942, only 2 were treated with Roger Anderson pins.

One great change occurred during the war in the method of treating fractured mandibles. Before 1939 a fractured mandible would normally have been treated by fitting a cast cap-splint, and the reduction of the displacement effected at the time the splint was fitted. During the war it was found preferable to fit sectional mandibular splints and,

if immediate reduction was impossible, to reduce the displacement gradually, securing the splints, when the position was satisfactory, by a locking bar.

It became a policy as the war progressed to give priority to casualties with maxillo-facial injuries in their transportation by air. During the campaign in western Europe in 1944 and 1945, 3·5 per cent. of casualties arriving at the reception airfields near R.A.F. Hospital, Wroughton,* had maxillo-facial injuries. The total number of patients with such injuries was about 1,800, nearly all of whom had received treatment either at mobile maxillo-facial units, or from dental officers in forward areas.

Later in the campaign patients arrived in more advanced stages of treatment. A high proportion were fit for further travel and were despatched to the special maxillo-facial centres or to E.M.S. hospitals; the remainder, 282 in number, were admitted to the Casualty Clearing Station established at Wroughton Hospital. The priority afforded to these patients worked well in practice and in one instance a patient was in the operating theatre at Wroughton Hospital within eight hours of being wounded on the Continent.

An analysis of the 282 cases shows that 77 per cent. of the fractures were due to gunshot wounds, bombs and similar causes, and only 14 per cent. to road accidents; 33 per cent. were complicated by other injuries. In nearly all the cases that arrived wired, 0·35 mm. wire, instead of 0·5 mm. wire had been used, as it was considered to be less painful to remove; 221 patients were held at Wroughton for an average of 2·4 days before being evacuated and 61 were admitted to the hospital. It is a tribute to the work done in the earlier stages of treatment that in only a few cases were even slight adjustments to the wiring necessary.

The 61 cases admitted received treatment for a period varying between a few days and six months. Forty-four of these had gunshot wounds, 37 had received no treatment before admission, and 51 had mandibular, and 11 maxillary, fractures.

The high proportion of injuries caused by gunshot wounds (77 per cent.) is in direct contrast to the far lower proportion admitted to R.A.F. Hospitals overseas. For instance, in 1944, of the thirty-eight cases admitted to the R.A.F. Hospital at Foggia, 50 per cent. were due to road accidents and only about 8 per cent. to war causes. The arrangements for treating maxillo-facial injuries were different overseas as the Army admitted most of the cases, and it must be remembered that the hospital at Foggia was a long way from the fighting line. The analysis of patients with maxillo-facial injuries admitted to Wroughton can only be considered as an indication of the proportions of the various types of injuries likely to be encountered in a hospital at the receiving end of a

* For further information *see* Chapter 5, Operation 'Overlord'.

system of air transportation of casualties during a sea invasion on a large scale.

Experience gained in the treatment of maxillo-facial injuries during the war confirmed the necessity for special teams trained in the treatment of these injuries, and the desirability of having sufficient experienced dental officers for assessing and sorting casualties at the receiving end of any air evacuation organisation.

APPENDIX A

PLATES V–VIII

Dental Accommodation Overseas

These plates illustrate improvised dental centres in any kind of accommodation which could be adapted for the purpose in various areas overseas, and a dental centre under canvas when no suitable accommodation could be found.

These improvised dental centres were found to be adequate for the purposes for which they were required.

PLATES IX AND X

Mobile Dental Units (M.D.Us.). Type 1.

A few mobile dental surgeries were used in the War of 1914–18. In the inter-war years various county councils adapted trailer caravans into mobile dental clinics and used them in their school dental services. Early in 1941 the Royal Air Force ordered eighteen mobile dental surgeries of the same design, except for a few modifications, as those used by the county councils. The manufacture of these Mobile Dental Units (Trailer), as they were called, was delayed, and the first six were not delivered until January 1942. A further six were completed in February and the balance of the order by the end of March.

PLATES XI AND XII

M.D.Us. (Trailer) Type 1. Second Modification.

In July 1942, four trailers were further modified by the inclusion of a small dental laboratory, a folding desk, and a shelf for the steriliser and the instrument tray. The wash basin was re-positioned and the plaster bench modified to take a mechanical foot engine for polishing. A zinc lined partition was also provided to cut off the vulcaniser, when it was in use, from the rest of the interior.

The first of these trailers was delivered in September 1942.

PLATES XIII AND XIV

M.D.U. (Trailer) Type 2.

When the dental branch became responsible for providing dental treatment for the Royal Air Force overseas it was realised that the early home-type service trailer would not be strong enough for service abroad. Three were, however, shipped to the Middle East as an interim measure until more suitable M.D.Us. could be supplied.

A six berth, two wheeled, metal-sided trailer had been adopted for conversion in the U.K. when the need for M.D.Us. overseas became felt. It was

PLATE V. Dental Centre, Maiduguri, Central Africa.

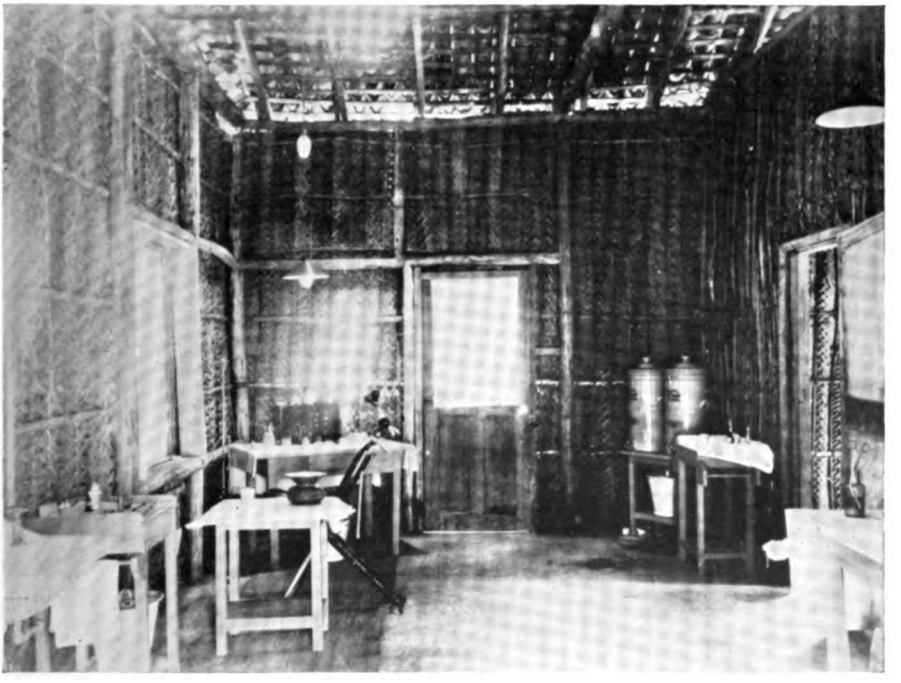


PLATE VI. Dental Centre, Ceylon. Interior.

[facing p. 176

PLATE VII. Dental Centre, under canvas, Tunis.

PLATE VIII. Dental Centre, wooden hut, West Africa.

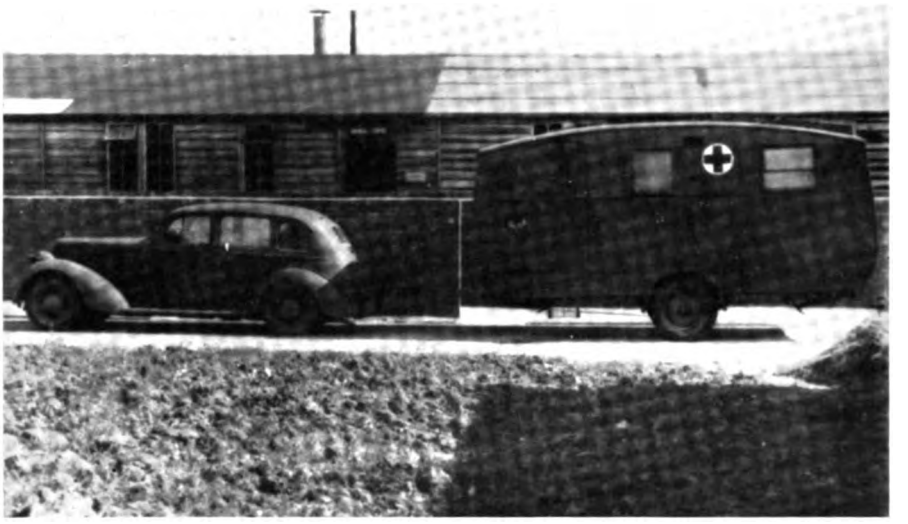


PLATE IX. M.D.U. (Trailer) Type 1. Humber car and caravan.

PLATE X. M.D.U. (Trailer) Type 1. Interior.

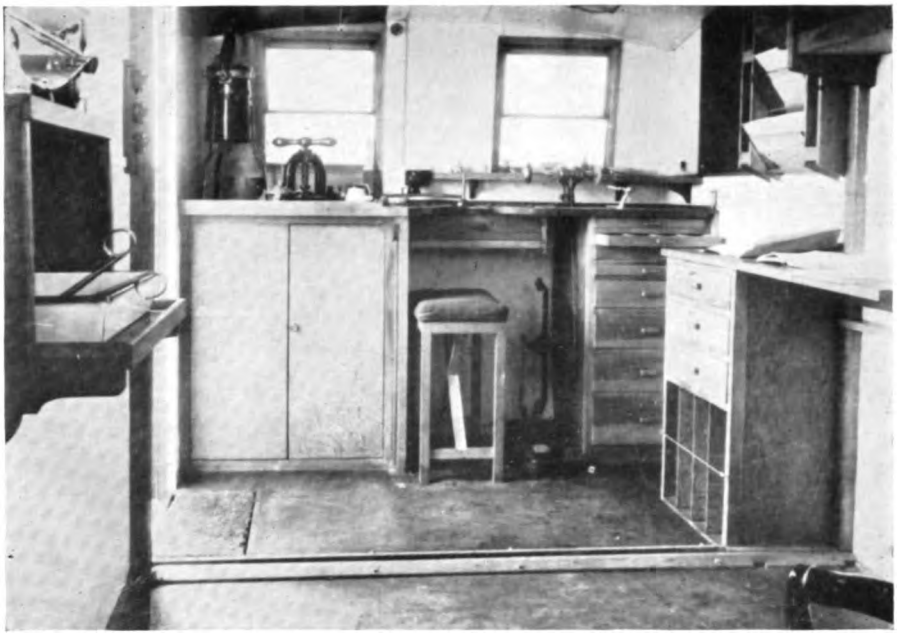


PLATE XI. M.D.U. (Trailer) Type 1. Second modification.

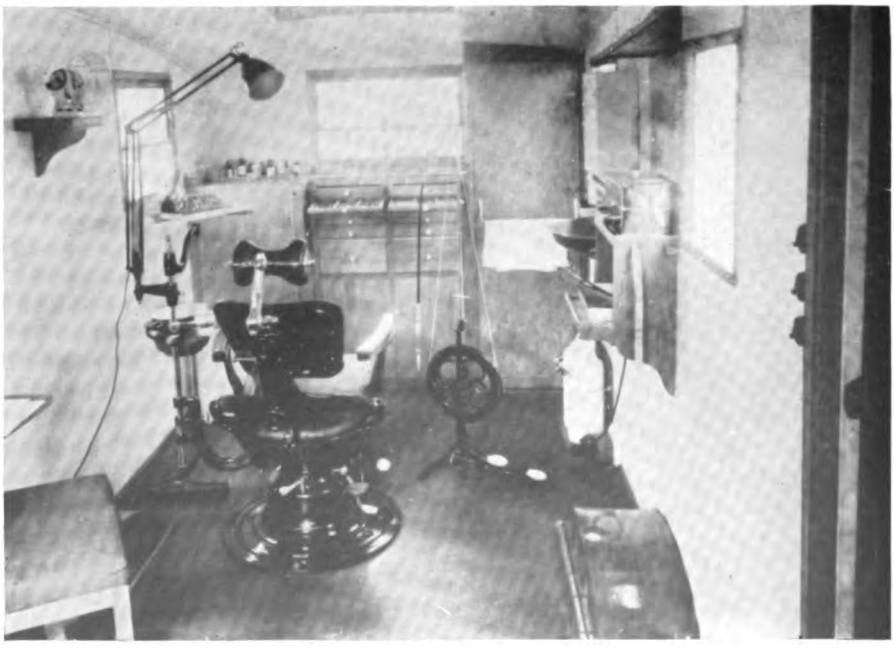


PLATE XII. M.D.U. (Trailer) Type 1. Second modification.

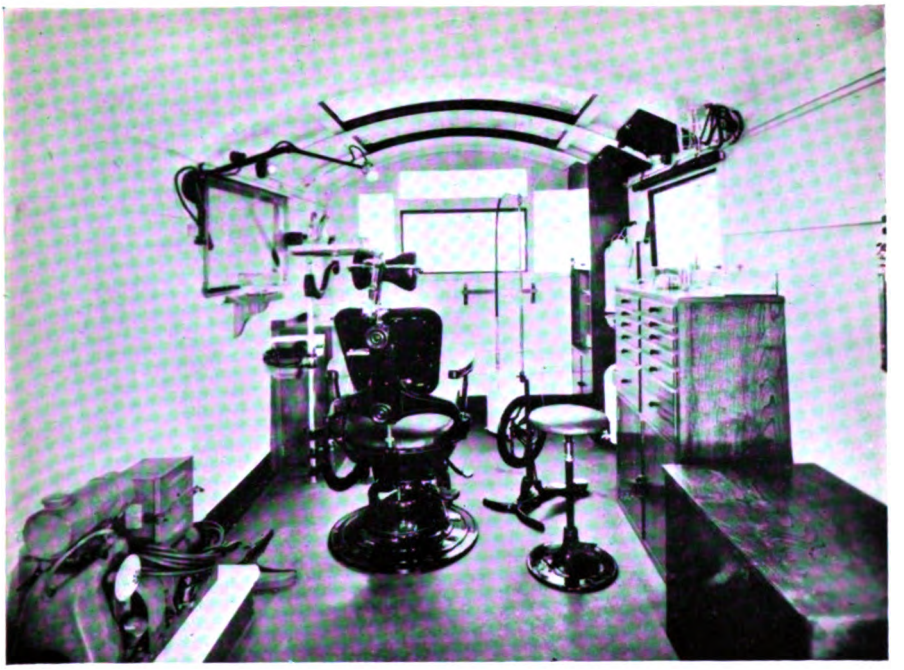


PLATE XIII. M.D.U. (Trailer) Type 2. Interior.

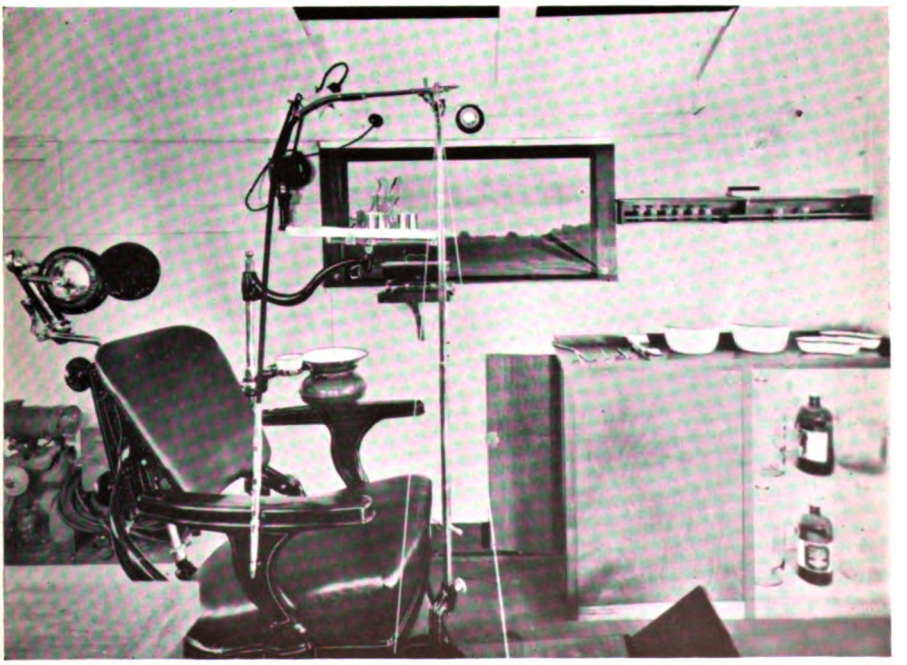


PLATE XIV. M.D.U. (Trailer) Type 2. Interior.

PLATE XV. M.D.U. (Tender) Type 3. Exterior.

PLATE XVI. M.D.U. (Tender) Type 3. Interior.

PLATE XVII. M.D.L. in modified Albion ambulance.

PLATE XVIII. M.D.L. (Albion) 2nd T.A.F., showing polishing tent.

decided to ship some of these stronger trailers abroad. Unfortunately, they were too long for some conditions encountered on field service and trouble was also experienced with the tow-bar coupling and the tyres. The trailer was modified after its arrival in the Middle East by the fitting of standard Ford wheels and tyres which gave a more comfortable ride. Meanwhile, until the new type M.D.Us. arrived, mobile surgeries were improvised by adapting different vehicles. The first improvised M.D.U. was a modified Albion ambulance. Other vehicles were similarly adapted in due course but to no standard pattern. A captured Italian mobile surgery, which was very elaborately equipped, was also repaired and used, but was unsuitable for general field service.

PLATES XV AND XVI

M.D.U. (Tender) Type 3.

In this type the designs were finally fixed. Full home scale equipment was provided and the interior further modified and the entrance re-positioned as in Type 1. M.D.Us. of Type 3 were provided for No. 2 Group and for other groups as necessary.

PLATES XVII AND XVIII

Mobile Dental Laboratories (M.D.Ls.).

Mobile Dental Laboratories were not needed in the United Kingdom because communications were good. Denture work for the M.D.Us. (Trailer) on circuit was carried out satisfactorily by the central and auxiliary dental laboratories in the country. M.D.Ls. were, however, needed overseas, and were made from either adapted Albion ambulances or other vehicles available.

M.D.Ls. made from modified Albion ambulances were also used in Nos. 83 and 84 Groups of 2nd T.A.F. but Nos. 85 and 2 Groups were provided with M.D.Ls. made from modified Ford ambulances.

APPENDIX B

TROPICAL FIELD DENTAL OUTFIT SCALE D4 (T)

The Tropical Field Dental Outfit is contained in four wooden cases:

Case 'A'—Contains three haversacks, Nos. 1, 2 and 3, which together contain complete and self-contained emergency field dental outfit, including maxillo-facial equipment. Case 'A' also contains plaster-of-paris, etc.,

Case 'B'—Contains dental instruments and sundries.

Case 'C'—Contains dental foot engine, trays, etc.

Case 'D'—Contains a field dental chair.

APPENDIX C

ANALYSIS OF DENTAL TREATMENT PROVIDED, 1939–45

Year	* R.A.F. and W.A.A.F. strengths	Fillings	Scalings	Extractions	Dentures				No. rendered dentally fit	Per cent. and total
					Supplied	Personnel fitted	Repaired	Remodelled		
1939 .	175,692	140,079	14,452	89,238	3,479	1,687	1,393	916	19,648	11·1
1940 .	223,494	336,381	55,880	236,621	11,126	7,353	2,992	1,642	80,052	31·3
1941 .	511,251	849,212	118,070	594,695	24,984	17,702	8,641	3,889	257,105	50·2
1942 .	915,670	1,362,391	221,919	600,532	47,221	32,009	12,669	8,621	405,104	44·0
1943 .	1,106,533	1,619,488	339,809	426,162	77,196	44,719	24,028	15,581	593,516	53·6
1944 .	1,181,491	1,653,536	350,042	555,177	60,232	45,433	38,148	17,138	556,837	47·1
1945 .	1,162,030	1,059,728	248,011	296,643	54,545	38,244	21,970	13,154	391,516	33·6

* The figure for 1939 is for September 3. The remainder are for December 31.

APPENDIX D

SUMMARY OF SPECIALIST DENTAL TREATMENT PROVIDED AT THE DENTAL CENTRE, R.A.F. STATION, UXBRIDGE, FOR THE YEARS 1943, 1944 AND 1945

	1943	1944	1945	Totals
1. Impacted wisdom teeth	88	94	137	319
2. Cysts	26	17	15	58
3. Odontomes	1	2	3	6
4. Miscellaneous surgical conditions	51	76	70	197
5. Chronic and recurrent gingivitis	7	2	8	17
6. Difficult prosthetic cases	8	10	11	29
7. Prostheses for cleft palates	50	28	19	97
8. Splints for facial paralyses	—	2	2	4
9. Cases sent for examination and advice	27	50	46	123
10. Follow-up attendances	—	18	42	60
Totals	258	299	353	910

COMMENT

1. *Impacted wisdom teeth.*

319 teeth were removed from 244 patients, 178 of whom were admitted to the station hospital for extractions under general anæsthesia. Patients with pericoronitis are included in this group.

2. *Cysts.*

There were 53 dental or radicular cysts and five dentigerons or follicular cysts. Thirty-six were operated on under general anaesthesia.

3. *Odontomes.*

Three were complex composite, 2 compound composite and one dilated composite. Four were removed under general anaesthesia.

4. *Miscellaneous Surgical Conditions.*

(*a*) Residual infections and focal sepsis including apicectomies, necrosis etc. 27
(*b*) Multiple extractions and alveolectomy 39
(*c*) Unerupted and misplaced teeth other than wisdom teeth . 52
(*d*) Infected antra and antro-oral fistulae 16
(*e*) Diagnosis and treatment for obscure pain 8
(*f*) Abscess involving soft tissues (including submaxillary abscesses and cellulitis) requiring surgical treatment . . . 17
(*g*) Neoplasms:
i. Mixed salivary tumour of the palate 2
ii. Myeloid epulis 1
iii. Papilloma in palate or cheek 3
iv. Osteo-fibroma of the maxilla 1
v. Myxoma of the mandible 1
vi. Fibrous epulis 1
(*h*) Alveolectomy to correct local abnormalities . . . 2
(*i*) Salivary calculus in submaxillary duct 1
(*j*) General hyperplasia of gums 1

(*k*) Delayed dentition 1
(*l*) Removal of sequestra 8
(*m*) Secondary haemorrhage 1
(*n*) Fractured maxilla 1
(*o*) Plastic operations to remove abnormal muscle attachments (for dentures), or to remove hypertrophied tissue caused by ill-fitting dentures 14

5. *Chronic and Recurrent Gingivitis.*
These were cases which had failed to respond to treatment at their units.

6. *Difficult Prosthetic Cases.*
Dentures and special appliances were made after necessary surgical work was completed, such as removal of hypertrophied tissue, cysts, etc.

7. *Prostheses for Cleft Palates.*
A dental appliance with an obturator extension was supplied in 78 cases of deficiency of the soft palate and a dental appliance for 19 cases of deficiency of the hard palate after the soft palate had been repaired.

In 1944 experiments were carried out to investigate the use of poly-vinyl chloride in the manufacture of obturator extensions. It was found that the material was unsatisfactory as it hardened and cracked in about three months. The acrylic obturator was most satisfactory and with a hinge at the obturator-extension junction was a clean and well tolerated appliance.

Repairs or modification to appliances were carried out on 18 cases including those whose poly-vinyl chloride obturators were replaced by acrylic obturators.

Surgical and conservative work was necessary in most of the patients to prepare their mouths to accept appliances.

Several patients were referred to a plastic surgeon for improvement of their harelip scars.

8. *Facial Paralyses Splints.*
At the request of the Ear, Nose and Throat Specialist small removable appliances for supporting the corner of the lip in facial paralysis were provided.

9. *Cases referred for Advice.*
(*a*) Removal of teeth (unerupted etc.) 18
(*b*) Location of cause of pain 32
(*c*) Lesions of the oral mucosa 13
(*d*) Post-operative complications 13
(*e*) Fractures 2
(*f*) Diagnosis of tumours 9
(*g*) Focal sepsis in relation to systemic disease 23
(*h*) Affections of the temporo-mandibular joint 5
(*i*) Prosthetic difficulties 2
(*j*) Continuation treatment for cleft palate 5
(*k*) X-ray interpretations 1

10. Follow-up on long cases enabled their progress to be kept under observation.

APPENDIX E

SUMMARY OF SPECIALIST DENTAL TREATMENT AT R.A.F. GENERAL HOSPITAL, COSFORD, BETWEEN 1943 AND 1945

	1943	1944	1945	*Total Number*
1. *Fractured Jaws*	40	52	31	123
2. *Cysts*	12	20	21	53
3. *Impacted Wisdom Teeth*	154	248	300	702
4. *Osteomyelitis of Jaws*	2	2	1	5
5. *Other surgical procedures*	83	101	61	245

Analysis of Fractured Jaws

Total number		123
Fractured Maxilla	14	
Fractured Mandible	105	
Fractured Maxilla and Mandible	4	
Type		
Civilian type fractures, e.g. fights, falls, car accidents	*Total*	91
Maxilla	6	
Mandible	82	
Maxilla and Mandible	3	
Aircraft crashes	*Total*	30
Maxilla	7	
Mandible	22	
Maxilla and Mandible	1	
Gunshot wounds	*Total*	2
Maxilla	1	
Mandible	1	
Maxilla and Mandible	0	

Method of Treatment

Cast cap-splints and inter-maxillary fixation	95
Gunning splints with alveolar and circumferential wiring, and inter-maxillary fixation	2
Single Gunning splint with circumferential wiring	4
Eyelet wiring	16
Cast cap-splints, inter-maxillary fixation and traction	2
Roger Anderson pins	2
Plaster head cap	2

Cysts

Total number		53
Radicular cysts	26	
Dentigerous cysts	14	
Traumatic cysts	3	
Adamantinomata	3	
Other cysts	7	

Impacted Third Molar

Total number		702
Lower Right	423	
Lower Left	279	
Proportion of mesic-angular impaction	80%	(approx.)
Proportion of vertical impaction	10%	(approx.)
Proportion of horizontal impaction	6%	(approx.)
Proportion of disto-angular impaction	4%	(approx.)

Osteomyelitis

Total number		5
Acute	2	
Chronic	3	

Causation

Mal-united or non-united fracture	3
Post-operative sepsis	1
Unknown origin	1

Other Surgical Procedures

Total number		245
These may be analysed as follows:		
Extractions with alveolectomy	79	
Surgical clearances	77	
Abscesses opened	19	
Teeth in palate	29	
Insertion of drainage tube	17	
Surgical preparation of mouth for dentures	5	
Sequestra removed	7	
Epulis	3	
Ranula	1	
Fibroma	1	
Cellulitis opened	1	
Removal of tooth from antrum	3	
Excision of muscles	3	

CHAPTER 5

HOSPITALS

General and Station Hospitals

HISTORICAL SURVEY

PRE-WAR HISTORY

WHEN the Royal Flying Corps was formed in 1912, no separate medical organisation was at first necessary to look after the rapidly increasing force, because the R.A.M.C. undertook the medical care of the Corps at home and overseas.

In 1916 a fund was collected by voluntary contributions to open a special hospital of twenty beds for R.F.C. flying officers in Bryanston Square, London, administered by the British Red Cross Society, and later another hospital of fifty beds was established in Eaton Square, London. There were, however, many inherent disadvantages in the establishment of hospitals such as these, which were outside general military administration. While the R.F.C. remained a relatively small body and the majority of the flying stations were well within reach of the Army medical facilities, the arrangements provided by the R.A.M.C. were considered satisfactory and they continued in force for some considerable time after the end of the First World War.* In 1917 the first Royal Flying Corps Hospital was set up at Hampstead, where patients of the R.N.A.S. and the R.F.C. were treated by a mixed naval and military staff.

As a result of the war, the military importance of aircraft grew very rapidly, with a proportionate increase in the size of the Air Force. The employment of additional aircraft necessitated the construction of new airfields and involved a wide dispersal of personnel. On April 1, 1918, the Royal Air Force was created as a separate Service and embodied the Royal Naval Air Service and the Royal Flying Corps, and it was decided on April 17 that R.A.M.C. and R.N.A.S. medical officers loaned to the R.A.F. as from April 1, who were employed exclusively with R.A.F. units, were in future to take instructions on technical medical matters from the Medical Department of the Royal Air Force instead of from the Army Medical Department. Thus, although these officers were not gazetted to commissions in the R.A.F. Medical Branch until July 13, 1920, April 1, 1918, can be taken as the date on which the Branch began to function as a separate entity.

* It should be appreciated that the Royal Flying Corps was until 1918 not a separate service, but part of the Army, like any other Corps; it was natural therefore that the medical services should be provided by the R.A.M.C.

To some extent the formation of a separate Service had been foreseen and the R.A.F. stations and establishments had been provided with sick quarters on a bed scale of 1 per cent. of station strength, with a minimum of four beds. These were staffed by R.A.F. medical officers assisted by male nurses or orderlies, as they were then called. But although these arrangements were adequate for the treatment of minor casualties and trivial sickness, there was no provision for surgical operation or the treatment of serious illness until much later. The military and civilian hospitals continued to admit all cases other than those which could be treated at station sick quarters.

The development of the Service brought with it special medical problems related to aviation and it was felt that the continued treatment of flying personnel patients in Army and Navy hospitals was depriving the R.A.F. of the opportunity to acquire specialist knowledge of medical conditions peculiar to their force. Furthermore, R.A.F. personnel were now being concentrated in areas where the medical facilities were small. Apart from the delay which occurred in getting severely injured cases to hospital, there was a loss in man-hours which could have been largely avoided had the sick quarters been able to offer the facilities for the treatment of many of the less serious cases. The need for geographically well-sited hospitals was urgent and the advantages to be gained from a fully equipped separate medical service became increasingly apparent.

In 1919 the first R.A.F. General Hospital was opened at R.A.F. Station, Halton, a large station housing the Air Force Apprentice Training School and a number of other training establishments. About this time the Central Pathological Laboratory, later the Institute of Pathology and Tropical Medicine, and the Medical Training Depot, later the Medical Training Establishment and Depot, formed up at Halton. Two general hospitals were opened overseas in 1928 at Hinaidi in Iraq and at Aden, and in the United Kingdom further hospitals were established at Cranwell (the location of the R.A.F. College) and at Uxbridge, the latter being a very small hospital of twenty-five beds for the use of officers. During the years immediately preceding 1939, the steady expansion of the R.A.F. and the ominous political outlook made it necessary to provide still further permanent R.A.F. hospitals and accordingly work began in 1937 on the construction of two large modern brick hospitals at Ely in Cambridgeshire and Wroughton in Wiltshire. These hospitals were designed to provide full medical and surgical facilities and to serve as teaching schools for medical airmen as well as provide refresher courses for medical officers.

Keeping pace with the growth of the R.A.F., the old station sick quarters had undergone considerable change since they were first instituted. Buildings were modern and the number of beds had increased, enabling station medical officers to hold and treat a good proportion of

cases. As the amount of flying increased, growing reliance came to be placed upon the sick quarters in times of emergency and the provision, in due course, of adequate crash rooms greatly increased their usefulness.

EXPANSION OF MEDICAL SERVICES 1939–45

By September 1939 there were six General Hospitals at home and overseas. During the war new general hospitals were built and others were formed in the United Kingdom for service abroad. Special field hospitals, known as Mobile Field Hospitals, were developed and were an outstanding success. Certain large stations had expanded sick quarters with between 50 and 100 beds known as Station Hospitals. In February 1940 there were ten such station hospitals and four more were opened before the end of the year. Temporary and semi-permanent sick quarters were built on new stations and extra accommodation was provided, where necessary, in either huts or requisitioned buildings, on a 1 per cent. of strength basis for airmen and 2 per cent. for airwomen.

The following comparative figures for 1940 and 1945 illustrate the growth of R.A.F. medical facilities during the war years :

	Hospitals		*Beds*	
	At home (including station hospitals)	*Overseas*	*At home*	*Overseas*
1940	20	4 (2 static 2 M.F.H.)	4,800	800
1945	27	37 (15 static 22 M.F.H.)	9,900	7,000

Seventy per cent. of R.A.F. patients during this period were admitted to R.A.F. hospitals and the remainder to authorised E.M.S., Army or Navy hospitals in accordance with a pre-arranged plan.

Special centres were formed to treat patients with orthopaedic, maxillo-facial, head, arterio-vascular, peripheral nerve, and burns injuries, and centres for neuropsychiatry and plastic surgery were also established. The R.A.F. were pioneers in the saline bath treatment for burns, and the results obtained by this method were unequalled. In addition, mobile surgical teams and mountain rescue units were established at certain strategic places at home and abroad to treat patients at the sites of crashes, or, if they were unfit to be moved to a special centre, at the hospital or sick quarters to which they had been admitted. Assistance was given by these teams to the civilian medical staffs in bombed areas.

The civilian hospitals played a very large part in the care of R.A.F. personnel by providing treatment in places where no R.A.F. medical facilities existed and this assistance was invaluable when the R.A.F. accommodation was overwhelmed by sudden mass arrivals of casualties, as, for example, after the fall of France. In addition, they helped R.A.F. station medical officers by affording facilities for X-ray and pathological investigation, when their own resources were severely strained or the nearest Service hospital was a long distance away.

In the narratives which follow, an attempt has been made to describe the major events which occurred in R.A.F. medical units during the war. Wherever possible the administrative problems which confronted the medical authorities have been outlined and the methods adopted to surmount such difficulties discussed, with particular reference to mistakes which were made and ideas which proved fruitful. Hospitals in the United Kingdom are described in some detail and in view of the inevitable similarity of their work, points of difference have been stressed and emphasis laid on special medical facilities or events of historical interest at the different establishments. A general description of the formation of and policy governing mobile field hospitals has been included, but the work of these and the general hospitals overseas is discussed in the campaign narratives into which they most appropriately fall.

GENERAL AND STATION HOSPITALS

R.A.F. Station Hospital, BRIDGNORTH
R.A.F. General Hospital, CHURCH VILLAGE
R.A.F. Officers' Hospital, CLEVELEYS, BLACKPOOL
R.A.F. General Hospital, COSFORD
R.A.F. Station Hospital, CRANWELL
R.A.F. General Hospital, ELY and LITTLEPORT ANNEXE
R.A.F. General Hospital, EVESHAM
Princess Mary's R.A.F. Hospital, HALTON
R.A.F. Station Hospital, HAVERFORDWEST
R.A.F. Station Hospital, HENLOW
R.A.F. Station Hospital, HEREFORD
R.A.F. Station Hospital, INNSWORTH
R.A.F. Station Hospital, KIRKHAM
R.A.F. Station Hospital, LOCHNAW, STRANRAER
R.A.F. Station Hospital, LOCKING
R.A.F. Neurological Hospital, MATLOCK
R.A.F. Station Hospital, MELKSHAM
R.A.F. Station Hospital, MORECAMBE
R.A.F. General Hospital, NORTHALLERTON

R.A.F. Station Hospital, PADGATE
R.A.F. General Hospital, RAUCEBY
R.A.F. General Hospital, ST. ATHAN
R.A.F. Officers' Hospital, TORQUAY
R.A.F. Station Hospital, UXBRIDGE
R.A.F. Station Hospital, WEETON
R.A.F. Station Hospital, WEST KIRBY
R.A.F. Station Hospital, WILMSLOW
R.A.F. General Hospital, WROUGHTON
R.A.F. Station Hospital, YATESBURY

WORK OF THE HOSPITALS

R.A.F. STATION HOSPITAL, BRIDGNORTH

R.A.F. Station, Bridgnorth, was opened in August 1939 as a R.A.F. Recruit Training Centre. It normally housed 4,000 airmen but this number was exceeded on several occasions due to operational requirements and the large influx of recruits into the R.A.F. The station was provided with a completely self-contained station hospital with a capacity of 114 beds.

The buildings were of part brick construction, the huts being joined by covered ways to make a single self-contained unit. There were five standard wards, each of which held twenty beds and had a small solarium at one end. A separate Infectious Diseases Block, containing seven two-bedded cubicles, was set aside for minor epidemics. The surgical unit comprised a well-equipped theatre with separate anaesthetic rooms and sterilising department, capable of dealing with all general and routine surgery. Laboratory, X-ray and physiotherapy departments completed the equipment of the hospital and these facilities were found adequate to deal with the majority of the cases which arose. Central heating was provided for the entire building by one boiler, which also supplied the necessary hot water and steam for the sterilisers in the theatre block. Electric wall panels provided additional heating for the latter and this proved a very satisfactory arrangement for a theatre which was not in constant use.

The type of case admitted naturally varied with the changing function of the station. Originally it was intended as a Recruit Training Centre, but after the fall of France in 1940, a large number of Allied personnel, including Poles, Czechs, Dutch and Free French, were stationed at Bridgnorth. In June 1941 the station became a W.A.A.F. Training Depot and a gynaecologist was employed full-time at the hospital. At that time the returns showed ninety-five beds occupied per month; it was noted that a high proportion of the illnesses from which W.A.A.F. personnel were suffering were either trivial or psychological in origin

and that a high boarding rate occurred. The bedstate for a typical month is indicative of the work of the hospital at this period:

Beds equipped—Officers	5	Beds occupied	81
Airmen	61		
W.A.A.F.	82		

In September 1942 the station reverted to the training of R.A.F. navigators and the number of female beds in the hospital decreased accordingly. A month later the hospital ceased to be controlled by Technical Training Command and came under the auspices of Flying Training Command.

In December 1943 a severe epidemic of influenza occurred on the station, and it was necessary to use two converted barrack huts as emergency wards. Despite all efforts, the epidemic was protracted and was noteworthy for the number of cases of pneumonia which developed as a secondary complication. Following this epidemic, the huts were held permanently for the use of the hospital, as the incidence of minor sickness had increased in proportion to the increased number of personnel on the station. The following figures illustrate the work at this stage:

Average beds occupied	95	Plasters	15
Operations (major)	20	X-ray	350
,, (minor)	15		(600 plates)

Out-patients—Surgical	74
Medical	62
Orthopaedic	18
E.N.T.	32
Gynaecological	6

The subsequent records of this hospital show little of historical interest, the work common to all station hospitals being carried on without abatement throughout the war years. In 1945, the station reverted to its original function of a Recruit Centre and the station hospital was one of the few which continued in being after the cessation of hostilities.

R.A.F. GENERAL HOSPITAL, CHURCH VILLAGE

In the early part of the war it was essential that adequate hospital facilities should be available in the South Wales area, and following the bombing raids on St. Athan in July and August 1940, incidents which might have been repeated, it was decided to look for additional medical accommodation in the Glamorgan district. Fortunately, the Glamorgan County Council had a very suitable, partially completed, hospital at Church Village, four miles from Pontypridd, and it was arranged with the authorities concerned that the Royal Air Force should have the use of the building.

This modern hospital had been under construction for some time, and in 1942, the interested parties held a conference to discuss plans for its future as a Service hospital. It was discovered that if the existing building programme was adhered to, the hospital would not be completed until the middle of 1943 and the R.A.F. plan for early augmentation of Service medical facilities in South Wales would be seriously delayed. It was decided, therefore, to limit further building to the essentials and, by revising the internal design to some degree, to have the hospital ready for the reception of patients much earlier than would have been possible under the original plan. No loss of efficiency would result from these temporary limitations and the original programme was to be completed by the County Council on the return of the buildings, when the time factor would be of less importance.

The hospital, which was situated on high ground, was a two-storied brick building, constructed on very modern lines, with a central block and two wings, the wards lying at right angles to the wings. Extremely large windows, commanding excellent views of the surrounding country, were a noteworthy feature of the building. There were 8 general wards which were of good design and easy to staff. Each ward accommodated 30 beds and distribution was as follows: 18 beds divided by glass panels into units of 4, 4, 4, 4 and 2, and separate side-wards, 2 of 4 beds and 4 of 1. In addition, there was room for a further 25 beds in the cubicled maternity department, which provided ideal officers' ward accommodation.

The hospital was opened with a complement of 110 equipped beds in early September 1942, roughly one year earlier than the original target date of the Glamorgan County Council, and the number of beds was steadily increased until the full number of 290 was reached. The policy of the hospital was common to that of all R.A.F. general hospitals with the following facilities available:

General surgical (major and minor)
Medical
Orthopaedic and peripheral nerve centres
Ophthalmic
E.N.T.
The usual ancillary facilities for X-ray and pathology.

The staff originally comprised 6 medical officers including the Commanding Officer, 10 Nursing Sisters, 3 W.A.A.F. officers and 78 airmen and airwomen with 5 V.A.Ds.

The work of the hospital followed the normal course of any general hospital in war-time, the first event of note occurring in June 1943, when it was decided to close the Orthopaedic Unit at St. Athan and transfer the patients to Church Village, where it was necessary to open thirty-eight extra beds in order to accommodate them. In August of the same

year a maxillo-facial unit was opened at Church Village to meet the increased demand for this type of treatment. In August 1944 the hospital was very actively engaged in dealing with convoys of wounded from the Normandy battlefields. The casualties were, for the most part, flown from the battle areas to Wroughton Hospital where they were re-allocated to the other hospitals; Church Village was one of the terminal hospitals participating in this scheme. In all, a total of 270 casualties was received at Church Village, 186 from Whitchurch, 35 from Wroughton and 49 from West Kirby.

In the years following 1944, the problem of housing patients suffering from tuberculosis became one of nation-wide importance and the R.A.F. had its difficulties in common with all other medical organisations. The increase in the incidence of the disease was considered to be only an 'apparent' one, brought to notice by the better methods of diagnosis, particularly the use of mass X-ray, but a little later the number of patients was definitely increased by the high incidence among returning prisoners-of-war. In order to relieve the strain on beds all over the country, Church Village for a short time opened a tuberculosis centre and wards, but the Glamorgan County Council did not approve of the use of the hospital buildings for this purpose, fearing that they might become medically 'unclean', thereby causing difficulties when they regained possession on derequisitioning. It was necessary to close the wards and send the patients to St. Athan.

The hospital was handed back to the Glamorgan County Council in April 1946, when the small numbers of patients no longer justified the retention of the building by the R.A.F. It is of interest to note that the Council were unable, due to staffing difficulties, to open the hospital for some time. This emphasises the fact that the relative isolation of the building was its major disadvantage, one common to both civilian and Service administrations.

R.A.F. OFFICERS' HOSPITAL, CLEVELEYS

It was imperative after R.A.F. Officers' Hospital, Torquay, had been rendered untenable by bombing in October 1942, to find alternative accommodation of a similar nature as soon as possible. The other general hospitals found the increased demands on their officers' beds hard to meet and in any case few of these were equipped with the facilities for convalescence with which Torquay had been so abundantly provided.

At this stage of the war it was far from easy to find such accommodation; most of the suitable buildings had already been requisitioned by the Services or by Government departments. It was only after prolonged negotiation and considerable difficulty that the R.A.F. succeeded in obtaining the use of Cleveleys Hydro, a rather dilapidated late nineteenth century building situated on the coast road about three miles

outside the town of Blackpool. The selection of this hotel limited the scope of the hospital to two hundred equipped beds, fifty less than had been available at Torquay, but in view of the urgent need for accommodation of some kind, the diminished bedstate was accepted.

Although the hospital was established on May 7, 1942, the official date of opening was delayed until July 26, the intervening period being spent in making the building habitable and fit for the reception of patients. The work of reconstruction was given high priority and taking into consideration the difficulties encountered by any building project at that date, the task was carried out both speedily and well.

The hospital catered, to a very large extent, for personnel who, although not in need of actual medical treatment, required supervision and recuperative facilities before they could rejoin their units. Cleveleys, while in no way attempting to function as a rehabilitation centre in the true sense of the word, offered most of the facilities associated with that type of unit, combined with the amenities of one of England's largest seaside resorts, and officers from the Dominions especially, without homes in this country at which to recuperate from illness, were grateful for the accommodation. The work of rehabilitation was carried a step further when a gymnasium was improvised in garage accommodation vacated by the Army authorities.

The general policy of the hospital was similar to that of Torquay in most respects. It was decided to admit all types of case other than patients suffering from infectious diseases and orthopaedic complaints, and the following departments were therefore set up:

Surgical (major and minor)
Medical
Ophthalmic
N.Y.D.N. (Not yet diagnosed neuropsychiatric)
E.N.T.
Gynaecological

The beds were divided roughly as follows: surgical 40, medical 60, N.Y.D.N. 80 and female 20, but as the small wards made it possible to adjust the allocation of beds according to the types of cases admitted from day to day, the figures quoted were very elastic. The number of beds allotted to female patients was small, but by rearrangement of accommodation it was possible to accept all cases requiring treatment.

By August 1942 the hospital had 125 equipped beds and the full figure of 200 was very soon reached. At the end of the month 140 beds were occupied, a very high figure for a newly opened hospital. It often happened that medical officers, in spite of every effort by the authorities to publicise new facilities, were slow to take full advantage of them, possibly due to a conservative outlook towards new channels for the disposal of patients.

In August 1943 the officers' N.Y.D.N. centre at the Littleport Annexe of Ely Hospital in Cambridgeshire was moved *en bloc* to Cleveleys and from then onwards the centre increased in size to become, with Matlock, one of the two main centres in the country for this type of case. The hospital was particularly suitable for this type of work and all but serious cases requiring observation and restraint were admitted.

There were no major changes in policy throughout the remainder of the war and Cleveleys continued to function as a general hospital. Towards the end of 1945 it was found that with the cessation of hostilities the demand for the hospital had lessened appreciably and in November of that year it was closed and the building was handed back to the civilian authorities.

R.A.F. GENERAL HOSPITAL, COSFORD

Before the outbreak of the war, Cosford was one of the principal R.A.F. stations engaged in the training of recruits and apprentices and its population was consequently invariably large. It is well recognised that the incidence of minor sickness is high in the age-groups from which the majority of these personnel were drawn and accordingly a large station sick quarters was already in existence in September 1939. The huts which comprised this unit had been built within the station perimeter in the north-west corner of the camp and as considerable attention had been paid to the layout of the surrounding area, its appearance was both smart and attractive. The huts were joined by covered corridors, making a compact unit which provided nine wards of standard size with twelve separate bunks for infectious disease cases, an operating theatre, X-ray department, a laboratory and a dental surgery. These facilities were available not only to personnel of the station, but also to those of several small units in the area and to families of such personnel whenever practicable. Staff for the sick quarters was provided by medical officers from the station, who were able to obtain specialist opinion on complicated and serious cases from local civilian practitioners* as and when the need arose. When, in the latter part of 1939, the unit was raised to the status of a station hospital and R.A.F. medical specialists were included in the establishment, it was no longer necessary to call upon local civilian consultants for assistance.

It had been realised well before the outbreak of hostilities that in the event of war the existing facilities, even when raised to the status of a station hospital, would be inadequate for the needs of the steadily increasing population of Cosford and other stations which were already

* These were civilian practitioners acting in a specialist capacity at local hospitals.

in course of construction in the vicinity. Plans were prepared for the erection of a full-scale general hospital, which would be constructed with a view to a lifetime of about ten years.

The new hospital was constructed on the general lines of all hutted hospitals and was in all respects similar to its sister establishment at St. Athan; the design of these two hospitals was unique, being arranged so that extra wards could be built on, all close together, and all having south-west or south-east aspect. Provision was made for the housing of the medical and surgical divisions at opposite ends of the building, with the theatre, laboratory, physiotherapy department, administrative offices and kitchens between, all sections being interconnected by covered-in corridors. Outbuildings constructed at the back of the hospital included medical stores huts, a mortuary and a gas annexe. The hospital was heated by a central boiler and was generally supplied with radiators. Water and sanitation were supplied from local mains sources. The total facilities available were thirteen wards, out-patients department, adequate specialist accommodation and two unusual features, not possessed by all general hospitals, a small padded cell and observation wards. The hospital was well designed and easy to run, one of its greatest advantages being the ease with which alterations could be effected with the minimum of materials. This asset was greatly appreciated when the out-patients' department, as originally designed, proved too small. The only disadvantage of the design of the buildings was that the corridors were constructed with flat roofs, so that after heavy rain pools of water collected where leaks had occurred.

Although the foregoing paragraphs have described the hospital as it was when completed, it was in fact opened in sections as each was finished and handed over by the contractors. In June 1940 the new hospital had still only 40 surgical beds equipped, while the station hospital had a total of 174 beds available as follows:

Medical	60
Surgical	60
Officers	2
Isolation	52

The delay was due in part to the labour shortage of the contractors and to the lack of personnel to unpack equipment. However, by the end of July 1940 the new hospital had 190 equipped beds available, so that the combined total was 364. The staff consisted of 10 medical officers, 27 sisters, 83 airmen and 12 V.A.Ds. Medical postings to R.A.F. Station, Cosford, bearing in mind the expansion of the hospital and its organisation into medical and surgical divisions with full ancillary departments, began to be made in 1939, and it so happened that a number of the

officers so posted remained there for long periods. The shared experience of the hard work and difficulties of the early part of 1940 welded them together into a harmonious and well-knit unit, a factor which stood them in good stead when they moved into the Regional Hospital in July 1940.

In August 1940 the capacity of the new hospital was again increased by putting up extra beds in the existing wards. The venereal disease centre in the old station hospital, which by this time had become the Infectious Diseases Hospital, increased its capacity from 72 to 136 beds. Orthopaedic, Ophthalmic and E.N.T. departments were now opened, and, with the use of the former families' ward as a female ward, the total facilities at Cosford were considerable:

R.A.F. Regional Hospital .	290 beds	503 beds equipped
Infectious Diseases Hospital .	213 ,,	

In the same month the staff billets in the main hospital area were opened, the staff of the Infectious Diseases Hospital continuing to lodge on the main camp.

In 1941 further developments of the hospital included the setting up of a reserve of beds, making a grand total of 612 beds equipped, and the establishment of a Burns Centre. This modern department, housed in the ward which in peace-time would have accommodated maternity cases, was graciously opened by Her Royal Highness the Duchess of Gloucester and its work is described in some detail in the narrative on Burns Centres.

Close liaison was maintained with the civilian medical authorities, in particular the E.M.S. Thoracic Surgery Unit at Barnsley Hall and the Military Hospital for head injuries at St. Hugh's College, Oxford. Medical meetings and demonstration ward rounds became a regular feature of the hospital life and R.A.F. medical officers were frequently joined at these functions by the staff of the Royal Hospital, Wolverhampton and the Birmingham United Hospitals.

The welfare side of the hospital's work was well organised. The British Red Cross and St. John Organisation ran an excellent library for the patients and also arranged that all Dominions personnel were visited regularly by specially appointed visitors. Film shows and concerts were given at least once a month and many other entertainments and drives were arranged for those patients sufficiently well to participate.

Apart from the special arrangements made in 1945 for the repatriation of ex-prisoners-of-war, the history of Cosford differs in no major respect from that of other large general hospitals in war-time. It was one of the largest of the R.A.F. hospitals and its volume of work was correspondingly of a high order. The following figures for the period January to March 1943 illustrate the scope of the hospital's activities:

In-patients	2,688
Out-patients	5,057
Operations	792
X-rays	3,147
Plasters	393
Laboratory tests	6,019
Venereal disease clinic	1,273
Spectacles issued	2,221*

* This figure represents the total for the year

One innovation introduced at Cosford appears worthy of special mention. In order to provide extra beds, use was made of concrete aprons approximately the size of a tennis-court, on which it was possible to erect large ward marquees. Although the use of such accommodation was impracticable during the inclement weather of winter, these wards were found singularly suitable for the nursing of plaster patients and other offensive-smelling long-term cases. The ease with which lighting and heating could be provided from existing supplies in the adjoining wards greatly facilitated the running of these improvised wards.

Towards the end of the war, it became increasingly apparent that comprehensive medical arrangements would be required to deal rapidly and tactfully with the large numbers of repatriated prisoners-of-war who would be reaching this country after the cessation of hostilities. The Air Ministry decided that it would be the best course to receive all ex-prisoners at one centre, within easy access of the likely ports of disembarkation, where hospital facilities would be available if necessary, and where the buildings would permit of housing the personnel comfortably. R.A.F. Station, Cosford, was chosen as the most suitable location and planning for the organisation of No. 106 Personnel Reception Centre commenced. As the work of this unit will be described in some detail in the section dealing with prisoners-of-war, reference in this narrative will be confined to a description of the events as they affected the hospital.

The unit was formed at Cosford in early March 1945, and a programme of the work envisaged was drawn up. As this was the first operation of its kind it was not easy to decide upon exact requirements but it was considered that the duties of the unit would fall under two broad headings:

(*a*) Initial reception, feeding, kitting and medical examination to determine whether the prisoner-of-war was fit to proceed on leave.

(*b*) Subsequent medical board and disposal following leave.

The unknown factors which had to be borne in mind when planning for the operation of these functions were the following:

(*a*) The total number of prisoners to be received

(*b*) The rate of reception

(*c*) The date of the commencement of the operation

(*d*) The medical condition of the ex-prisoners on arrival

(i) Number requiring hospitalisation

(ii) Disinfestation

(iii) Nutritional state

It was found impossible to obtain accurate forecasts of the numbers and types of cases likely to be received and the unit had to be prepared to make *ad hoc* decisions in accordance with circumstances. The first group of 99 prisoners-of-war was received on April 10, 1945, within a few hours of notification of their impending arrival. It was, medically, the worst contingent ever received at the unit; 21 were admitted to hospital, 3 with suspected pulmonary lesions, 1 with diphtheria and the rest with obvious signs of malnutrition. So poor was the condition of these ex-prisoners that special medical experts on malnutrition were sent to the unit on instructions from the Air Ministry. However, among groups received subsequently, there was never again such a high percentage requiring hospitalisation, the general condition of the personnel being slightly better than that of the first group. The medical examination included a miniature X-ray of the chest, but the prisoners-of-war were allowed to proceed on leave, their chief desire, without waiting for the result. Arrangements were made to get in touch with their own general practitioners should the result unhappily prove positive, so that the patient could be given medical care and attention with all possible speed. These arrangements worked well, the action taken to send men rapidly on leave proving of great psychological value.

A rapid succession of ex-prisoners was received, medically examined, documented and sent on leave. They arrived at all hours of the day and night and staff often worked for twenty-four hours without a break. During the period April 10, 1945 to June 4, 1945, 9,185 officers and men passed through the unit and of this number, 210 were admitted to hospital, the majority suffering from the effects of malnutrition or requiring investigation for gastro-enteritis. Disinfestation did not prove so large a problem as had been expected, as most of the prisoners had been disinfested several times before arrival at the unit and only a relatively small number required this treatment. The garments discarded by the prisoners-of-war, which were disinfested and reclaimed, weighed fifteen tons, some small indication of the magnitude of the task.

The second phase of the operation, namely, the medical boarding and disposal of this large number of men, created a further problem for the medical and executive staffs. From June 1945 onwards the men began to arrive back from leave and in order to deal with the large number of

medical boards which had to be arranged, part of Fulton Block, a large modern barrack block, was taken over as the Board Centre. It was arranged in a very similar manner to the Central Medical Establishment and comprised:

Waiting rooms
General medical section
Ophthalmic section
E.N.T. section
Laboratory
President's section
Office accommodation

These arrangements made it possible to board the prisoners-of-war in groups of fifty at a time. It was aimed to deal with 250 a day and although this figure was never quite attained, very near approximations were reached on several occasions and a figure of 474 boards in two days is quoted. The work of the Board may best be considered by dividing the patients into two groups, fit and unfit. Those who were assessed as fit were passed on to the administrative authorities for disposal and posting, but later, when general releases of personnel were proceeding after the cessation of hostilities in Europe, they passed direct to the medical release centre. The unfit personnel were either admitted to hospital or posted to No. 4 Medical Rehabilitation Centre which was located at Cosford and is described below. The following figures give some indication of the work of the Board:

Number of boards up to August 11, 1945	10,136	
Forms typed for the boards . .	13,071	
Number of ex-prisoners attached to No. 4 M.R.U..	1,379	
Number admitted to hospital . .	582	Medical . 236 Surgical . 229 Neurological . 25 E.N.T. . . 68 Ophthalmic . 12 Dermatological 12
Miniature X-ray films . . .	9,123	
Normal X-ray films	1,054	

To these figures must be added the work of the unit in respect of the prisoners-of-war who arrived later from the Far East. These personnel, however, did not present the same difficulty, most of them having had the advantage of a long sea voyage, during which their health had improved considerably. There was among them, however, a fairly high incidence of chronic tropical disease and various forms of dysentery. Treatment was in most cases carried out at the unit without recourse to

the hospital, which was extremely busy at the time. Special huts were set aside for them and adequate laboratory facilities were made available. These arrangements worked admirably.

The function of No. 4 M.R.U. was the care of those patients who, although not sufficiently ill to warrant admission to hospital, were nevertheless still in need of medical supervision. The unit was established at Cosford in close proximity to No. 106 P.R.C. and was housed in hutted units with their own kitchens and every possible amenity calculated to make the prisoners-of-war feel at home. A complete hangar was fitted up as a gymnasium, where the patients did carefully graded exercises. These exercises, performed under careful supervision, combined with the pleasant atmosphere of the unit and generous well-cooked meals, had a dramatic effect upon the health and morale of the majority of the patients. In dealing with the more difficult cases the unit had the advantage of specialist opinion within very easy reach.

The war history of Cosford divides, as we have seen, into two phases: the first, the build up of a large general hospital offering all the usual facilities associated with the best traditions of such hospitals, and the second, the special function of caring for returned prisoners-of-war, which was entrusted to it in early 1945. By the end of 1945 Cosford Hospital was again engaged in carrying out the normal duties of a general hospital, but on a scale commensurate with the gradually declining R.A.F. population in the area.

R.A.F. STATION HOSPITAL, CRANWELL

Although its history dates from the beginning of 1916, R.A.F. Hospital, Cranwell, was in use as a general hospital for only a short period during the war and accordingly very brief mention will be made of its activities from the outbreak of war until June 22, 1940, when it was reduced to the status of a station sick quarters.

The original sick quarters was built by the Naval Authorities as a sick bay early in 1916 and was converted for use as a R.A.F. Hospital in April 1918, when the station was handed over to the R.A.F. The antiquity of the original structure and the various additions made to it by the successive occupants to meet their own particular needs has resulted in an unusually diverse group of buildings. The design of the hospital was typical of those of the 1914–18 period, the Nissen huts being much more widely separated from each other than those constructed during the Second World War. This was a bad feature, leading to a wider dispersal of personnel than was desirable and causing many difficulties of administration which impaired the general efficiency of the hospital.

In peace-time Cranwell Hospital was responsible for the small R.A.F. population in the north-eastern area of England and at the outbreak of hostilities it was also charged with the medical care of personnel on the

station, comprising the Royal Air Force College and a large number of trainees and boy entrants. It offered facilities for the treatment of all types of cases and possessed an efficient operating theatre with all the necessary ancillary departments and a medium sized out-patients department. Before the war, in accordance with Service practice, treatment was given to entitled civilians, but this activity had to be curtailed on the outbreak of hostilities. The bedstate at that date was 210 equipped beds but to meet the emergency this figure was increased to 355 by opening further huts and increasing the capacity of those already in use.

It was considered by the Air Ministry that the area in which this hospital was situated was particularly vulnerable to enemy air attack and that the continued existence of a large hospital in the area was inadvisable. Several schemes for alternative accommodation were considered and a board of survey inspected several sites, finally selecting one at Canwick just outside Lincoln as the most suitable for the erection of a 270-bedded hospital. Pending the completion of the long-term project, arrangements were made to accommodate patients in Rauceby or Newark E.M.S. Hospitals if the need arose and at the same time use was made of Nocton Hall, a large private house converted to accommodate convalescent cases. This house was used as an annexe in which patients could be billeted as a temporary arrangement.

In March 1940 the first stage in the closing down of Cranwell was achieved when seventy patients were transferred to Rauceby E.M.S. Hospital. By this time it was becoming apparent that the project for a new hospital at Canwick was very costly and the scheme was finally abandoned when the acquisition of Rauceby for use as a R.A.F. General Hospital provided a reasonable number of beds in the same area. Cranwell closed down on June 22, 1940, when the remaining patients were transferred to Rauceby.

It is interesting to note that the threatened air attack, which led to the closing of Cranwell and the opening of the larger, more modern hospital at Rauceby, did not materialise. Cranwell, reduced to the status of a sick quarters, continued to function actively throughout the war, both as a sick quarters and as a centre for special treatment cases and skin diseases. For both of these functions its hutted accommodation was adequate.

R.A.F. GENERAL HOSPITAL, ELY AND LITTLEPORT ANNEXE

During the period of expansion which preceded the events at Munich in 1938, it was planned to set up numerous R.A.F. stations in the Fens area which, owing to the flatness of the country and the complete absence of geographical features likely to impede flying, was particularly well suited to aerodrome construction. It was a foregone conclusion that a hospital of some considerable size would be needed to serve these stations. Building was commenced in early 1938, but at the outbreak of

war in September 1939, was still incomplete. The need for hospital facilities was urgent and it was decided to seek suitable temporary accommodation to bridge the period which must still elapse before Ely Hospital could be brought into service.

The building chosen was a Convalescent Home at Littleport, a village five miles north of Ely, which had been used in peace-time by the Transport and General Workers' Union. It consisted of a series of standard type wooden huts estimated to accommodate at capacity 250 equipped beds and the necessary ancillary services such as laboratory and X-ray departments. In this way it was possible to provide a reasonable number of beds rapidly, with the minimum of alteration.

Meanwhile work proceeded on the final details of the new hospital at Ely, which it was found possible to open, with limited facilities, in August 1940. The construction of this hospital merits special mention since it was perhaps the most modern and well-built of all the R.A.F. hospitals, although R.A.F. Hospital, Wroughton, was later constructed on similar lines. It is a two-storied brick building, designed in the shape of the letter H, with the wards running out at right angles from the cross stroke. Viewed from a distance the most striking feature is the large area of window space; the pleasantly rounded glass windows of the wards all face south to obtain the maximum amount of sunshine and all have solarium facilities.

The wards were designed on modern lines with all the usual labour-saving devices such as rounded corners and other advantages which facilitate efficient management. They were all spacious and well floored and in some the hanging curtain system has been adopted to allow privacy for the individual patient. The theatre, of sound modern construction, was notable in that it was the first in the R.A.F. to be fitted with twin air-conditioning and was blast-proof. The whole hospital was well provided with lifts of sufficient size to allow trolleys with stretchers to be wheeled in, an important feature and one with which many of the requisitioned hotels used in war-time as hospitals were not provided. The design of the kitchens was in keeping with that of the rest of the hospital; the apparatus was modern and well laid out, offering every facility for the ready preparation of meals whenever required. Lighting, heating and drainage were all provided from main systems, linked to the local municipal supply. These units were efficient and the arrangement was found during the war to have certain advantages; those establishments which had their own sewage plants, for example, found that they became overloaded as a result of the necessary all-round expansion which was taking place.

When the hospital opened in August 1940 the medical and physiotherapy departments were ready and in September it was possible to accept surgical cases by using field mobile surgical units until the theatre

PLATE XIX. Outpatients' waiting room and NAAFI canteen, Cosford General Hospital.

PLATE XX. Main operating theatre, Cosford General Hospital.

facing p. 200

PLATE XXI. R.A.F. General Hospital, Ely, from the South-west.

PLATE XXII. General surgical ward, Ely General Hospital.

PLATE XXIII. Special treatment room, Evesham General Hospital.

PLATE XXIV. General surgical ward, Evesham General Hospital.

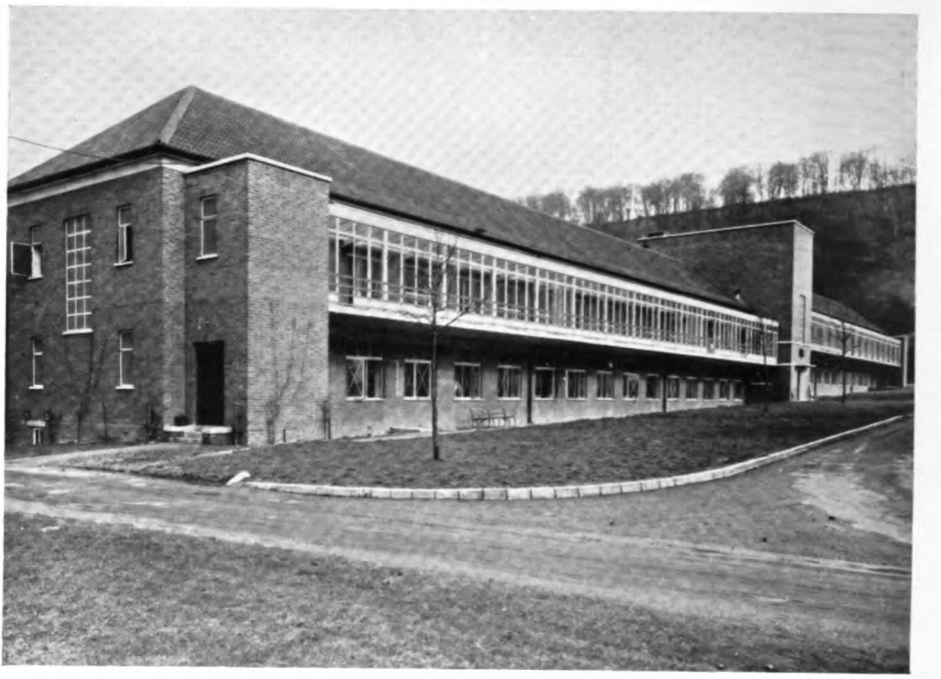


PLATE XXV. General view of a main ward, Halton General Hospital.

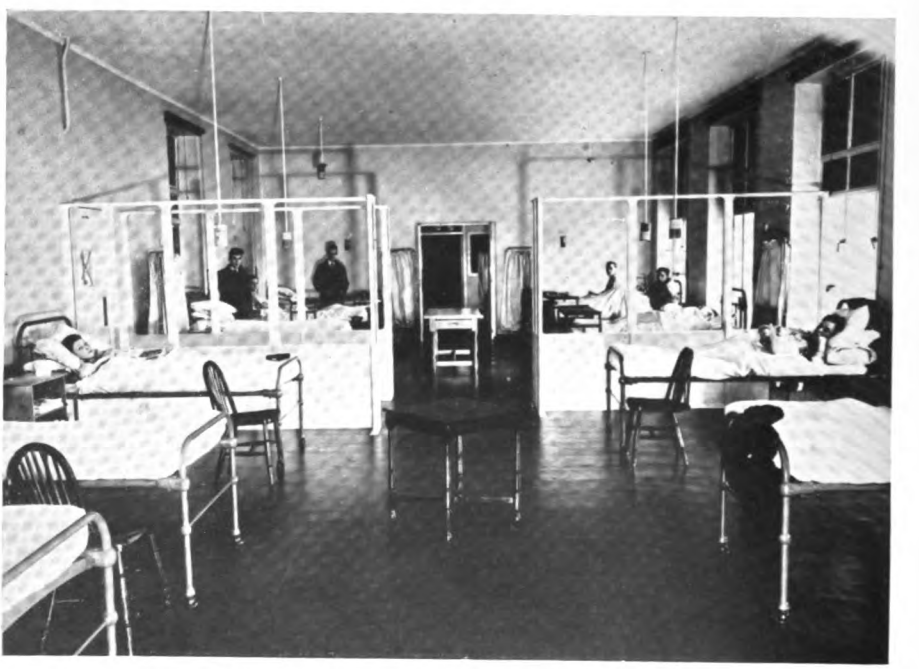


PLATE XXVI. Interior of a ward showing blackout, lighting and screening, Halton General Hospital.

proper was ready for use. In September also the laboratory was opened and undertook all work other than bacteriological investigations, which were still sent to the annexe at Littleport. By this time the advantages of retaining the Littleport hospital as an overflow centre for convalescent medical and surgical cases had become increasingly apparent and the two hospitals combined under the title 'General Hospital Ely and Littleport Annexe'.

By early October 1940 the equipped bedstate had risen to 202 and the expansion of the hospital proceeded steadily until 315 beds were available, in June 1941. Including the accommodation available at Littleport the total capacity for use in an emergency was 565 beds, although this number was never actually required. The hospital was now one of the best equipped Service hospitals in the British Isles and served a wide area with more than forty R.A.F. stations within a radius of fifty miles. In addition to the usual facilities of a general hospital, it included physiotherapy and burns centres among the departments less frequently to be found in such establishments. The distribution of the departments between the two hospitals varied considerably over the years but the average arrangement, which was entirely flexible in order to meet any eventuality, was roughly as follows:

Ely General Hospital—	General Surgical (major and minor)
	General Medical
	Orthopaedic
	Burns
Littleport Annexe—	N.Y.D.N. Centre
	Dermatological
	Infectious Diseases
	Ophthalmic
	Convalescent Centre (surgical and medical)
	Invaliding Holding Centre

It was possible to use Littleport as an overflow for practically all types of cases from Ely and all departments made use of the convalescent facilities there.

The work of the hospital differed in no major respect from that of the other general hospitals. The following figures of work done in the month of June 1941 are representative of conditions at Ely throughout the war years:

	Beds equipped	*Beds occupied*
Ely	302	232
Littleport	250	172

Operations:	Major	156
	Minor	48
Plasters		200

X-rays: Reports	638
Films taken	1,576
Screening	42
Physiotherapy: Patients treated	110
Treatments	1,162
Laboratory: Reports issued	1,787
Investigations	2,153
Admissions:	525
Night admissions	130
Accidents	74
Operations	10
Discharges	394
Out-Patients:	
Ely—Surgical	130
Medical	100
E.N.T.	321
Orthopaedic	241
Littleport—Ophthalmic	255
Neurological	80
Special treatment	100
Boards: Officers	41
Airmen	92
Aircrew	33

The Fens area was one to which the enemy paid considerable attention and air-raid warnings were frequent, often lasting for some hours. In February 1941, the hospital was hit by a raider which dropped a small high-explosive bomb in the vicinity of the hospital lodge. An airman on duty in the lodge was unfortunately killed outright, but luckily, although considerable damage was done to the glazing of the hospital, the structure remained intact and the work was in no way impeded by the incident. The hospital authorities, realising in 1940 that the hospital might perhaps become involved in enemy action on a large scale, perhaps even to the extent of invasion, had established good liaison with the Army and civilian authorities in the area. Full measures for mutual aid were agreed and the hospital was envisaged as a casualty clearing centre. Fortunately, the need to implement these plans did not arise to any great extent and the only time the hospital was called upon to assist an outside body was in February 1941, when, after the bombing of Newmarket, the mobile surgical team helped the E.M.S. Hospital at White Lodge, Newmarket, to deal with the very heavy civilian casualties.

Ely Hospital was particularly well known throughout the war years for its work in connexion with the burns centre. This was chiefly due to the fact that a large number of the patients admitted from the bomber stations in the neighbourhood were suffering from flying injuries

sustained in the bombing attacks on Germany, which were intensified in the later years of the war. In contrast to most of the other general hospitals, Ely was still working at high pressure in 1945, largely because the strength of Bomber Command was reduced considerably more slowly than that of the other commands.

During the war years Ely was honoured by visits from the Royal Family on several occasions, those most notable being the visit of Their Majesties the King and Queen in January 1941 and that of Their Royal Highnesses the Princess Royal and the Duke of Kent later in the same year.

The only major change of policy occurred in March 1945, when the R.A.F. Neurological Hospital at Matlock closed down. Patients from Matlock were housed in the Littleport Annexe, whose patients were transferred to Ely where two wards were opened to accommodate them. From this time onwards Littleport had only N.Y.D.N. and ophthalmic wards. When hostilities ended later in 1945, the work of Ely, planned and constructed as a permanent hospital, continued, rivalled in functional efficiency only by its sister hospital, Wroughton, and by Halton, the principal R.A.F. General Hospital.

R.A.F. GENERAL HOSPITAL, EVESHAM

In the latter part of 1940 the establishment of a R.A.F. hospital in the Evesham district became necessary as a result of the speed-up in mobilisation and the opening of new R.A.F. stations in the area. The nearest R.A.F. hospital was at Gloucester, about thirty miles away, and it was essential to provide hospital facilities nearer at hand for the rapidly increasing R.A.F. population which, later on, included a high percentage of W.A.A.F. personnel, due to the location of W.A.A.F. Depots at Bridgnorth, Innsworth and Gloucester and the W.A.A.F. Officers' School at Loughborough. In view of the relative urgency for the provision of this hospital and the impossibility of constructing new buildings for the purpose, it was decided, in the interests of speed and economy, to requisition suitable premises. In February 1941 it was agreed, after a preliminary survey, that the Evesham Public Assistance Institution, where the E.M.S. had recently opened a hutted hospital, would be a suitable site.

The hospital was built on high ground behind the Public Assistance Institution entrance in Hampton Street, and was completed in May 1940, when it was opened for the reception of E.M.S. patients, with a total of 378 equipped beds. It was built of hutted units of standard E.M.S. type, each designed to accommodate thirty-six beds but capable of expansion, if necessary, to forty-two beds. As originally planned the huts did not allow for side wards or the segregation of infectious disease

cases. The wards were heated by the standard type E.M.S. central ward slow-combustion coke fires, which although far from ideal were adequate and could be supplemented by electric heating as the hospital was connected to the local mains. Water was distributed to the hospital from the local supply and sewage was disposed of into the local main sewer. The hospital kitchens were well equipped with modern apparatus and designed in such a way that they could cater easily for 500 or more people without undue strain. When the R.A.F. took over, a two-storied brick building was in course of construction, the ground floor to provide office accommodation and the upper to house six medical officers with their own dining-room and necessary offices.

It was decided that the hospital did not require a great deal of reconstruction to bring it into line with Service standards, but it was necessary to reduce the capacity to 180 equipped beds. This represented a decided decrease in the number of beds available under E.M.S. administration but it was found necessary to use five of the wards to house staff and to accommodate new departments. The following is a list of the departments and ancillary facilities which required organisation:

Reception room
Laboratory
Medical board room
Plaster room
Nurses' domestic quarters
Quartermaster's stores
N.A.A.F.I.
Transport shed
Inflammable store

After much difficulty due to the shortage of labour and materials, a universal problem at this stage of the war, the necessary alterations, which included the resurfacing of all ward floors with Durocrete and the installation of an incinerator, were completed on May 20, 1942.

Before this date, in February 1942, the first patient was admitted to the hospital, fifty equipped beds being ready for occupation, and by the end of March all the beds were occupied. When the hospital became fully operative in May 1942, six fully equipped wards were provided, the distribution being as follows:

Ward 1—Male . .	Surgical
,, 2—Male . .	Medical
,, 3—Female . .	Surgical and medical
,, 4—Female . .	Gynaecological (observation ward)
,, 5—Female . .	Venereal disease (gonorrhoea)
,, 6—Female . .	Venereal disease (syphilis)

A portion of each ward was partitioned off to form a side bunk with one bed for the immediate isolation of patients suspected to be suffering from infectious disease, or for the nursing of seriously ill cases.

In addition to its normal duties, the hospital provided an out-patient department, with the usual ancillary services, for the surrounding stations. The original plan to provide a reception room was not proceeded with and, although there were special arrangements for the reception of patients attending the V.D. clinic, there were no facilities for the reception and examination of general medical and surgical out-patients. These patients were received in the Decontamination Centre and conducted by runners from the waiting-room in that centre to a ward or ward bunk for examination by the appropriate specialist. This caused considerable inconvenience and, as time progressed and more and more out-patients attended the hospital, the need for a properly equipped out-patients department became increasingly apparent. However, it was impossible to effect any major alteration, although in 1945 the work was facilitated to some extent by the provision of a larger waiting-room.

The most noteworthy individual feature of the work of Evesham Hospital was its function as the centre for the treatment of venereal disease among members of the W.A.A.F. Before 1942, women suffering from this disease had been treated first at the Lock Hospital in London and later at R.A.F. Hospital, St. Athan, where twenty beds were made available in a separate wing. In February 1942 this centre was transferred to Evesham Hospital, which from that date admitted cases from all over the United Kingdom. A venereal disease treatment room was provided by utilising the plaster room, plaster work being carried out in the main operating theatre. The medical board room was converted into a waiting-room and as this and the plaster room were situated one on each side of a corridor in the theatre block they formed a self-contained V.D. clinic.

From a disciplinary point of view, the control of women suffering from V.D. was fraught with considerable difficulty, largely due to the presence in the W.A.A.F. of numerous women of questionable character, serving in the Forces only because of their liability to call-up and in some cases completely indifferent to discipline. The presence in hospital of this type of patient had a deleterious effect upon morale and the policy of invaliding them was adopted whenever possible. Although the percentage of such cases was small, the problem was of some importance, demanding extreme tact on the part of the Commanding Officer.

Another matter which gave rise to some concern was the attitude of the local residents who appeared to think that the hospital was run entirely for V.D. cases and to view such a policy with extreme disfavour. Much unpleasantness was experienced by both staff and ordinary

patients before it was appreciated that the hospital was also treating numerous other medical and surgical conditions. In order to convince the residents that this was in fact the case they were given every opportunity of seeing normal orthopaedic patients out for airings in their wheel-chairs.

By 1945 the R.A.F. population in the area was decreasing rapidly due to the closing down of redundant stations and the movement of personnel abroad to the other theatres of war. The demand for hospital treatment decreased proportionately and on March 15, 1946, the hospital was handed back to the civil authorities for use as planned under the original E.M.S. scheme.

PRINCESS MARY'S R.A.F. HOSPITAL, HALTON

It has been the policy in the majority of the hospital narratives to confine descriptions of their work to the actual war period, but among the few exceptions which merit at least brief mention of their pre-war activities is the P.M.R.A.F. Hospital at Halton, the oldest and largest of the hospitals. With a long history dating back to the War of 1914–18, Halton has always been regarded as the cornerstone of the planning of all R.A.F. hospitals.

Just as the Royal Air Force had its beginnings in the Army, so the Medical Branch was evolved from the existing organisation to serve an entirely separate and rapidly growing force. It was at once perceived that this new medical branch would ultimately be an organisation of considerable size and ramifications and that it needed a major hospital of its own to serve as a basis for the establishment of all its ancillary medical departments. Halton Camp, which even in 1919 was a large training depot, was chosen as the most suitable site, being pleasantly situated in Buckinghamshire, within easy reach of the Air Ministry in London and accessible from all parts of the British Isles.

In January 1919 the hospital was formed as R.A.F. General Hospital, Halton. Its buildings consisted of the typical 1914–18 wooden huts joined by covered corridors and it was similar in most respects to the present-day hutted hospital. It was staffed by the R.A.M.C. with a major as Commanding Officer, assisted by nursing sisters, V.A.Ds. and W.R.A.F. nursing orderlies. The hospital furnishings were provided by the local Army stores, while the medical equipment was acquired from Kidbrooke, the original R.A.F. medical supply depot.

At the time of opening the hospital was unable to deal with all types of patient and major surgical cases were sent for a while to the Royal Buckinghamshire Infirmary and infectious disease cases were transferred to Tring Isolation Hospital. During the first years, however, an X-ray department was opened, greatly facilitating diagnosis and treatment in

many cases and eliminating the irritating necessity of transferring patients for simple X-ray examination.

The first year in the life of the hospital was notable for a staffing problem, for in September the W.R.A.F. was disbanded, creating a grave shortage of nursing orderlies. The difficulty was met by re-mustering eighty sanitary assistants to the trade of nursing orderly until trained personnel could be supplied by the Medical Training Depot (see Chapter 2).

While post-war improvisation proceeded, efforts were being made to make the hospital entirely self-sufficient and during the first few years the greatest advance made was the opening of the hutted isolation hospital. This enabled the R.A.F. Medical Branch to retain all cases of infectious disease and to study any aspects of the aetiology of the disease peculiar to the R.A.F. By allotting three wards to special treatment cases in 1927, the isolation hospital provided the basis for the treatment of venereal disease within the Service and afforded R.A.F. medical officers the opportunity to benefit from the study of cases which had hitherto been transferred to the care of other hospitals.

By 1927 a large modern hospital became a necessity, and in October 1927, such a hospital was opened at Halton by Her Royal Highness Princess Mary, who graciously consented to the hospital being named after herself—The Princess Mary's Royal Air Force Hospital, Halton. The following is a brief description of the hospital which, with modifications, remains in use to this day. The main buildings are situated on the side of a hill overlooking a large area of the camp, with a fine view of the Buckinghamshire countryside. There are two main two-storied rectangular buildings, constructed of brick and connected by enclosed corridors, and in the square formed by these buildings is another smaller one joined to the two corridors at right angles. The most southerly of the two main blocks has two large wards at either end on both floors, separated on the lower floor by the administrative offices and on the upper floor by the physiotherapy and ophthalmic departments. The rear block similarly has wards at either end which are divided into smaller units, the space between them being occupied by the quartermaster's department and the hospital kitchens. Leading off from the northern corridor is another single-storied section, in which is housed the out-patients department. Just behind this, leading from the same main corridor are the chapel and the X-ray department, the former on the ground floor. Detached from the hospital but within easy access, are the barrack blocks, barrack stores and mortuary. The Commanding Officer's house and the sisters' mess are also situated in the immediate neighbourhood of the main hospital. The infectious diseases hospital, a modern brick building about a quarter of a mile away, is entirely self-contained in all respects.

The activities of any hospital are perhaps best judged by the yearly volume of work and the following figures for the year 1929 are typical of the years which preceded the Second World War:

Patients admitted:	Officers . .	105	
	Airmen . .	2,297	
	P.M.R.A.F.N.S. .	17	
	Maternity . .	54	(53 live births)
	Families (female)	63	
	Children . .	137	

These figures indicate that a fair proportion of the energies of the hospital were devoted to the treatment of families. The maternity service, in particular, was a great advantage as there was a shortage, even in peacetime, of hospital beds for this type of work. The enforced withdrawal, during the war years, of the general facilities for families, was a cause for much regret.

In 1929 there were two events of importance in the history of the hospital. The infectious diseases hospital (I.D.H.) was extensively redecorated and large windows were installed wherever possible. At the same time Ward 7 was enlarged and, after a solarium had been added, the ward was given over entirely to the treatment of tuberculosis cases. The second important event was the installation of modern wireless equipment, with individual headphones for each bed in the main hospital and a communal loudspeaker in each ward of the I.D.H. This installation, made possible by a generous donor, was very much appreciated. At this time there were few hospitals in the country which were equipped with wireless apparatus.

The next development of major importance occurred in 1937 when considerable alteration to the structure of the hospital was thought necessary in view of the threat of war and the large number of casualties which the hospital might be called upon to treat. An efficient central heating system was installed in the infectious diseases hospital, administrative blocks and staff billets. The bedstate was increased by the opening of two new huts with a capacity of thirty beds. One of the existing huts was divided into two sections so that a larger number of different types of cases could be accommodated at the same time. Verandahs were added to the tuberculosis wards and in the main hospital solaria were constructed in the principal wards, one of which was extended to accommodate ten additional equipped beds. This year, too, the foundations for the new sisters' mess were laid. The following details of the work done during 1938 are included for comparison with those given earlier for 1929 and to indicate the scope of the hospital's activities during the last year of peace:

Patients admitted:	Officers	360
	Airmen	7,111
	P.M.R.A.F.N.S.	26
	W.A.A.F.	49
	A.T.S.	9
	V.A.D.	1
Families	Maternity	122
	Women	143
	Children	96

When war was declared in 1939 the hospital had a total of 650 equipped beds and was in a position to offer all the most modern facilities, so that it constituted a basis for the expansion of the general medical service. Arrangements were made for the provision of emergency beds and a mobile surgical team, with its own apparatus and transport, was formed to deal with any major incident which might occur in the immediate neighbourhood of the hospital. The old X-ray department was converted into a plaster room, which could also be used as an auxiliary theatre if the need arose, and the two permanent theatres were prepared for immediate use in anticipation of large numbers of casualties. The hospital chapel was converted into a casualty clearing centre.

Due chiefly to the expansion of the R.A.F. and the consequent increase in the number of trainees at Halton camp, the work of the hospital had increased considerably by 1940. The orthopaedic centre was enlarged and the conversion of two of the male medical wards to this work made it possible for the department to have 'clean' and 'dirty' wards, which was a great advantage. The remedial section of the physiotherapy department increased in size in proportion to the growing realisation of the importance of rehabilitation for post-operative and fracture cases. A department entirely new to the R.A.F. Medical Branch was opened in 1940 : this was the burns centre, formed by reconditioning Ward 3 to deal with the many severe cases of this kind of casualty which were expected as the logical outcome of the type of warfare which was being waged. The modern technique of treating such cases made it impossible to deal with them in the surgical wards. A new block was added to the infectious diseases hospital in February 1940. This increased the bed capacity by ninety-nine beds and was a very welcome addition in view of the increase in the numbers of cases of minor infectious disease. During 1940 also, changes were made in the staffing of the hospital. The establishment was increased at all levels and W.A.A.F. personnel were substituted for R.A.F. in all domestic occupations. This was a particularly happy change in the kitchens, where a qualified dietitian was permanently employed, and the improvement in the quality of the cooked food was immediately noticeable.

In 1941 the main advances were again in the orthopaedic and burns sections. The latter now became a completely self-contained unit and its equipment was increased by the addition of three brine baths of special construction. The orthopaedic department was enlarged by the addition of thirty beds, which were situated on the upper floor of the new block of the I.D.H. and were used entirely for 'clean' surgical cases. On the medical side accommodation was also increased by the erection of two large Papworth type huts which were built close to the hospital and were used to house officer patients suffering from tuberculosis. Due, however, to the lack of heating, these were used only in the spring and summer months. Until 1941 it had been found that a single ward was sufficient to house all the ophthalmic and E.N.T. cases, but, as the numbers of patients for both these departments were steadily increasing, separate wards were now allocated. Although at the time this appeared to be an over-generous allocation of space, it was found in later years to be a very necessary provision.

The enemy offensive began to increase in intensity in early 1941 and it became evident that the hospital might in the near future be called upon to deal with numbers of casualties from the immediate area or transferred from other R.A.F. or civil hospitals. To meet this contingency the ward which had previously been used for 'detained' cases was converted into a reception centre for surgical cases and was placed under the direct control of the duty surgeon. It was fitted with a piped oxygen supply to each bed and other anti-shock therapeutics were made available, but although this ward was used a great deal for local surgical emergencies, it was never required to serve the purpose for which it was intended.

The out-patients department was always extremely busy due mainly to the fact that, as the principal R.A.F. hospital, Halton possessed the finest specialist facilities available and medical officers were inclined to send their patients there in preference to any other hospital. In 1942 one of the major advances was the construction of an entirely separate out-patients department, adjoining the main hospital, and when towards the end of the year a separate X-ray apparatus became available, the value of the new unit was even more apparent.

In the latter part of 1943 the volume of surgical work showed a steady increase and the theatres were in constant use. It had been considered necessary, in the interests of safety, to brick up the large plate glass windows, so that work was carried on by artificial light. The ventilation of these rooms was a problem, for after long hours of operating the atmosphere became intolerable and it was finally decided to install air-conditioning. This presented some difficulty in view of the shortage of materials but finally, after representations by the D.G.M.S., a suitable plant was forthcoming. In 1943 also, the problem of providing adequate

accommodation for R.A.F. patients suffering from pulmonary tuberculosis became acute. The civilian authorities were in similar difficulties and it was unlikely that they would be able to offer much assistance. At Halton, however, it was found possible to convert premises recently vacated by the Central Medical Establishment into suitable accommodation for tuberculosis cases and this helped to relieve the situation so far as the R.A.F. was concerned, although the problem remained. Due chiefly to the use of mass X-ray apparatus, increasing numbers of cases were detected in the early stages of the disease and it was difficult to keep pace with the demand for hospital beds.

Research was undertaken in several departments at Halton, which with its proximity to London, its wealth of clinical material and the resources of the laboratories of the Institute of Pathology and Tropical Medicine, was exceptionally well suited for this work. A certain number of experiments relating to the introduction of penicillin into burns creams was carried out at the hospital and work was also done on the location by radiological means of foreign bodies in the eye. With the opening of large-scale operations in tropical areas, the hospital admitted large numbers of patients from overseas, and the Institute of Pathology and Tropical Medicine benefited by the opportunity to observe cases which would not otherwise have been seen.

The work of the hospital for the years 1944 and 1945 presents no features of historical interest and can perhaps best be indicated by the following details of the number of patients treated:

Admissions	*1944*	*1945*
R.A.F. Officers	1,723	1,700
Airmen	7,443	8,977
P.M.R.A.F.N.S.	40	53
W.A.A.F. officers	55	60
Airwomen	551	513
V.A.Ds.	6	1
Civilians	9	7
Totals	9,827	11,311

R.A.F. STATION HOSPITAL, HAVERFORDWEST

The majority of the R.A.F. general and station hospitals were administered by Headquarters, Technical Training Command. The station hospital at Haverfordwest is an interesting exception, being the only hospital under the control of Coastal Command.

The station was situated in the pleasant countryside of Pembrokeshire, some three miles outside the town and within eight miles of the sea on the north, south and west. Including the personnel of the neighbouring

Coastal Command stations of Pembroke Dock and St. Davids, the total R.A.F. population in the area was between 5,000 and 6,000. Until February 1, 1945, medical care was provided by the station sick quarters, but on that date the Nissen hutted sick quarters at Haverfordwest, which had been supplemented by additional Laing type structures and a brick-built theatre, was raised to the status of a station hospital. The additional buildings provided consisted of three wards and two small side wards, an operating theatre, an X-ray and a physiotherapy department, a laboratory, kitchens and the usual offices.

The total bed strength was 100, the average number of bed patients being sixty, and the accommodation was distributed as follows:

1 medical ward . . .	Male
2 surgical wards . . .	Male
1 general ward . . .	Female
2 small side wards . . .	Officers

The medical staff consisted of a senior medical officer, who was also in charge of the medical ward, one surgeon, one anaesthetist, also in charge of the female ward, and one general duties medical officer in charge of the medical inspection room, who also acted when necessary as station orderly officer. Out-patient treatment was available and specialists from St. Athan General Hospital paid regular monthly visits providing orthopaedic, E.N.T., ophthalmic and gynaecological facilities.

The nursing staff, apart from nursing orderlies, consisted of only three sisters, who fed in the station officers' mess, but were accommodated in a separate building. One sister acted as theatre sister and was in charge of the 'clean' surgical ward, the second was responsible for the medical and 'dirty' surgical wards and the third looked after the female and officers' wards. In addition, each acted as duty sister every third night, although this was a sleeping duty similar to that of the orderly medical officer. The nursing arrangements at this hospital, which contrasted markedly with those at most other hospitals, where nursing sisters were usually available in far greater numbers, worked admirably.

Historically there is little of note in the records of the hospital. Apart from the usual 'teething' troubles, there were no major difficulties. The domestic amenities, including water supply and sewage disposal, supplied by the town of Haverfordwest, functioned well and there were adequate transport facilities by road, rail and air. From the outset, work ran smoothly, probably due in part to the fact that this was a small, compact unit, where the team spirit was high, and where there was opportunity for a greater degree of personal supervision and encouragement than was possible in the larger, more impersonal establishments.

The hospital closed in April 1946, and was ultimately taken over by the Polish authorities for the use of the large concentrations of Polish troops which moved into the area after the cessation of hostilities.

R.A.F. STATION HOSPITAL, HENLOW

R.A.F. Station, Henlow, is situated on the main Bedford–Hitchin road in low-lying country on the county boundary between Bedfordshire and Hertfordshire. The present permanent station was built in 1932–4, during the period of rapid expansion of the Royal Air Force, but many of the temporary buildings which existed before that date remained in use, so that there was a large hutted camp of the standard Nissen type side by side with the permanent brick buildings.

This station has always been one of the largest of the engineering and technical training establishments in the R.A.F. Its function has changed little with the years and with its large number of workshops and technical hangars, Henlow station is, in effect, a small but pleasant factory town. The population naturally increased very considerably during the war years and the original sick quarters was regraded as a station hospital in late September 1939. The capacity of the hospital at that time was 100 equipped beds, accommodated in two units approximately 200 yards apart. The new modern brick hospital provided 32 beds and 8 isolation beds in an adjacent temporary building which also housed the medical stores and dispensary; the wooden huts of the original sick quarters provided accommodation for 60 beds. In early November 1939 it was found that the total number of beds was insufficient to meet the requirements of the increasing population in the area and a further 50 beds were improvised by converting an adjacent barrack block and two warrant officers' married quarters. The station hospital at this time was providing facilities not only for the large numbers of trainees at Henlow but also for the personnel of at least ten other large stations in the vicinity, so that in addition to in-patient treatment, a large out-patients department was maintained.

The facilities available at the hospital were typical of those provided by the average cottage hospital:

Medical
Surgical (major and minor)
E.N.T.
Ophthalmic
Orthopaedic
Special Treatment Centre
Laboratory
X-ray Department
Physical Medicine Centre (opened in February 1943)
Out-patients Department

The scope of the hospital's work may be judged by the following figures for December 1943, a typical month's work:

Total admissions to hospital	227	Officers	0
		Airmen	191
		W.A.A.F.	36
Total admissions to E.M.S. hospitals	58	Officers	7
		Airmen	43
		W.A.A.F.	8
Total admissions to other Service hospitals	12	Officers	0
		Airmen	11
		W.A.A.F.	1
Total operations performed	39	Surgical	35
		E.N.T.	4
Total number reporting sick	3,568	R.A.F.	2,850
		W.A.A.F.	718
Total specialist consultations	506	Medical	71
		Surgical	88
		Orthopaedic	69
		E.N.T.	66
		Ophthalmic	212
Total number of medical boards	88		

It will be seen from the above list that the hospital was an extremely busy one and, in view of its somewhat limited bedstate, it was fortunate that it was situated within easy reach of several of the large E.M.S. hospitals in the County of Bedfordshire. Close liaison was maintained between the hospital staff and their E.M.S. colleagues, who were ready to accept R.A.F. patients whenever the need arose. This liaison was carried a step further with a comprehensive plan for the complete evacuation to E.M.S. hospitals in the event of enemy action. Fortunately there was never any need to implement this plan, although the station was on two occasions subjected to attack, the first on September 26, 1940, when an air raid resulted in eleven casualties, including four which proved fatal, and the second in November 1942, when cannon fire slightly injured one airwoman.

In common with all other medical establishments, Henlow hospital shared in the treatment and care of the evacuees from Dunkirk and later gave similar service in respect of the slightly wounded of the D-day landings. Apart from this, there were no events of historical significance and in 1945 the hospital was continuing its normal duties, although on a reduced scale, the natural result of widespread demobilisation and closure of stations.

R.A.F. STATION HOSPITAL, HEREFORD

It has already been seen in other hospital narratives that the usual reason for setting up a general or station hospital was an increased concentration of R.A.F. personnel in the particular area. R.A.F. Station Hospital, Hereford, was no exception. At the beginning of the war the very considerable increase in the population not only of R.A.F. Station, Hereford, but also of the other stations in the neighbourhood, justified the establishment of a hospital, for the nearest R.A.F. general hospital was at Cosford, between eighty and ninety miles away.

R.A.F. Station, Hereford, was an almost ideal situation for a hospital, being in pleasantly wooded country with a fine view of Credenhill, a local beauty spot. It was within five miles of Hereford railway station and the R.A.F. units at Madley, Shobdon, Ludlow and Newland were easily reached by good motor roads. Work on the construction of the hospital was begun early in the war and was completed in June 1940. The design followed the usual pattern of wooden hutted wards interconnected by covered corridors, but was unusual in that the basis of the hospital was a single main corridor, running the whole length of the building from east to west, from which all the main departments were accessible. On the north side were the hospital theatre with its ancillary departments, the physiotherapy and X-ray departments, the laboratory, the kitchens and the main offices. On the south side of the corridor were four wooden wards of the usual type equipped with solaria, which greatly increased their efficiency.

In 1942 a further ward of brick construction was added on the north side. Cases of infectious disease were treated in a separate department adjoining the main hospital, the accommodation consisting of twelve single bunks, with kitchen and bathroom facilities. This department was extended in 1942 by the addition of two small ten-bedded wards, both of which were connected to the main infectious diseases hospital by covered corridors. A steam disinfector plant was also built in the immediate vicinity.

The equipped beds on the opening of the hospital totalled 140, 32 in each of the four wards and 12 in the I.D.H. The addition in 1942 of the extra ward on the north side of the corridor and the two 10-bedded wards in the I.D.H. increased the accommodation to 192 beds.

The matron and sisters were housed in separate hutted quarters in the immediate vicinity of the hospital, while airmen and airwomen were accommodated in barrack huts in the camp area. N.A.A.F.I. facilities were available and an excellent library was provided by the British Red Cross Society.

Patients requiring specialist treatment were generally, except in cases of emergency, sent to hospitals which were able to treat their particular complaint, so that Hereford performed a function similar to that of the

average cottage hospital. In spite of this limitation, a large amount of varied work was undertaken and a big out-patients department was maintained. The following figures give some indication of the scope of the hospital's work:

Patients under treatment	December 1940	41
	January 1941	98
	December 1945	177
Surgical operations	1940	61
	1941	398
	1942	434
	1943	444
	1944	171*

* For first half-year

During 1940, 1,974 cases were treated in the massage and physiotherapy department and for the ensuing years the figures show a steady upward trend. The station, whose population was well over 3,000, was largely concerned with technical training and as the age of many of the recruits was low, there was a relatively high rate of minor sickness, chiefly of a respiratory nature.

The work of this station hospital continued, without any events of historical importance, until November 1947, when the small remaining local Service population no longer justified its existence.

R.A.F. STATION HOSPITAL, INNSWORTH

R.A.F. Station, Innsworth, opened in June 1940 as a Technical Training School for recruits and trainees. Geographically it was conveniently situated, being approximately four and a half miles from both Gloucester and Cheltenham, with good rail and road communications with both towns. The medical facilities available when the station opened included a small hospital comprising five wards equipped with 20 beds each and an infectious diseases hospital with 12 beds. With an additional 5 beds for officers, the total capacity of the hospital was 117 equipped beds.

The wards were the standard 'B' type wooden huts connected by enclosed covered ways, and with several additional huts for stores and equipment, they provided a compact and expansible unit. A separate sisters' mess of similar construction was built within easy reach of the hospital. The buildings were heated by radiators from a central boiler and additional slow-combustion stoves were installed where necessary. Sewage was piped into the local sewers and electricity was supplied from local municipal sources.

By 1941 it was found that the available accommodation was insufficient for the needs of the expanding community and three wards were added

to the main hospital and one to the infectious diseases hospital. At the same time the kitchens were enlarged. The facilities in use by early 1942 were the following:

Medical Department
Surgical (major and minor surgery) Department
Orthopaedic Department
Ophthalmic Department
Neuropsychiatric Department
E.N.T. Department
Gynaecological Department
Laboratory
X-ray Department
Physiotherapy Department

The hospital was approximately equidistant from six other R.A.F. hospitals, namely, Halton, Wroughton, Cosford, St. Athan, Hereford and Locking, so that patients could be readily moved to other accommodation in the event of mass transfers becoming necessary. It was also fortunate in having two Red Cross Convalescent Homes in the immediate neighbourhood. Both were converted country mansions. Hartpury House provided sixty beds for airmen and accommodation for a similar number of airwomen was reserved at Brockhampton Park. Both these establishments were extremely pleasant places at which to spend sick leave and the facility was much appreciated, particularly by those patients who had no homes in this country. Regular weekly transfers to these convalescent homes were arranged and by this means beds for urgent and emergency cases were kept free at the hospital.

The type of personnel stationed at Innsworth varied considerably over the war years. In the weeks immediately following the fall of France large numbers of Allied troops of all nationalities were stationed there and it was necessary to allot a large number of beds to them and to set up a Special Treatment Centre at one of the station medical inspection rooms. Included in their numbers were several medical officers, a factor of considerable value in view of the language difficulty which would otherwise have arisen. In 1941 it was decided to establish No. 1 W.A.A.F. Training Depot at Innsworth. This entailed a considerable change in the allocation of hospital beds and the presence of a whole-time gynaecologist became essential. The W.A.A.F. population grew steadily from an initial strength of 2,000 and greatly increased the hospital's commitments. Towards the middle of 1944 Innsworth was completely evacuated and maintained as an emergency station to which other units, rendered homeless as the result of enemy air attack, could retire for regrouping. Fortunately, it proved unnecessary to use the station for this purpose, and before D-day it was occupied by a large

number of Canadian aircrew. At the end of the same year the Record Office moved into Innsworth.

Throughout the war the hospital was extremely busy providing treatment and care for all these differing types of personnel and it continued to fulfil this function until it closed in September 1948, by which time the R.A.F. population in the area had declined to such an extent that immediate hospital facilities were no longer considered necessary.

R.A.F. STATION HOSPITAL, KIRKHAM

During the war, Lancashire was one of the most heavily populated Service areas. Its relative geographical safety from bombing, its good transport facilities and above all the fact that the port of Liverpool lay within its boundaries, all combined to make this county one of the centres of concentration of R.A.F. forces. There were already several R.A.F. hospitals in the area, namely, Weeton, Padgate and Morecambe, but in June 1940 it was decided that an additional establishment should be set up at R.A.F. Station, Kirkham, to assist in the care of the rapidly increasing numbers of personnel.

R.A.F. Station, Kirkham, had a population of 5,000 and 1,000 Polish airmen were also billeted on the station site. In addition there was a large number of smaller R.A.F. units in the vicinity, so that the new hospital provided cover for a considerable number of personnel. It was situated a few miles from the Ribble estuary, adjoining the main Blackpool–Preston road and slightly apart from the main camp. In contrast to so many hospitals in drab surroundings, Kirkham hospital stood in well-kept gardens, with a pleasant outlook over wooded country and grass lands.

This was another of the hutted hospitals, the detached wooden wards being joined by passages to allow easy, comfortable movement of patients. There were four main wards, with the usual side wards and ancillary facilities, an operating theatre, physiotherapy and X-ray departments, laboratory, dispensary and specialist's examination room. The administrative offices were situated off one corridor and the cookhouse adjoined the hospital. The initial capacity was 152 equipped beds, which figure was later increased to 270, when a large infectious diseases block was opened. This was a completely self-contained unit, consisting of eight standard size wards with side wards and twelve separate bunks, X-ray department and cookhouse; this was a great advantage from the points of view of isolation and administration. To complete the hospital's buildings, a quartermaster's stores, medical stores and linen stores were situated about fifty yards from the main hospital.

All buildings were centrally heated from a common steam plant and electric light was supplied from local sources, supplemented by emergency apparatus in case of failure. Water was piped from the local

Fylde Water Board and was adequate for the needs of the hospital. Sewage was disposed of by a water-borne system into the main sewer of the local authority, a 'booster' system having been installed at the camp.

When the hospital opened, only the facilities for the treatment of general medical and infectious diseases were available and it was necessary to send surgical cases to R.A.F. Station Hospital, Weeton, about six miles away, but it was not long before surgical facilities were also provided at Kirkham and the complete list of departments was then as follows:

Medical	Gynaecological
Surgical	Physiotherapy
E.N.T.	X-ray
Ophthalmic	Out-patients
Dental	

Apart from some initial difficulty in connexion with the disinfestation of bedding, which was eliminated by the erection of a 'Velox' disinfestor, the work of the hospital proceeded smoothly from the outset.

All types of patient were treated and there was a steady flow of work throughout the war. When the hospital opened, as many as 6 per cent. of the large number of Poles lodging at the station were found to be suffering from malaria. In view of the close proximity of Liverpool and the large numbers of R.A.F. personnel passing through the port, it is not surprising that a considerable number of cases of infectious disease found their way to Kirkham and it was a notable occasion when, on May 1, 1945, no less than 1,300 smallpox contacts from locations overseas were quarantined at the hospital for a few days. Another feature of the work was the maintenance of a large out-patients department, which was very active and provided consultation facilities for many thousands of personnel, and in so doing conserved valuable hospital bed space.

From an early date considerable numbers of patients suffering from tuberculosis were treated at this hospital and in later years it became the policy to deal almost exclusively with this type of case, transferring other patients to either station sick quarters, Warton, or R.A.F. Station Hospital, Weeton. This specialisation continued until 1948, when the hospital closed down, after all patients had been transferred to R.A.F. Hospital, Wroughton.

In the first six months of its existence approximately 700 patients were accommodated at Kirkham and during the year 1943 no less than 3,700 in-patients passed through the hospital, a good record for a 270-bedded establishment. It is estimated that a total of 20,000, including personnel of almost every nationality, from Burmese to German and

Italian prisoners-of-war, received in-patient treatment at Kirkham between the years 1940 and 1948.

R.A.F. STATION HOSPITAL, LOCHNAW, STRANRAER

The problem of providing suitable hospital accommodation in some parts of Scotland was one which presented some difficulty. There were fairly high concentrations of R.A.F. forces in certain areas of the country, and there were also numbers of personnel stationed in remoter parts which were difficult of access owing to the mountainous nature of the country and the relatively poor road and rail communications. From the early days of the war it was felt that a small hospital was necessary for the care of this scattered R.A.F. population in Wigtownshire. The care of isolated R.A.F. sick was undertaken, in the main, by the Emergency Medical Services which had a number of small cottage hospitals throughout Scotland. As the war progressed the numbers of R.A.F. personnel increased steadily, until a point was reached where it was considered no longer reasonable to expect the civilian authorities to undertake the care of Service sick without some measure of assistance from the R.A.F.

In early 1942, therefore, the R.A.F. took possession of an old E.M.S. hospital at Lochnaw Castle, Stranraer, in the county of Wigtownshire. Situated on the shores of a loch the castle was surrounded by very beautiful scenery and was a self-contained unit which had been used successfully by the E.M.S. as a 30-bedded hospital. The central entrance hall had reception rooms on either side and a double stairway led to the first floor which had bedrooms on either side of the landing. The E.M.S. had used the entrance hall as a reception centre and the three rooms on the left side of the ground floor as 9-, 5-, and 9-bedded wards respectively. The reception rooms on the right had been used for a theatre, sterilising unit and office accommodation. On the upper floor an 8-bedded ward and a laboratory were accommodated on the right, while the rooms on the left provided quarters for the matron and the nursing staff. The large basement was used for the kitchen, patients' dining-room and the laundry. The building was centrally heated from a single coal-burning plant and electric light was provided from the general grid system. Sewage disposal was by flush-type units emptying into septic tanks, an arrangement which had proved adequate for the small number of staff and patients accommodated under E.M.S. administration.

Adjoining the old fourteenth-century castle was a partially completed Nissen-type hospital which was in process of erection by an American Labour Force unit. These hutted buildings had been originally planned to house four U.S.A. wings, but as these forces were diverted and did not reach Stranraer, the accommodation was handed over to the R.A.F. at the end of September 1942. The R.A.F. planned to complete the work and have it ready for use at the end of November 1942, but a series of

unfortunate events delayed this project; and it was not until June 1943 that it was possible to open the new hospital and transfer patients from the castle, where work had been in progress since July 1942 when the unit formed. After June 1943 the castle was no longer used for patients and one half of the building was adapted as an officers' mess and the other half as a sisters' mess.

The American hutted buildings, all of which were designed to accommodate thirty beds, were, in certain respects, different from the standard English type. The principal difference was that the walls of the huts were curved like a bee skep, in contrast to the gothic curve of the English-type hut; as a result it was impossible to have the usual double row of beds. These had to be arranged with one row in the usual position, with the beds opposite at right angles, a space-consuming device, but a necessary one in order to allow sufficient space at the head of each bed.

The huts were heated by paraffin-type stoves with flues leading off through the roofs, which were composed of three layers, metal on the outside and plastic material on the inside, with a centre of wood wool. The risk of the hot flues causing damage was so great that the hospital fire-fighting personnel were provided with special implements to remove the centre roof coverings in case of fire. Outbreaks did actually occur on several occasions during the existence of these buildings. On the first occasion in November 1942, two and a half wards in the new buildings were destroyed by fire and delayed occupation by the R.A.F. Later, between June 1943, when the hospital opened and January 1944, two further outbreaks occurred, but little damage was done, due to the efforts of the fire-fighters, equipped with special tools. A similar hutted building in the grounds of Lochnaw, which was occupied by the Royal Engineers, lost its entire kitchen by fire during the same period and finally, when squatters moved in after the departure of the R.A.F. from the camp, nearly all the huts were burned down. This disastrous series of fires stresses emphatically the need for adequate insulation of chimneys in all hutted buildings, particularly those of this type.

Apart from the danger of fire, there were several other disadvantages to the in many ways admirable American-type huts. They had been built among trees, presumably as a protection against bombing. Unfortunately, these trees had very shallow roots and several blew down every time there was a gale, although fortunately none fell on the huts. The sewage system was far from satisfactory and was extremely unpleasant until a water-borne system was installed.

There were certain amenities not usually found in English hospitals of similar type, including a large steam laundry. The local water was, however, very acid, and as the pipes were iron, its use had to be limited to the boiling of overalls. A large mortuary-type frigidaire had been

installed by the Americans, presumably with a view to refrigerating bodies for later return to the United States. When the R.A.F. took possession the N.A.A.F.I. wished to take this over, but the hospital authorities retained it for their own requirements. The buildings were also equipped with a very fine dry-cleaning department.

The original plan to accommodate 200 beds proved too large for R.A.F. requirements and it was amended to provide a total of 100 equipped beds. After the destruction of two and a half wards by fire on November 24, 1942, there was considerable delay in completing the work required before the buildings could be used as a hospital, and in June 1943 it was decided to open them without ward kitchens, which had still not been provided. The hospital was then able to offer facilities for medical and surgical treatment and a well-equipped laboratory carried out all the normal routine clinical tests. It was possible to treat all types of cases other than those requiring specialist advice. The hospital was, however, never extended to its fullest capacity, probably due in part to the existence of so many excellent and perhaps more readily accessible E.M.S. hospitals, and also to the fact that units in Scotland were, for the most part, small and had, as is often the case in such establishments, a low sickness rate. The work declined considerably in the years 1945 and 1946 and the hospital closed down in April 1946.

R.A.F. STATION HOSPITAL, LOCKING

The station hospital which opened at R.A.F. Station, Locking, in Somerset in early 1939, was formed by extending the existing station sick quarters to meet the demands of the rapidly increasing population of this Training Command establishment. The station was situated on the alluvial plain at the western end of the Mendip Hills, approximately three miles from the Bristol Channel and six miles from Cheddar. In addition to its main function as a training centre for R.A.F. recruits and trainees, the station provided accommodation during the war for various other formations, including a detachment of the Free French Forces and a W.A.A.F. Reception Centre, and it was also responsible for many outlying units. At its maximum capacity the station complement was 7,000 and the hospital was very busy during the whole period of its existence.

The hospital buildings, in common with the rest of the camp, were of wooden construction, the standard type wooden hut being the basic unit. The huts were built of weather boards outside and plaster boards inside, with a final finish of wooden fittings and enamel paint. The plan of the hospital differed little from that of other hutted hospitals.

The facilities offered were also similar to those of any large cottage hospital and consisted of:

Surgical (major and minor)	Physiotherapy
Medical	Ophthalmic
E.N.T.	X-ray
Orthopaedic	Out-patients
Gynaecological	Laboratory

The work done at Locking during the war years followed the usual pattern for such establishments and there were no major events of historic importance. In 1942 the numbers of surgical cases treated showed a considerable decrease following the closing of Weston Aerodrome, at which No. 14 Recruit Centre had been accommodated. In 1942 the surgical operations totalled 887, but in 1943 the number dropped to 590. The same year showed an increase in the number of medical boards as the result of the invaliding home of large numbers of patients from abroad. There was 779 boards in 1942 and 880 in 1943.

In 1944 a small outbreak of food poisoning was traced to a tin of tainted meat—twenty-five cases, none of them fatal, were treated by the hospital and every possible assistance was given by the civilian health authorities.

In 1944 and 1945 the hospital shared in the work of treating casualties from operation 'Overlord' and by the end of 1945 a total of 1,500 major and 1,300 minor operations had been carried out at the hospital. These figures were high in relation to the number of beds available. The hospital continued to function after the cessation of hostilities and it was not until April 1949 that it was reduced to the status of a station sick quarters.

R.A.F. NEUROLOGICAL HOSPITAL, MATLOCK

Before the outbreak of war, when it was realised that a large number of personnel would, before long, be requiring specialised treatment for neurological disorders, it was decided to establish a hospital which would deal primarily with this type of case, and a site was chosen at Matlock. The choice of site was governed by several different requirements. It was essential that the hospital should be located in an area which could be reached without difficulty from all parts of the British Isles and which would, in addition, be as free as possible from enemy air attack, an important consideration in view of the type of patient for which the hospital would cater. Centrally situated in the Peak District surrounded by country likely to be conducive to speedy convalescence, Matlock Spa appeared to be an ideal location for the hospital.

The building selected was the Rockside Institution, a five-storied stone building situated on the slope of a hill some four hundred feet above the town and standing in four acres of grounds in which there were facilities for tennis, croquet and bowls. The type of building was not altogether suitable for its purpose. It was in most cases only possible to

have one bed in each room, although a few could accommodate two or three, and it was possible to convert one ground floor public room into a small ward. This enforced segregation of patients added considerably to the routine work of the nursing staff and it is doubtful whether even such a slight degree of isolation was good for patients who were inclined to withdraw too much into themselves or to be excessively introspective. On the other hand, the privacy of a separate room was much appreciated by many of the patients.

The hospital opened in early October 1939, with an initial equipped bedstate of 145, and this number was increased after one year to 170, being ultimately capable of expansion to 200 in case of need. The original staff comprised a group captain as Commanding Officer with a staff of 6 medical officers and a quartermaster, a matron and 4 senior sisters with 14 sisters, 40 airmen, 22 airwomen and 8 civilians retained from the staff of the Institution. The medical staff of the hospital was drawn, wherever possible, from personnel with previous experience of treating the mentally sick and particular attention was paid to the personality of the doctor, for the patients were usually ambulant and the care of such personnel presented an entirely different problem from that of treating the normal hospital patient. Many of the orderlies were trained mental nurses although the nursing sisters were not specially trained.

The main object of this hospital was to treat cases of psychological disorder, with a view to their speedy recovery and return to duty, and although personnel of other branches were admitted, it was chiefly upon aircrew that the efforts of the hospital were concentrated during most of the war years. Patients were usually admitted through one of the special R.A.F. Neurological Centres, such as Ely, Rauceby, Halton, Torquay and Dunblane*, to which they had originally been sent by their unit medical officers, as N.Y.D.N. cases. At these centres they were examined by fully qualified psychiatrists who, if they thought the case was suitable, referred the patient to Matlock. This procedure was designed to eliminate the admission of unsuitable cases and when any element of doubt existed the patient was retained at the local centre until a confident diagnosis could be established by the psychiatrist in charge. The term N.Y.D.N. stood for 'Not yet diagnosed, neuropsychiatric?' and it was essential, in view of the protean nature of the symptoms, that patients should be thus described until investigation had eliminated any possibility of organic disease. This was particularly necessary in cases with a gastric or rheumatic background.

It was the policy of the hospital to treat only patients who had a reasonable chance of a quick recovery, as it was considered that too lengthy a stay had a detrimental effect upon the rest of the patients.

* An E.M.S. hospital with a special ward for R.A.F. cases.

In view of the urgent need to return personnel to their original Service occupations as early as possible, a careful check was kept upon the progress of treatment and some indication of the measure of success which was achieved is given in the following analysis of the cases treated during the period September 1, 1941 to August 31, 1942, a typical year's work:

Number of cases treated during the year		937
Rheumatic cases	29	
Miscellaneous cases	37	
Psychiatric cases	871	

Of these last, 241 were flying personnel, including 73 pilots.

An analysis of the nationalities treated during the year shows that 23 per cent. of the flying personnel admitted were either from the Dominions or of Polish or Czech nationality:

	Pilots	*Other aircrew*
R.C.A.F.	19	7
Australian	2	6
New Zealand	—	4
Polish	4	8
Czech	2	2

This rather high percentage was probably due to the fact that these patients were in nearly all cases far removed from their normal home environment, and in the case of the Central Europeans, worry concerning the fate of their relatives, mostly in occupied territory, was a further predisposing factor.

The majority of the flying personnel had been showing severe 'stress reaction' to flying strain and the degree of stress can be judged from the following figures, which show that although a proportion were returned to limited flying, few were able to resume full flying duties. It is not surprising to find that few men who were the sole survivors of air crashes were ever returned to flying.

Results of 200 *boards on flying personnel:*

	per cent.
Discharged to operational flying	5
Discharged to non-operational flying	34·5
Removed from all flying duties	60·5

Results of 660 *boards on non-flying personnel:*

Returned to duty (442)	67
Invalided (218)	33

Analysis of conditions reviewed at the above boards:

	per cent.
Anxiety states	50
Depressed states	23
Hysteria	19
Obsessional states Psychopathic personalities Mental defectives Psychoneurotics	8

In view of the large numbers of personnel who were unable to return to their original occupations, every effort was made to improve the standard of the occupational therapy department. It was difficult to find suitable premises in the hospital large enough to accommodate all the patients who wished to make use of the facilities offered, but a great improvement was made by the addition of a workshop in which the mechanically minded were able to construct simple furniture. The services of a trained occupational therapist did much to stimulate the enthusiasm of the patients.

In October 1940 a limited number of long-term gastric and rheumatic cases, drawn chiefly from the Littleport Annexe of Ely Hospital, were admitted to Matlock, but the arrangement did not last long. The gastric cases did not make good progress in close contact with psychiatric patients, but it had been thought that Matlock would be suitable for the treatment of rheumatic cases, in view of its reputation as a spa. There were, however, no special facilities available and the treatment given was that obtainable in any other hospital. Furthermore, it was found that the weather, which on the whole was rather poor, and the hilly nature of the district made the area very unsuitable for rheumatic patients, many of whom were suffering from some degree of cardiac damage. Some 165 patients, chiefly arthritic in type, were treated by the centre and of these about 102 were returned to duty, though in many cases a limitation was imposed on the type of duty which would be suitable. The hospital continued its main work of treating neurotic cases until May 1945, when, with the impending cessation of hostilities, the demand for its special facilities became less urgent and the Institution was handed back to the civilian authorities.

R.A.F. STATION HOSPITAL, MELKSHAM

Consequent upon the rapid expansion of No. 12 School of Technical Training, the station hospital was opened at Melksham in the early part of July 1940, although at that time the buildings were incomplete. Apart from the personnel at Melksham itself, it was to serve nearly thirty other units in the immediate vicinity. Situated on higher ground than the

camp, the hospital commanded a wide view of the Wiltshire countryside; Bath, twelve miles away, was the nearest large town and both the rail and road services were excellent.

The structure of this building was typical of the standard hutted hospital of the early war period. Single-storied huts connected by covered passages allowed easy movement of patients even in bad weather and the whole building was centrally heated from a single plant. The basic design of the hospital was a single corridor with the wards and departments leading off at right angles. The operating theatre and sterilising rooms formed a separate unit connected to the rest by a passage and the surgical wards were adjoining. A physiotherapy department, a laboratory and X-ray facilities were also available and a separate isolation unit was provided adjacent to the main hospital.

On opening in 1940 the beds available numbered 120, by 1943 the number had increased to 140, and in the latter half of the same year the final aim of 218 equipped beds was realised.

The medical facilities provided were in most respects standard for this type of hospital. There was a considerable number of W.A.A.F. personnel on the station and a reasonable number of beds were reserved for the use of these and other W.A.A.F. in the district. The facilities available were as follows:

Surgical (major and minor)	X-ray
Medical	Physiotherapy
Ophthalmic	Laboratory
Gynaecological (from early in 1942)	

The record of the surgical department is noteworthy, the number of operations performed during the years 1940–4 being 105, 506, 537, 673 and 606. Bearing in mind that this was a station hospital, these figures are high and must have resulted in considerably easing the burden which otherwise would have been imposed on the larger general hospitals. From the surgical point of view, Melksham was interesting also for its function later in the war as a centre for thyroid surgery and a number of cases were treated, some coming from places as far removed as the Hebrides.

There is little else of note in the history of Melksham Station Hospital. It was established to care for personnel stationed at the many surrounding units and it performed this task efficiently until in 1946 it closed down when there was no longer need for its services.

R.A.F. STATION HOSPITAL, MORECAMBE

R.A.F. Station, Morecambe, was opened on December 11, 1939, as a Training Depot for the large number of recruits who entered the R.A.F. following the outbreak of war. One of the chief reasons for choosing

Morecambe for this type of unit was its position on the coast and the consequent large numbers of hotels and boarding-houses which could be used to provide suitable accommodation for personnel, including many W.A.A.F., newly recruited from civilian life.

Although it could be safely assumed that all new entrants to the Service had passed an initial medical board, manned by civilian medical practitioners under the auspices of the Ministry of Labour, it was at the same time recognised that these personnel, many of them young and unused to Service life, would provide the medical authorities with a fairly high incidence of minor sickness. Preparations were made accordingly. Immediately the station opened, a hall was requisitioned to provide bedded accommodation for any sick. Thirty beds were equipped and provided a fair degree of comfort. Two medical inspection rooms were set up, one in a hall and the other in a shop. Although far from ideal these quarters provided workable and adequate facilities for the welfare of about 3,000 people. Later, as the station grew in size, it became apparent that more beds would be needed and a small hotel, the 'Midland', was requisitioned for conversion into a hospital. Completed in two months, the new hospital admitted its first patient on February 19, 1940, by which time its capacity was 142 equipped beds with a small theatre and laboratory; 134 beds were allotted to airmen, 6 to officers and 2 to the P.M.R.A.F.N.S. and the W.A.A.F. The original sick quarters in the requisitioned hall was retained as an infectious diseases hospital.

The medical problems encountered were those common to this type of unit. The rapid rate of intake of recruits, with a relatively high sickness rate, placed a heavy burden on the medical facilities. All personnel, furthermore, required inoculation, and as about 1,000 to 1,500 arrived at the unit every week this was no easy task to accomplish in the initially rather cramped sick quarters. Many of the recruits, too, on reporting sick shortly after arrival, were found to be medically unfit, requiring either recategorisation or invaliding from the Service. This was felt to be time-consuming and wasteful of effort. Many entrants would have been rejected had a more thorough initial examination been possible. It was appreciated, however, that this was an unavoidable circumstance in view of the rapid mobilisation and no effort was spared to place the recruits in their correct medical categories and to ensure that as many of them as possible were retained to fulfil a useful function in Service life.

The station grew rapidly until in 1941 the figure for W.A.A.F. alone was 7,000, and even this high figure was later exceeded on several occasions. A third medical inspection room was opened and two of the three rooms were used exclusively for W.A.A.F. personnel. Although, broadly speaking, the incidence of major sickness among R.A.F. and

W.A.A.F. was about the same, that of minor sickness was considerably higher among the W.A.A.F.

The incidence of psychoneurosis among the trainees generally was higher than had been expected and at one time the figures reached such proportions that it appeared likely that a specialist would be required at the unit for this work alone.

The medical staff allocated to this unit varied considerably over the war years, but in general the position was as follows:

Officers (including Commanding Officer, Adjutant and medical officers)	13
P.M.R.A.F.N.S. (including a Matron)	15
Airmen and Airwomen	100
Civilians	13

Good liaison was maintained with the civilian authorities and arrangements were made for mutual assistance in the event of enemy action or widespread epidemics. Although the medical arrangements in the converted and requisitioned buildings were not ideal, they were nevertheless adequate and afforded efficient medical care for the large numbers of personnel who passed through the unit until it closed in October 1944.

R.A.F. GENERAL HOSPITAL, NORTHALLERTON

The need for a general hospital in the north-eastern area of England first became apparent early in 1942. Although numerous R.A.F. hospitals had been established elsewhere in the country, there were none in the north-east and R.A.F. personnel in need of treatment were admitted to the Army hospital at Catterick or the E.M.S. hospital at York. Alternatively, they were sent to the nearest R.A.F. hospital at Rauceby, a very considerable distance away. The hospitals at Catterick and York were becoming increasingly busy with their own commitments and the R.A.F. population in the area was growing steadily.

After comparison of the various establishments which were available, it was decided that the E.M.S. hospital at Northallerton was the most suitable both for its geographical location and for the amenities it offered, and a transfer was arranged through the Ministry of Health.

Although the original survey of the hospital was carried out in February 1942, the R.A.F. were unable for various reasons to take possession until January 1943, nearly one year later. The E.M.S. had been using the building as a medical stores and although the hospital had a bedstate of 640 it had never been extensively used.

The hospital was situated in a country district of the North Riding, well served by metalled roads and within one mile of the nearest railway station. The original site had been used as a Public Assistance Institution and the E.M.S. hutted hospital had been built in the grounds. It

was of standard type, the accommodation being divided between two blocks, the north block and the south block. The latter had two wings running east and west. The north block consisted of eight wooden huts and the theatre, all the buildings being unconnected with each other, except by means of a covered verandah. The south block was of more modern construction, with brick-built huts, and the east and west wings, although unconnected, each had an enclosed corridor which was centrally heated. In all the wards heating was furnished by the standard slow-combustion coke stove, three units being provided in each ward.

At the original survey it was found necessary to carry out a number of alterations before the hospital could be adapted for R.A.F. use. Some of these illustrate the point that a hospital may be quite suitable for civilian use but will invariably require modification before it can be used by the Services:

(*a*) There were no facilities for storage and maintenance of motor transport such as ambulances. Transport bays had to be constructed.

(*b*) A suitable storage place for the quartermaster's stores was provided by using the old 'cells' in the Public Assistance Institution after suitable racks had been constructed.

(*c*) The sisters' mess accommodation required considerable numbers of screens and the erection of partitions.

(*d*) The following new construction was essential:

(i) A mess to accommodate at least 20 medical officers.
(ii) Kitchen and dining-hall for at least 175 airmen.
(iii) Kitchen and dining-hall for at least 20 sergeants.
(iv) Living quarters for 100 airmen and 75 airwomen.
(v) N.A.A.F.I. accommodation for patients and staff.
(vi) Installation of a high-pressure steriliser.

It was soon apparent that the modifications would not be completed for some time and it was decided to open the hospital for limited use and to add the other facilities as each department was ready. This decision entailed the housing of staff in buildings which had been originally earmarked for patients. By using the north block for staff and the south block for patients, it was found that a bed capacity of 200 could be achieved, with the prospect of an increase to 450 at a later date. Emergency arrangements were therefore made to accommodate the staff until their own permanent quarters were available.

When the hospital opened there was accommodation, as had been anticipated, for 200 equipped beds, and eighteen months later, in July 1944, the full establishment of 450 beds was reached. This figure was capable of expansion to 525 in case of emergency.

The distribution of beds was flexible and changes in allocation were frequent to meet the different circumstances which arose. It often proved

necessary to devote an entire additional ward to the care of the W.A.A.F., for during the later years of the war there was a large number of W.A.A.F. personnel in the area.

One interesting feature of this hospital was the highly organised mobile surgical unit, which was mechanised by the use of a Humber utility van, capable of carrying a portable operating-table and the equipment necessary for major surgical procedures. This unit was used extensively to succour patients injured in aircraft crashes and also performed emergency operations at station sick quarters when it was considered inadvisable for the patient to travel to hospital. It was instrumental in saving many lives and its existence was of great psychological value to station medical officers in times of extreme emergency.

The lack of out-patient accommodation was a major disadvantage. This was usually found to be a difficulty in the E.M.S. type of hutted hospital, because the E.M.S. had no need for this kind of accommodation, while the Service hospitals invariably had a large and flourishing out-patients department. To meet the need in this case, work on converting Ward 4 in the block was begun in August 1943 and completed in November 1943 when the following facilities were made available:

Medical Department
Surgical Department
E.N.T. Department
Ophthalmic Department
Orthopaedic Consulting Room and Plaster Room
Clinical Photography Department
Waiting-rooms

The number of out-patients increased to such proportions that the waiting-rooms were overcrowded and many had to wait in the corridors; efforts were made to overcome this shortage of accommodation but the problem remained. Despite the difficulties under which the hospital was working in its early days, a considerable volume of work was done in the first few months. The following numbers were treated: medical admissions (including 66 aircrew) 259, medical out-patients 577, E.N.T. out-patients 465.

Among the medical staff were a number of R.C.A.F. personnel, including four medical officers and ten sisters. The exchange of differing medical ideas and views which resulted was considered to be extremely beneficial and it is recorded that the medical duties of the hospital were carried out in a most efficient and harmonious atmosphere. The work of this hospital differed in no way from that of most other R.A.F. hospitals and is historically uneventful. It was active in matters outside its normal function of treating the sick. A very flourishing medical society was formed and the frequent demonstrations and rounds which were

organised were well attended by local medical officers from R.A.F. and Army establishments and by civilian practitioners, who were always welcome. Close liaison was maintained with the local civilian doctors and several emergency operations were performed for them. The local charitable institutions were very generous to the hospital, their numerous kindnesses including organised recreational drives for patients and the provision of ward wireless apparatus.

Northallerton hospital was one of those which continued to function for some time after the war, and it was not until November 1947 that it was handed back to the civilian authorities.

R.A.F. STATION HOSPITAL, PADGATE

One of the most important features of the rapid expansion of the Royal Air Force, which followed the Munich crisis, was the establishment of Recruits Reception and Training Centres, and R.A.F. Station, Padgate, was one of the stations constructed for this purpose. In anticipation of the high incidence of minor sickness usually found in the age groups from which the majority of arrivals at these centres were recruited, the station was provided with a small hospital. When, in later years, Padgate became one of the more important Personnel Despatch Centres, the hospital added much to the efficiency of the organisation.

Opened in May 1939, the hospital was situated within the station perimeter in the south-west corner of the camp, unfortunately on the lowest-lying ground on the station. The buildings, similar to those at Cosford and St. Athan, were of the standard wooden-hut type, constructed in the form of the letter T. Three main wards, each nominally accommodating thirty beds, ran at right angles from the main corridor, which represented the upstroke of the T. At the far end of the corridor was the isolation department, consisting of twelve cubicles and two small wards of eight beds each and the cross-stroke section of the T housed, in addition to one of the three wards, the operating theatre, anaesthetic room, X-ray department and laboratory. The hospital kitchen, the administrative offices, the patients' dining-hall and the recreation rooms also led off the main corridor and the dental centre, added later, was built to connect with it. Outbuildings comprised the sisters' mess, south of the Isolation Wing within easy reach of the hospital, the staff barrack block, north of the Dental Centre, and the hospital fumigator, situated on the main road, north of the main entrance.

As this hospital was built before the outbreak of war, full advantage had been taken of the large allowance of room space per bed permitted under peace-time regulations, so that although the original plan was for only fifty equipped beds, it was found possible to house approximately double that number without undue overcrowding. When, in 1941, the

small brick-built wards were added to the isolation cubicles, there was room for a total of 110 beds. Although only a small hospital, Padgate could offer nearly all the facilities of the average cottage hospital and by 1941 the following departments were in full function:

Medical	Neuropsychiatric
Surgical (General)	Venereal Disease Clinic
Ophthalmic	Dental Clinic
E.N.T.	Full ancillary departments

R.A.F. Station, Padgate, functioned initially as a Recruits Reception Centre and Training Depot and later as a Personnel Despatch Centre. At times there were approximately 20,000 troops (Army, Navy and Air Force) in Padgate and the immediate vicinity and consequently, although it was originally intended for the treatment of cases arising on the station, the hospital developed rapidly from the beginning of the war into a comprehensive medical and surgical unit.

Large numbers of fresh trainees arrived regularly at the station and it was found that many of them, although graded fit, were far from being so, and their medical care devolved upon the hospital authorities, who found it necessary to admit some as in-patients and to instigate medical boarding action on others, after obtaining specialist opinion. The same situation arose later when personnel began to pass through the station *en route* for overseas.

The hospital was responsible for the vaccination and inoculation of all recruits. This task was an onerous one and continued without abatement until a change of policy decided that recruits on their way to other training centres should be vaccinated and inoculated at those centres. It is noteworthy that Padgate was one of the few places where personnel could be inoculated against yellow fever. The disinfestation and fumigation of bedding used by the recruits was another big task dealt with by the hospital and, as arrivals and departures were very frequent, the work in this connexion was considerable. Fortunately, the arrangements for fumigation were entirely satisfactory, and it was possible to keep pace with the constant flow of blankets which needed attention.

The principal events of medical interest during the war years were the influenza epidemic in 1939–40 and the treatment of smallpox contacts in 1942. During the former, the accommodation available in the hospital was inadequate to house all the patients requiring in-patient treatment and temporary wards were improvised in the barrack blocks. In 1942 the hospital was required to care for a large number of personnel who, on disembarking from a troopship, were quarantined as suspected smallpox contacts. Again the hospital itself was unable to accommodate them and it was necessary to segregate several barrack blocks to provide

quarters for these troops. Fortunately, there was a medical officer among them and he helped very considerably to ease the burden. One problem in this connexion was the inadequacy of latrine accommodation and to supplement the existing system, bucket latrines were provided. The contents were emptied into the local sewer, a brick platform having been constructed above the sewer. The buckets and platform were cleaned by pressure water hoses. During both these periods of emergency, valuable assistance was given to the hospital medical staff by the personnel of an Aircrew Medical Board, which was stationed as a lodger unit at Padgate. The location of this board was convenient and facilities were available for rapid investigation of special cases to be carried out on the spot.

From 1942 onwards close liaison was maintained with American Forces which were stationed in the area. Initial assistance was given to them and later a flourishing medical society was formed, at the meetings of which current ideas and views from both sides of the Atlantic were freely exchanged.

After the cessation of hostilities Padgate hospital continued to function, being retained as one of the official R.A.F. station hospitals.

R.A.F. GENERAL HOSPITAL, RAUCEBY

R.A.F. General Hospital, Rauceby, was partially opened on April 1, 1940, when the annexe of Rauceby Mental Hospital was taken over to house eighty R.A.F. patients, the main hospital being handed over to the Royal Air Force on June 1, 1940. This date coincided with the closure of R.A.F. Station Hospital, Cranwell, from which patients and stores were transferred by ambulance convoy in June 1940. The staff from Cranwell were transferred at the same time to augment the existing staff at Rauceby, which from its inception was envisaged as one of the principal R.A.F. hospitals.

The hospital was well situated in pleasantly wooded country near Sleaford in Lincolnshire, within easy reach of the R.A.F. station at Sleaford and of several other units with good airfield facilities. There were a large number of Bomber and Maintenance stations in the area and from 1940 onwards the numbers of R.A.F. personnel served by the hospital increased rapidly. It was equipped with all the specialist facilities, so that in addition to its immediate commitment in the Lincolnshire area it also accepted transfers from other general hospitals which were in need of accommodation.

The number of equipped beds was fixed at 250, a proportional allocation being made between the departments, although the number allotted to each varied from time to time with changing circumstances. The departments and ancillary units available were as follows:

Surgical (major and minor)
Medical
Orthopaedic and Rehabilitation
Ophthalmic
Burns Centre
Dental and Maxillo-facial
Psychiatric
X-ray Department
Laboratory
Special Treatment Centre and Skin Department
Administrative Departments and other facilities of a general hospital

The hospital rapidly became functional, due largely to the fact that, unlike many requisitioned premises, this building had previously been used as a hospital; the conversion of hotels and similar buildings frequently proved very time-consuming, as well as being extremely costly.

In February 1941 an increase in the incidence of pulmonary tuberculosis in the area made it imperative to set aside one ward for the treatment of the many cases which were admitted to Rauceby. The psychiatric patients were transferred to R.A.F. Neurological Hospital, Matlock, leaving a complete ward vacant for the reception of tuberculosis cases. It was considered that the increase in the number of cases was due, not to a widespread increase of the disease itself, but to the growing numbers of R.A.F. personnel in the area. Later in 1941 the Special Treatment Centre and the Skin Department were moved to Cranwell, releasing further beds for medical and surgical cases.

The possibility of invasion and widespread bombing raids causing large numbers of casualties, both Service and civilian, was foreseen and good liaison with the Army and civilian medical authorities was established. A comprehensive scheme was drawn up, in which the hospital assumed the responsibilities of a casualty clearing centre and an exercise was carried out, as a result of which all concerned gained practical experience of the conditions which might be encountered. Further liaison with the medical authorities in the neighbourhood was achieved by inviting them to attend the meetings of a flourishing medical society organised by the hospital, at which papers and selected cases were discussed and well-known members of the profession gave lectures and demonstrations.

Throughout the war years the hospital functioned as a full-scale general hospital until it was handed back in January 1945 to the civilian authorities. The following figures for the year 1943 are representative of the work done over the period:

Surgical	Major operations	1,398
	Minor operations	2,926
Medical		1,233
Orthopaedic		1,452
Burns		163
Orthodontic		48
Psychiatric		1,791*
		141†
Total cases for the year	Admissions (all ranks)	5,337
	Out-patients	18,650

* Reviewed in out-patients department—includes 607 aircrew
† Admitted to hospital—47 aircrew

R.A.F. GENERAL HOSPITAL, ST. ATHAN

Early in the expansion period of the war it became evident that the R.A.F. would be concentrating large numbers of personnel in the South Wales area, a part of the country not adjacent to enemy-held territory and therefore likely to be relatively free from air attacks. R.A.F. Station St. Athan began to assume considerable proportions and with the opening of other stations in the area a large general hospital became a necessity. As there was already a large station sick quarters at St. Athan, which was centrally situated, it was decided that this would be a very suitable site and building commenced early in 1939. At the same time the old station sick quarters was converted into an infectious diseases hospital and annexe for the main hospital.

The new buildings, which were opened in July 1940, were built to the same plan as that used for Cosford, constructed of wooden units which were linked together, in contrast to the design of the standard type E.M.S. hutted hospital in which the ward huts were much more detached from each other. The buildings were grouped in the form of a capital 'A', the angle at the top being a right angle, with the wards and theatre block leading off the uprights and the cross stroke forming the administrative corridor. Further outbuildings were constructed for stores and mortuary accommodation, etc.

The old station sick quarters, now the infectious diseases hospital, was used to accommodate all cases of venereal disease and also housed the skin department. It also provided emergency overflow accommodation for the main hospital and storage space for reserve equipment. The dental section, too, was still housed in the I.D.H. but steps were taken to partition it off from the latter, to avoid risk of infection to personnel attending the building for dental treatment.

So urgent was the demand for this hospital that it opened in July 1940 without its full equipped bedstate and it rapidly became a unit of considerable size and importance. The growth of stations in the area was

more than keeping pace with the supply of hospital beds and St. Athan was at all times an extremely busy hospital, receiving its patients for the most part from Wales but also to some extent from the Midlands. The 282 beds were allocated as follows:

	Officers	*P.M.R.A.F.N.S.*	*Airmen*	*W.A.A.F. and Families*	*Totals*
General	5	4	204	24	237
I.D.H.	—	—	45	—	45
Totals	5	4	249	24	282

The following facilities were available:

Surgical (major and minor)	E.N.T.
Medical	Convalescent
Orthopaedic	Family treatment
Ophthalmic	

The staff to run this large hospital comprised 17 medical officers, including the Commanding Officer, a medical quartermaster and an adjutant; 56 nursing sisters, including the matron and 4 senior sisters; 110 medical airmen and airwomen and 42 non-medical other ranks for duties with the ancillary services of the hospital.

Despite the geographical situation of the hospital there were frequent air-raid alarms and the choice of site appeared less advantageous from this point of view than it had done when building commenced. The reason for this unwelcome attention from the enemy was the proximity of Cardiff and Swansea and the Government's policy of constructing 'shadow' factories in Wales. On July 18, 1940, the hospital was hit by an enemy raider, a single Heinkel which at approximately 1600 hours dropped four 50 kilo. high-explosive bombs on the camp causing six casualties, one of which proved fatal. The damage was confined to No. 2 Wing with some slight damage to the I.D.H., which was unfortunate as that hospital was about to admit a large number of Polish venereal disease cases. The reception of these patients had to be deferred for one week, when they were housed in the family block until the necessary repairs could be effected. But on August 24, 1940, a second and more serious attack was made on the hospital area. Six high-explosive bombs, probably of the 50 kilo. type, landed on or near the main hospital at approximately 2100 hours causing considerable structural damage, although happily none of the few casualties was fatal. Wards 5, 9 and 10, the main entrance and the Matron's office were almost totally destroyed, and the medical common room and Ward 4 were slightly damaged. Delayed-action bombs fell in the waiting-room of the consultants block, the orderly medical officer's room and the main X-ray department, but these were all removed, before they could do damage, by the prompt and courageous efforts of the Army Bomb Disposal Squads. The telephone system was completely disrupted and partial breakdown occurred

in the water and central heating systems. Fortunately, there was no outbreak of fire and the weather was mild, so that the lack of heating did not present a serious problem, in contrast to the bombing of Torquay Hospital, which occurred in bitter weather.

The casualties were expeditiously treated by the hospital staff who fortunately found only four cases in all, the most serious being a fractured jaw and the others only minor cuts and abrasions caused by flying glass. That the casualty rate was so low was largely due to the commendable action of the sisters in charge, who at the first air-raid warning had hurried patients and staff into the nearby shelters.

The general function of the hospital was so disrupted by the damage that it was reluctantly decided to evacuate the building until the necessary repairs could be effected. Before the incident occurred the authorities had drawn up a plan of evacuation and dispersal of patients and this was put into immediate effect. All who could reasonably be discharged were sent to their homes or back to their units, all seriously ill male patients were sent to Landough Hospital, Penarth, and female patients were transferred to the E.M.S. Hospital, Whitchurch. Both these establishments were about twelve miles from St. Athan and the patients were conveyed by road. Assistance in transport and loading was given by the volunteer organisations, including the Women's Voluntary Services and the American Red Cross. The evacuation was uneventful, a good example of the value of complete regional hospital liaison.

The work of repair was given high priority and the hospital re-opened to a limited extent as soon as the essential items could be completed; it was decided not to rebuild the three wards which had been totally destroyed. The wooden construction had withstood the blast very well indeed and the absence of brick blast walls proved a definite advantage, as it is likely that broken fragments of such walls would have been blown into the building thereby greatly increasing the casualty rate.

Further heavy raids occurred in the area but fortunately the hospital was not hit again. Following a very heavy raid on Swansea, when a large number of civilian casualties were sustained, the mobile surgical team at St. Athan Hospital went to the aid of the Swansea E.M.S. Hospital and was able to render valuable assistance.

In 1941 the work of the hospital increased considerably, largely due to the opening of a full-scale Orthopaedic Centre with all the necessary rehabilitation facilities. It was originally intended that this centre should take all cases from South-West Wales but in practice the scope was wider, patients being received from the Midlands and even further afield. During 1941 also, the number of beds for the treatment of venereal disease in women was increased and it was arranged to admit patients from the A.T.S. and the W.R.N.S., if their authorities so desired. The only structural addition to the buildings was a large Decontamination

Centre capable of dealing with the full complement of hospital patients and staff, should the need arise.

In 1943, as a result of the very heavy demand for hospital accommodation, it became necessary to make fuller use of the local convalescent depots so that beds could be freed for the reception of fresh seriously ill cases. Male patients at a stage of recovery requiring only limited medical supervision were sent to Merthyr Mawr Convalescent Depot and female patients to Quarry Hill. Most of the patients so transferred were orthopaedic cases and in June 1943, the Orthopaedic Centre moved to R.A.F. General Hospital, Church Village, then in process of formation. The transfer of this centre freed accommodation for additional surgical cases and in November of the same year a burns treatment unit was opened, the number of patients requiring this type of treatment having increased considerably as a result of the intensification of the bomber offensive. The work of the Burns Centres is discussed at some length in Chapter 6 of this Volume.

The work of the hospital throughout the remainder of the war differed in no major respect from that of the other general hospitals. Considerable numbers of convoys were received from the Normandy battlefields and other locations overseas, the patients suffering from all types of illness, principally medical conditions and skin disorders. In May 1945 sixty beds were opened for the treatment of tuberculosis, being housed to begin with in the infectious diseases hospital, and from this modest beginning a flourishing T.B. Centre was evolved.

R.A.F. OFFICERS' HOSPITAL, TORQUAY

In 1939, it was decided to set up a R.A.F. Officers' Hospital in a district with both reasonable rail access and good surroundings for convalescence. The Palace Hotel, Torquay, was selected as a suitable building in an extremely favourable location. The town of Torquay was easily accessible by rail with its own station on the Great Western Railway network and the local roads were well metalled and suitable for ambulance traffic in spite of the hilly nature of the surrounding country. The hotel was situated just outside the town at Babbacombe, overlooking the bay, one of the loveliest parts of the county of Devonshire and an area well recognised in peace-time as a health resort because of the equable climate which it enjoyed throughout the year. The district was considered to be relatively safe from enemy air attack, an assumption which was, unfortunately, to prove far from correct.

Every effort was made to get the hospital ready for the reception of patients as soon as possible and in October 1939 a start was made with 48 equipped beds. This number was increased rapidly and the full strength of 249 beds was achieved by December of that year. The hospital staff in 1939 consisted of 11 R.A.F. officers (including a

medical quartermaster and an accountant officer), 22 members of the P.M.R.A.F.N.S. (including a matron and 4 senior sisters), 87 airmen and airwomen, including nursing orderlies, and 83 civilian employees, mostly former members of the hotel staff. Although the hotel did not require much structural alteration, it was found necessary to convert four bedrooms on the second floor in order to set up a satisfactory theatre block and it was not possible to complete this work until May 1940. By this time the hospital was running fairly smoothly, the only slight difficulty being that of dealing with patients scattered in what amounted to single rooms. The hospital was then treating more than 100 in-patients of all types and this number increased to 150 by the end of 1940.

On Sunday, October 25, 1942, at approximately 1100 hours, the hospital area was attacked by enemy aircraft. Following preliminary ground strafing with machine-gun fire, the attack was pressed home with high-explosive bombs of 500 kilos. The first scored a direct hit on the south side of the east wing; the resulting explosion wrecked two sections of the wing from roof to ground level and was responsible for practically all the casualties. The east end of the east wing was virtually cut off from the rest of the hospital buildings and suffered a complete severance of all domestic utilities. The second bomb dropped approximately fifty yards from the north-west corner of the west wing, landing in the main road and exploding on impact. The west wing was extensively damaged by the blast from this bomb. A large number of windows were broken and frames displaced, doors and partitions were wrecked and unfortunately the operating theatre, which was situated in this area, was severely damaged and put out of action. The centre block, which was of older and stronger construction, suffered less and was still serviceable and the kitchen accommodation was undamaged.

Rescue work was begun immediately by the staff assisted by all the convalescent patients. Reinforcements arrived quickly in the shape of the local Air Raid Precautions squad and the Home Guard, and the work of rescue and resuscitation was rapidly organised. Operations were based on a scheme prepared for such an emergency by the Officer Commanding, who had planned to use the main ballroom as a casualty clearing centre. In view of the extensive damage to this area it was decided to use the sisters' mess for this purpose and as most of the reserve medical stores were kept nearby and were therefore readily to hand, this proved to be a wise choice. Only first-aid treatment and resuscitation were attempted by the staff because the majority of the hospital buildings had been damaged and there was no suitable surgical accommodation for major procedures. Patients were brought by stretcher to the casualty centre for rapid diagnosis after which any necessary dressings and splints were applied and drugs administered. Plenty of blankets and hot-water bottles were available for the treatment of shock,

but unfortunately no electric cradles or blankets were available, having been either destroyed or buried in the *débris*. The kitchens were still functioning and able to produce continuous supplies of hot drinks, a matter of particular importance, as it was a bitterly cold, rainy day and the entire building was draughty as a result of the almost complete destruction of the windows. (Plate XXVII.)

At the time of the raid the hospital was full, with a total of 203 in-patients. The casualties were as follows:

	Officers	*Nursing Staff*	*Airmen and Airwomen*	*Total*
Deaths	14	2	3	19
Missing	1	—	—	1
Injured	35	2	8	45

Among the injuries were 5 fractures, 2 of them serious, and 17 lacerations, with 2 serious cases. Considering the number of patients in the hospital these figures are low. Had the incident occurred on a week day, the milk bar, which was located in a severely damaged area, would have been crowded with both patients and staff at the eleven o'clock break. Fortunately, however, the incident occurred on a Sunday, when no organised programme was followed.

As it was obvious that the hotel would be untenable for some time the problem was twofold: the disposal of casualties according to the gravity of their condition and the transfer of the remaining patients to other hospitals. As soon as the condition of the injured permitted they were removed by ambulance, the more serious cases to Torbay E.M.S. Hospital and the remainder to Torquay station sick quarters. It was found necessary to give plasma transfusions to two of the seriously injured before it was considered safe to transfer them but in the majority of cases there was no delay and the last casualty was evacuated from the hospital at approximately 1545 hours on the same day, some 4½ hours after the incident. Uninjured patients were sent home wherever possible and those whose condition required continued hospital attention were transferred to R.A.F. Hospitals Wroughton or Melksham. The transfer was completed by October 29.

After the evacuation of the hospital, it was left in the hands of a care and maintenance party pending a decision as to the fate of the building. On January 8, 1943, another enemy attack resulted in considerable damage to the central block, although fortunately no further casualties were sustained. The building was now considered useless and the hospital closed down, further accommodation for officers being found in May 1943 at Cleveleys Hydro near Blackpool.

R.A.F. STATION HOSPITAL, UXBRIDGE

The history of Uxbridge Hospital dates from the days of the Royal Flying Corps, when the policy of establishing a hospital solely for the

use of officers was first formulated. In early 1918 a very small unit, then known as the Royal Air Force Central Hospital, was set up in a requisitioned house at Holly Hill, Hampstead. In May 1919 it moved to another requisitioned house in East End Road, Finchley, where it remained as a small unit until June 1925, when it was transferred to Uxbridge and opened on July 13, 1925, as the Royal Air Force Officers' Hospital.

At Uxbridge the establishment remained small but the twenty-five equipped beds were sufficient for the needs of the still relatively small Air Force. The building taken over was one previously used by the Women's Royal Air Force as ordinary quarters and after the necessary conversion the facilities available were as follows:

Two main wards
Four small wards of 1 or 2 beds
X-ray Department
Operating Theatre
Several small annexes for stores
Billiard Room

At a later date a separate medical stores department was built and a small mortuary was provided. No further additions were made until the outbreak of the Second World War, when in common with other establishments, it became necessary to increase the accommodation at Uxbridge.

When mobilisation was ordered, the hospital, in order to meet possible immediate contingencies, increased the number of beds in the existing buildings to thirty-five and augmented the operating facilities by converting two dental surgeries into auxiliary theatres. The small staff, consisting of four medical officers, including the Commanding Officer, nine nursing sisters, including the matron, and a general staff of thirty-four, was divided into three teams to man the three theatres. During the early months of the war, also, a comprehensive blood depot was established, with refrigeration and a list of donors from the station.

It very soon became apparent that general mobilisation was likely to result in a demand for increased hospital accommodation, which could not be met at Uxbridge without considerable alteration to the existing arrangements. It was decided that it would be possible to increase the accommodation by incorporating the sick quarters building which, situated to the immediate east of the main hospital building, could be easily and efficiently connected to it by means of a covered way. Temporary conversion was carried out in 1940, a more permanent corridor being built in 1941. As a result of this conversion the total capacity of the hospital was increased to 125 equipped beds, with room for specialists' offices and administrative departments.

Despite these alterations, the establishment had a comparatively short life as a war-time officers' hospital. In October 1939 a large requisitioned hotel in Torquay had been opened as a R.A.F. Officers' Hospital and in February 1940 Uxbridge became a W.A.A.F. Hospital. In July 1941 it was reduced in status to a station hospital and remained such until the end of the war.

One of the greatest advantages of Uxbridge was its proximity to London and the Central Medical Establishment. It enabled the consultants to keep special cases within easy reach of the large civilian hospitals which were able to provide facilities not available in even the largest of the Service hospitals. Conversely, the major disadvantage was its position on the fringe of an enemy target area. Many bombs fell in the immediate vicinity of the hospital, but fortunately, although the nearest landed within two hundred yards of the building, no damage or casualties were sustained.

Historically the work of the hospital was uneventful and it satisfactorily fulfilled its function of providing medical care for the numerous personnel at stations in the area. The following figures for the year 1944 are typical of the average annual output:

Total number of patients admitted		1,732
R.A.F. officers		171
W.A.A.F. officers		40
Sisters and V.A.Ds.		8
Airmen		1,151
Airwomen		362
Surgical operations	Major	527
	Minor	531

R.A.F. STATION HOSPITAL, WEETON

R.A.F. Station, Weeton, was one of the numerous large stations set up in the Lancashire area during the period of rapid expansion in the early days of the war. In May 1940 construction was still in progress but the station was opened up by an advance party, as it was considered that the occupation by the R.A.F. of some of the buildings might assist towards more rapid completion of the work. In consequence, during the early days, considerable improvisation was necessary. The station hospital was among the unfinished buildings, but it was decided that work was sufficiently advanced to permit of its use.

The function of R.A.F. Station, Weeton, at that time was to be the training of metal and armament workers and the first trainees were due to arrive at the end of May 1940. It was expected that the numbers of personnel on the station would eventually be between 4,500 and 5,000. The medical facilities planned for their care included two medical inspection rooms on the camp and a hospital of 198 equipped beds.

The plan of the hospital was typical of the R.A.F. hutted hospitals and the whole formed a compact and workable unit.

Good progress was made on the remaining construction and by the end of May eighty beds were equipped. The first patients were admitted early in June 1940. By the end of the month the X-ray department, using a small set, was ready for use and at the beginning of July a fully equipped massage department was opened. By this time the hospital consisted of nine wards, the infectious diseases hospital and two separate side wards. The distribution of beds was as follows:

	Wards	*Beds*
General surgical	2	40
Medical	2	34
Orthopaedic	2	40
E.N.T.	2	40
Ophthalmic	—	6
Infectious diseases	—	12
Officers	1	24
Emergency side wards	2	2

Early in 1941 a special surgical block was opened, consisting of two theatres, a plaster room, X-ray department and the necessary ancillary facilities. Part of the original temporary accommodation was converted into an additional waiting-room for the out-patients department and the remainder provided a further extension for the massage department, which by this time was becoming overcrowded with orthopaedic cases. By June 1941 the equipped bedstate had risen to 248, a 25 per cent. increase on the original figure, due to the even greater increase in the population of the station, which now numbered over 10,000. The stations in the neighbourhood had likewise increased in size.

The following figures for a typical period give some indication of the work of the hospital:

Period May 21, 1940 to June 30, 1941

Total admissions to hospital		3,583*
Surgical operations	Major	786
	Minor	659
Total out-patients	Medical	86
	Surgical	684
	Orthopaedic	1,856
	Ophthalmic	—
	E.N.T.	—
	X-rays	9,800
	Massage	850

* Largest number of beds occupied in one month 235

The following figures for the work of the surgical division in the year 1943 illustrate the gradual increase in the work:

Major operations . . .	1,454
Minor operations . . .	476
Plasters	1,231

Medically there is little of unusual interest in the history of Weeton Hospital. An opportunity to gain experience in the treatment of malaria was afforded in June 1940, when 1,135 Poles were attached to the station and a number of cases were recorded. Considerable attention was directed to prophylactic measures and careful case histories were prepared. In general the work done throughout the war years was typical of most R.A.F. station hospitals, its main activity being centred in the out-patients department. Medical officers at the many R.A.F. stations in the area sent their patients to the hospital for examination and specialist opinion and in addition many patients were recategorised and boarded from the hospital. In 1945 small convoys of wounded and repatriated personnel were admitted, but the main function of the hospital remained the not very spectacular, yet nevertheless extremely important one, of caring for the numerous personnel on and around the station.

R.A.F. STATION HOSPITAL, WEST KIRBY

In April 1940, R.A.F. Station, West Kirby, was opened for the reception of recruits and was known as No. 5 Recruit Centre. This station, situated in Cheshire overlooking the estuary of the River Dee, was in the immediate neighbourhood of Birkenhead and Liverpool, with good road and rail transport for personnel required to embark for overseas.

The camp, in common with many other similar projects at this period of the war, had been hurriedly built and was incomplete when it was handed over to the R.A.F. In consequence large numbers of personnel had to be accommodated in tents, which was an unsatisfactory arrangement in view of the inclemency of the weather common to the area and the rawness of the recruits. The general drainage of the camp was poor because the subsoil consisted mainly of clay, and the inability to provide adequate hutted accommodation was a source of some anxiety at the outset, particularly as the intake of recruits was high, 750 of them passing through the centre during the month of June 1940 alone.

The hospital was similarly incomplete, and for a time those cases of sickness which could not be dealt with in the medical inspection room were sent to the local civilian hospitals. After a while it was decided, in order to relieve the pressure on the civilian authorities, to open the

hospital in its incomplete state, using the wards as and when they became available.

The hospital building was constructed of wood, the typical wooden-type huts being joined by closed corridors. The following beds were available:

	Beds
Main Hospital:	
8 large wards with 25 beds each	200
2 small wards with 3 beds each	6
2 officers' wards with 1 bed each	2
Isolation Hospital:	
2 wards with 12 beds each	24
12 bunks with 1 bed each	12 *
Total beds equipped	244

* This number could be increased to 24 by placing 2 beds in each bunk.

The general amenities were those common to the average station hospital. Electricity and water were supplied from the local municipal sources and the sewage was disposed of into the main sewers; heating was from central boilers supplemented by radiators in the wards and corridors, and provision was made for emergency lighting in the operating theatre.

The volume of work done by this hospital during the war years was very considerable. In June 1941 recruit training ceased and thereafter the station functioned as No. 1 Personnel Despatch Centre. Additional tented accommodation was made available between April and October 1941, by which time it was possible to house in all about 7,000 personnel. The regular passage of troops through the P.D.C. *en route* for destinations overseas created a great deal of work for the medical staff, not all of it to be expected in the normal course of duty. The years 1941 and 1942, when large numbers embarked, were particularly busy. Many of the troops were in need of inoculation and vaccination and all required yellow fever inoculation, without which it was not permissible for them to pass through the Suez Canal. In theory, all personnel were already medically fit for embarkation, having been passed beforehand as fit for overseas duty by the unit medical officers at the stations from which they had come. In practice, however, it was found that numbers of them arrived unfit, suffering from all types of disability, including hernias, rheumatic heart lesions and gross anxiety states. Some of the personnel had already advised their unit medical officer of their condition, but had been informed that the necessary decision regarding their drafting would be made at the P.D.C. Thus it became necessary for the hospital to admit a proportion of the draftees as patients and the available beds were fully occupied. The pressure on the hospital was relieved to some extent in February 1942, when Thornton Hall E.M.S. Convalescent

Home, owned by Viscountess Leverhulme, was made available to the R.A.F.

The activities of the hospital can perhaps best be judged by the following figures for June 1942, a typical month's work:

Admissions	214
Discharges	247
Surgical operations (major)	37
Surgical operations (minor)	101
Medical out-patients	94
Surgical out-patients	148
Orthopaedic out-patients	62
X-ray	184
E.N.T.	77
N.Y.D.N.	47
Gynaecological	6
Massage	586

In 1944 West Kirby was of particular interest as the main P.D.C. for W.A.A.F. personnel posted overseas. These postings had been sanctioned only after much discussion and one of the conditions of their posting was that a very thorough medical examination should be carried out to determine their fitness for service abroad. West Kirby Station Hospital was responsible for this examination, which included as an invariable rule an X-ray of the chest and an exhaustive 'free from infection' inspection. This naturally resulted in an appreciable amount of additional work for the hospital staff, for in March 1944 alone, 4,639 airwomen passed through the centre *en route* for the Middle East and India.

Due to its position within easy reach of Liverpool and Birkenhead the hospital was well within the target area of heavy bombing, but fortunately, although several bombs were dropped in the vicinity, only slight structural damage was caused and there were no casualties. While the wisdom of siting a hospital in such an area is open to doubt, there can be no question of the value of such an establishment in a locality through which large numbers of airmen were being routed overseas. On the cessation of hostilities the hospital continued to function, serving the P.D.C. and the many stations which survived the contraction of the R.A.F.

R.A.F. STATION HOSPITAL, WILMSLOW

R.A.F. Station, Wilmslow, was built as a training depot for recruits during the period of rapid R.A.F. expansion at the beginning of the war. The opening-up party assembled at R.A.F. Station, Padgate, in May 1940

and was transferred to Wilmslow when accommodation was ready for one of the four proposed training wings.

The station, which was designed to house approximately 5,000 personnel, was situated in very beautiful country in part of a private park and it was unfortunately necessary to fell a considerable number of the trees in order to gain sufficient space for the camp. The station was well provided with road and rail facilities, lying one mile from the local station of Wilmslow, twelve miles from Manchester and about double that distance from Liverpool. In view of its close proximity to the last-named town the station was also used as a Personnel Despatch Centre.

When the station opened the only medical facilities available were a medical inspection room and a sick quarters consisting of two wooden-hutted wards of 20-bed capacity with a separate infectious diseases block of one hut divided into 12 bunks. The medical buildings were situated at the extreme corner of the camp, three-quarters of a mile from the main gates, this slight degree of dispersal being considered necessary in view of the possibility of enemy air attack. It soon became apparent that the large numbers of relatively young trainees, among whom a high minor sickness rate was inevitable, would necessitate the provision of a small station hospital and steps were taken to enlarge the existing facilities, which, being of hutted construction, were easily extended.

Five additional wooden-hutted wards were constructed, together with an operating theatre and a combined sterilising and anaesthetic room. A laboratory, an X-ray department, a physiotherapy section and accommodation for out-patients completed the equipment of the hospital. The wards, which were joined by completely closed passage-ways, were of standard type, except that heating was in all cases provided by radiators supplied by a central boiler, representing a considerable advance on the usual type of inefficient slow-combustion stove.

On the initial opening of the hospital in July 1940 it was not possible to provide full medical and surgical facilities as a considerable portion of its equipment was not yet available due to the universal shortage of these commodities in the early war years. It was necessary to transfer all major surgical cases to R.A.F. Station Hospital, Padgate, fortunately only twenty miles distant. The outstanding equipment soon became available and the hospital was then able to provide all the usual facilities for personnel on the camp, now numbering over 5,000, and for those on the surrounding stations which by this time had expanded considerably. Out-patient consultations increased rapidly and in September 1942 it became necessary to construct a large waiting-room to avoid congestion of the corridors, which were being used to supplement the existing overcrowded accommodation.

In 1943 the policy of the station underwent a radical change. Until this date the trainees and personnel of the P.D.C. had been male, but in late February 1943 it was decided to use the station as a large W.A.A.F. training depot. At this time the policy of W.A.A.F. substitution was being widely adopted and a large training centre was urgently required. This change made necessary considerable reorganisation of the ward accommodation and a whole-time gynaecologist was posted to the hospital. On the station two huts in No. 2 Wing were joined together by a sanitary annexe and used for the treatment of minor sickness, a third hut being reserved for the use of the mobile miniature X-ray section. A hairdressing section was added, with special facilities for the treatment of head infestations, the incidence of which was at this time reaching high proportions, approximately one in every five W.A.A.F. entrants being found to need treatment. It was also necessary to devote a special section to the treatment of scabies, a disease with a high incidence among both civilian and Service personnel at this period.

After the opening of the hospital a Red Cross section was organised, staffed mainly by voluntary workers from the neighbourhood. These workers provided library facilities and initiated bed patients into the arts of various handicrafts. For the fitter convalescents in the area they ran excursions and arranged tea parties. They also offered convalescent facilities in a large converted private house which accommodated twelve beds, thereby freeing hospital beds for acute cases. Patients who had no homes or satisfactory sick leave accommodation were encouraged to make use of these arrangements. The Red Cross were also responsible for meeting the relatives of dangerously and seriously ill patients and finding them accommodation in the district. This service, provided at a time when accommodation was in extremely short supply, was of inestimable value.

The medical work of the hospital differed in no major respect from that of any other similar hospital. Being conveniently situated, close to Liverpool, which became the most important port for the embarkation of personnel for overseas, the hospital was at all times extremely busy and side by side with the normal work of the station treated very large numbers of out-patients sent from the stations in the immediate vicinity. During the period when the station functioned as a P.D.C. the numbers of gastric and N.Y.D.N. cases were such that they necessitated the allocation of separate wards. Although all types of surgery could be undertaken it was the practice to transfer orthopaedic cases to station hospital, Weeton, which housed a special centre for this type of work. At the end of the war R.A.F. Station, Wilmslow, was still acting as one of the few remaining centres for the W.A.A.F. and the hospital continued in the status of a station hospital with approximately 250 beds for all types of cases.

Summary of bedstates over the period August 1940 to *August* 1945

	Patients
August–December 1940*	59
January–December 1941	122
January–December 1942	152
January–December 1943	151
January–December 1944	181
January–August 1945	131

* This period covers the initial opening of the hospital thus accounting for the lower average figure.

R.A.F. GENERAL HOSPITAL, WROUGHTON

Work on the construction of R.A.F. General Hospital, Wroughton, began in June 1939. It was intended that this modern hospital, situated near Overton, ten miles from Swindon in Wiltshire, should serve the south-west area of England and should also provide a suitable centre for special branches of medicine and surgery in the R.A.F. Constructionally the hospital was similar to Ely Hospital and a description of the type of building is given in the account of that hospital. Every possible priority was given to the construction of Wroughton, in view of the state of emergency and the pressing need for beds, but it was not until June 1942 that it was completed. Sections of the building were occupied as they were handed over by the contractors.

The opening-up party, consisting of an adjutant, quartermaster and eleven airmen, assembled at R.A.F. Station, Yatesbury, in early 1941 and moved to Wroughton. The primary object of this party was to clear all the available completed buildings, put the ward accommodation in order and arrange medical stores and equipment as it arrived. This party lived in primitive conditions in the hospital buildings, but was fortunately able to mess with No. 15 Medical Rehabilitation Unit, which was nearby. A considerable amount of stores arrived during the last fortnight of the month and good progress was made towards the opening of the hospital.

At this stage the Air Ministry Works Department assisted considerably by producing a plan of anticipated dates when the various sections of the hospital would be completed. The estimated dates were as follows:

August 15, 1941	Theatre Section X-ray Department Sisters' Mess Wards 2 and 6 (93 beds) Officers' and W.A.A.F. Kitchens
August 30, 1941	Wards 3, 4, 7 and 8 Pathology Laboratory

September 15, 1941	Wards 1 and 5
September 20, 1941	Officers' married quarters (Groups 3 and 5)
October 15, 1941	Officers' married quarters (Group 4)
October 30, 1941	Infectious Diseases Block

It was found possible to adhere fairly closely to this schedule and at the end of the first week in August 1941, the first patients, ten convalescent cases from R.A.F. Station Hospital, Yatesbury, were admitted. By the end of the month fifty beds were available, including a number for female patients, and the theatre performed its first operation under emergency conditions. By the end of November the bedstate had risen to 147 beds, the hospital was able to admit medical, surgical, orthopaedic and E.N.T. cases and a N.Y.D.N. Centre was operating on an out-patients basis. It was at this stage that the hospital was honoured by a visit from His Royal Highness the Duke of Kent.

In early 1942 further accommodation became available, including additional wards, and the infectious diseases block opened in late March. The final ward as envisaged in the original planning was completed in June of this year, the hospital now having 319 equipped beds available and all the departments associated with a large general hospital. Little of historic interest is recorded during the remainder of the year, although during June an outbreak of smallpox occurred in Swindon and the hospital medical personnel assisted the local authorities with the vaccination of the civilian population. The area was placed out of bounds to the Service population and no case of smallpox was recorded among either patients or staff.

Close liaison with the local civilian authorities had been maintained since the foundation of the hospital. In August 1941 it was agreed with the local Medical Officer of Health at Trowbridge that in the event of the hospital becoming incapacitated by enemy action, E.M.S. hospital beds would be placed at the disposal of the R.A.F. These arrangements were reciprocal. Liaison was also established with the Bristol Tramways and Carriage Company and a service of buses was provided for the hospital. This, in view of the relatively isolated position of the hospital, was a facility appreciated by patients and staff alike.

In 1943 the capacity of the hospital was enlarged by the erection of hutted buildings. In August, four W.A.A.F. barrack huts, four wards and a stores hut were constructed and in October, eight hutted wards were added. This additional accommodation was required chiefly as the result of the formation of No. 50 Medical Receiving Station, the work of which is discussed at length in the latter part of this narrative dealing with Operation 'Overlord'.

In spite of the very considerable pressure under which the hospital was working and the extensive preparations for 'Overlord', the authorities found time to place thirty-six acres of land under cultivation, and

to lay out a good deal of the ground surrounding the hospital as gardens.

Damage due to bad weather conditions is recorded on two occasions. In January 1943 very heavy storms and winds did considerable damage to the newly arrived stores of No. 50 M.R.S. and destroyed several of the hospital's large plate-glass windows. In January 1944 another storm flooded and made untenable five of the huts used by the W.A.A.F. nursing orderlies, who were accommodated in wards of the hospital which were not in use at the time.

OPERATION 'OVERLORD'

From early 1944, the attention of the hospital was focused upon 'Overlord'. On April 4, 1944, a directive was received from Technical Training Command, giving the executive instructions for the 'Reception, Treatment and Disposal of Casualties arriving in the United Kingdom by Air'. Briefly the instructions were as follows:

(*a*) R.A.F. casualties arriving in the United Kingdom by air were to be transferred, under arrangements made by the S.M.O. No. 46 Group, Transport Command, from the main base airfields in the United Kingdom to R.A.F. Hospital, Wroughton, for treatment and disposal, as required.

(*b*) In an emergency casualties other than R.A.F. could be admitted pending onward transfer to E.M.S. hospitals by road or ambulance train from the Swindon area.

The main base airfields which were selected to act as 'feeders' to the Casualty Clearing Station at Wroughton were the following:

Blakehill Farm .	6 miles N.W. of Swindon
Down Ampney .	8 miles N.N.W. of Swindon
Broadwell . .	15 miles N.N.E. of Swindon

These airfields, all of which were administered by No. 46 Group, were considered to have good all-weather facilities, and at each of them the conversion of the existing sick quarters into a casualty holding unit presented little difficulty. It was decided that accommodation of 200 beds should be provided at each unit and arrangements were made to equip the sick quarters with facilities for emergency operations, although it was not intended that the casualties should stay longer than twenty-four hours at the units before they were moved to Wroughton. It was calculated that the three units with a total of 600 beds would be able to deal with at least 20 per cent. of the daily casualties and that the proportions would be roughly 90 per cent. Army and 10 per cent. R.A.F.

An Air Evacuation Headquarters was set up at the advanced Headquarters of the Assistant Director of the Army Medical Services,

Salisbury Plain District and was accommodated at The Close, Stratton St. Margaret. Its function was to control the arrival and subsequent evacuation of casualties arriving by air from the European theatre of operations. Representatives of the three Services and the E.M.S. were attached to this Headquarters and no movements of Service personnel, civilians or prisoners-of-war were authorised without consultation with the competent authority at the Headquarters. The evacuation of R.A.F. personnel was the responsibility of the Officer Commanding, R.A.F. Hospital, Wroughton, who was also responsible for the movement of Dominion Air Force personnel. Later a Canadian representative was attached to the Headquarters and special arrangements were made, through him, for the evacuation of all Canadians, both air force and army, to Canadian hospitals. Air Evacuation Headquarters also arranged for the evacuation of casualties from the casualty clearing station at R.A.F. Hospital, Wroughton, to base hospitals and special centres in accordance with the instructions received from the medical officers in charge of the various wards.

To meet its new commitment as a casualty clearing station, the following arrangements were made at Wroughton:

(*a*) Accommodation was to be increased to 1,100 beds.
(*b*) Authority was given for the appropriation of a ward as an operating theatre.
(*c*) R.A.F. and W.A.A.F. barrack accommodation was re-allocated and a tented camp was erected for the airmen.
(*d*) Authority was given for the provision of extra equipment.

The accommodation available at Wroughton was fortunately very suitable for use as a casualty clearing station, for early in 1943 it had been decided to add a hutted extension to the main hospital in order to provide additional ward accommodation for use in an emergency. Twelve Uni-seco huts joined by a central corridor were completed in the latter part of 1943; these were not used until early 1944 when the opening of the Second Front increased the commitments of the hospital. In early 1944 also, a resuscitation ward, with an individual oxygen supply to each bed, was constructed; a further ward was reserved for the sorting of casualties and two small wards were converted into an emergency X-ray dark room and a laboratory respectively. Following a visit by the D.G.M.S. further alterations and extensions were effected, including the conversion of one of the Uni-seco huts into an operating theatre of four-table capacity with the necessary anaesthetic and sterilising rooms and the addition of a covered way connecting the resuscitation ward to the pre-operative ward and theatre. This covered way was a great advantage, making it possible to move patients from the reception centre to the theatre or ward as required. To facilitate the movement of

ambulances a one-way road was constructed to the door of the reception ward and a generous covered loading space was provided. The conversion of the original officers' waiting-room into a dental laboratory completed the structural preparations made at Wroughton for the reception and rapid treatment of large numbers of cases in a comparatively short time.

To convey the patients from the airfields to the C.C.S. a pool of twenty-five ambulances was set up at Yatesbury and a wireless transmission channel was maintained between Yatesbury and Wroughton, as it was considered that this would be the most efficient and expeditious method of controlling the ambulances. In practice, however, the W.T. channel was found to be redundant and it was eventually closed down. Teams of stretcher-bearers were provided to off-load casualties at the C.C.S. and to on-load them again when convoys had been made up for transfer by road or by hospital train from Shrivenham siding. Initially, twenty-five aircrew pupils from a nearby training centre were utilised but at a later date fifty Italian co-operators were employed and this arrangement was found to be satisfactory. Considerable care was devoted to the training of these personnel, as the efficient working of the C.C.S. depended greatly upon the rapid and careful unloading of the casualties.

It was foreseen that it might be necessary to transfer large numbers of patients from the C.C.S. to other hospitals to allow for the admission of fresh casualties and arrangements were made for the bedstates of all R.A.F. hospitals to be telephoned every day to the C.C.S. In this way medical officers would know in advance whether patients could be admitted, a matter of vital importance in the case of those requiring treatment at specialised units or centres.

Although in theory patients arriving from both the Normandy battle area and the Far East fronts would have only small kit and a very limited amount of personal luggage, it was expected that many of them might have considerably more than this in practice, and a system of checking and recording luggage was devised which proved to be of great value. To ensure that the patients were both admitted and transferred with the minimum of documentation, but with all the necessary information concerning their condition and treatment, arrangements were made for the use of the following documents:

Form 3118. This form was known as the Field Medical Card and was contained in a case called Form 3118A. It gave the history of the casualty and the diagnosis by the medical officer at the Field Ambulance in the theatre of war. The whole was tied firmly to the clothing of the patient and was not removed until the C.C.S. was reached.

Form 2074. This form consisted of three parts and was also tied to the clothing of the casualty. The three parts were 'A' Emplaning,

'B' Disemplaning, 'C' Admission to Hospital. On emplaning in the theatre of war the section 'A' was detached and held as a record, on disemplaning the section 'B' was similarly detached for record purposes and the particular casualty clearing station for which the patient was destined was written on the reverse of section 'C'.

Form 2042A. Hospital re-direction card. This form was completed for every casualty received and forwarded to the next-of-kin. This informed them of the arrival of the patient and stated whether on account of wounds or illness.

Pro forma notification of evacuation of casualties from C.C.S. This *pro forma* was passed to the quartermaster, catering officer, X-ray department and pathological laboratory, notifying the names of casualties due for evacuation, showing the date, time and particulars of the ward concerned. This allowed the quartermaster to collect certain items from patients and to issue the personal effects from the barrack stores before departure, the radiologist to pass films to the movement controller, the catering officer to arrange feeding and the pathologist to arrange for penicillin during transit.

To this scheme of documentation it was necessary to add a general classification for the types of patients and the severity of injury or illness, and this was done by the use as code letters of the first five letters of the alphabet:

(A)	indicating	Unfit to move.
(B1)	,,	Fit for transfer as a stretcher case.
(B2)	,,	Fit for transfer as a walking case.
(C)	,,	Fit for transfer to a rehabilitation centre.
(D)	,,	Fit for discharge to sick leave.
(E)	,,	Fit for discharge—return to unit and light duty.

The first convoy of patients was received at Wroughton from Down Ampney on June 13, 1944, seven days after D-day and consisted chiefly of Army cases which had been flown home from the advanced airfields in Brittany. Four days later the Broadwell shuttle opened, followed on the next day by Blakehill Farm. On June 17, at the request of the E.M.S. authorities, a convoy of eighty-five patients, including only three R.A.F., was accepted to relieve the pressure on the E.M.S. hospital at Stratton St. Margaret. As this hospital was likely to be overburdened in the future, arrangements were made through the Air Ministry for Wroughton to alternate daily with Stratton St. Margaret in the reception of casualties. This gave each hospital a free day every other day, although the proviso was made that each would have to accept patients every day in an emergency.

For the reception of patients in convoy, the medical staff at Wroughton was divided into two teams which did duty eight hours on and eight

hours off, but during the peak rush periods there was always a considerable overlap and it was rare for teams to get more than five hours' sleep. Happily these periods lasted only for a short time and the standard of work did not suffer, the arrangements made later to alternate with Stratton St. Margaret easing the position considerably. The teams consisted of four surgeons, two resuscitation officers, one or two anaesthetists and a dental surgeon who worked with both teams. This arrangement worked well, though the numbers of anaesthetists available were below establishment and medical officers from nearby stations provided assistance when required. This situation eased later when medical officers were attached to the hospital for a course in forward surgery. A further member of both teams was the ophthalmic specialist stationed at Yatesbury, who was available at all times for the treatment of eye injuries.

All convoys came in after 1400 hours, the majority between 1800 hours and midnight, so that a complete night duty was the rule. On receipt of warning of the arrival of a convoy the duty team took up its stations. The senior surgeon in charge was responsible for the sorting of all cases and was assisted by two sisters, two V.A.Ds., two nursing orderlies and a clinical clerk. All these personnel wore gowns and masks while engaged on the sorting. A rapid assessment of the patient's general condition was made and his injuries were inspected. In this respect an exception was made for burns cases and for patients in plaster casts, all of whom were transferred immediately to the appropriate department. All wounds were redressed with full sterile technique and the sister checked the Form 3118 to ensure that the patient had been given a prophylactic injection of anti-tetanus serum; if this had not been given the omission was rectified on the spot. The condition of wounds was noted and special care was devoted to deciding whether or not any significant injury to either vessels or nerves had occurred. A short note of the findings was added to the Form 3118; this was found to be of the greatest importance to the operating surgeon, who usually saw the case for the first time in the theatre when the patient was anaesthetised. Many of the early Forms 3118 were scarcely decipherable, due sometimes to staining from water or blood, but more often to bad writing.

After this preliminary examination it was possible to divide the patients into three big groups:

(*a*) Those not requiring immediate surgical interference or resuscitation. These were allotted to a ward, the number of which was written on the Form 3118A.

(*b*) Those requiring active resuscitation. They were passed through to the resuscitation ward with a large 'R' written on the Form 3118A.

(*c*) Those requiring immediate operation. An 'O' was marked on the form 3118A. In the majority of these cases (over 80 per cent. in practice) an X-ray examination was required and this was carried out

PLATE XXVII. Bomb damage. Enemy attack, October 25, 1942.
Officers' Hospital, Torquay.

PLATE XXVIII. Main laboratory, Wroughton General Hospital.

[facing p. 256

PLATE XXIX. General Medical Ward, Wroughton General Hospital.

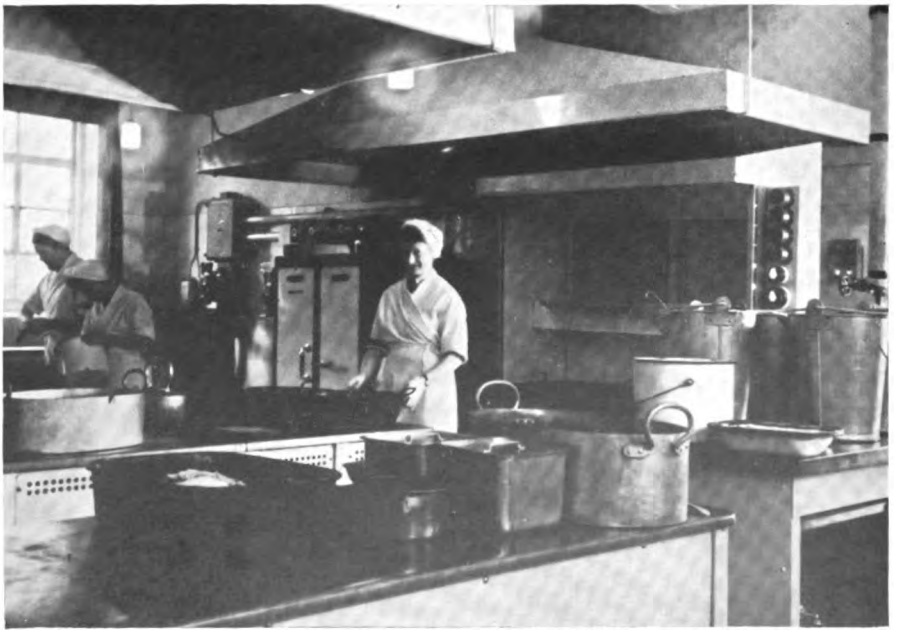


PLATE XXX. Hospital kitchen, Wroughton General Hospital.

[*facing p.* 257

en route for the pre-operative preparation room. A special form was used for these cases and 'X-ray' was written on the Form 3118, after the clinical notes, to inform the surgeon that an X-ray film was available. A piece of cardboard, 8 in. square, with the letter 'X' in red inscribed on it, was laid on the stretcher so that the case should not be passed through before the requisite examination had been carried out.

The disposal of patients on whom no operative interference was necessary was simple, but the procedure for those cases which did require operation merits description, for it was only by close adherence to the routine laid down that a rapid flow through the theatre was maintained. The stretcher was placed on a wheeled trolley and at the exit of the sorting room the necessary documentation was carried out by a team of clerks. At the junction of the corridor the traffic was controlled by a non-medical duty officer, who ensured that the case was taken to its correct destination. At this point also, pyjamas, towels and other articles required by the patient were placed on the stretcher. Along this one-way route the casualty, his condition sufficiently examined and his documents annotated, reached the pre-operative ward and it was here that the stretcher placed under him in Western Europe was removed for the first time. He was undressed and washed, his physiological needs attended to and pre-operative medication was administered. Any urgent case was marked forward on the list, but otherwise each was operated upon in turn.

The kitchen arrangements at Wroughton required considerable re-organisation, for in addition to catering for the patients in the hospital proper, the staff were called upon to provide hot meals at very short notice for convoys of casualties numbering between 20 and 200. As most of the convoys arrived at night a large number of cooks was needed throughout the twenty-four hours. Patients travelling by road to other R.A.F., Army or E.M.S. hospitals were provided with packets of food and flasks of hot drinks for the journey. Those who travelled by ambulance train from Shrivenham were given a hot meal at Wroughton before leaving, but did not require rations for the journey as these were provided on the ambulance trains. In view of the constant movement of patients in and out of the C.C.S. and between wards in the C.C.S. itself, close liaison was maintained between the kitchens, movement control and the sisters-in-charge of the wards, so that the catering arrangements were always adequate for the numbers in each unit. Notification slips, showing the numbers of patients being transferred or evacuated from each ward, were sent to the kitchens from movement control and admission slips showing the numbers of new patients and the proposed diet were sent from the reception centre. By this means it was possible for the kitchens to run a system of blackboard recording

which indicated the number of meals to be prepared for each ward or centre over the whole twenty-four hours.

That the organisation of the C.C.S. at Wroughton was reasonably efficient is indicated by the fact that, after the arrival of a convoy, the first patient was in the theatre ready for operation within three-quarters of an hour and that from then on a steady stream of patients from the anaesthetic room to the theatre was maintained. One arrangement in the theatre itself which was a great advantage was the system of running four operating tables simultaneously. This made it possible for a surgeon who found himself in difficulty or needing advice to get help in the minimum of time; it tended to produce a uniform standard of work and it meant that the trolley of 'special' instruments was readily available to all four surgeons. A V.A.D. clinical secretary was always on duty and the surgeons dictated their notes, which were typed on to the Form 3118, a procedure which was time saving and ensured legibility.

The majority of the casualties received had been evacuated by air from the Western Front and it was considered that none of them had suffered a major setback as the result of the air journey. Some of them, particularly those who were splinted, experienced pain in the region of their injuries, usually as the aircraft ascended and descended. A few were troubled by air sickness, but the vast majority travelled well and, apart from a degree of fatigue, were none the worse for their journey. The few complaints which arose concerned the road ambulance journeys to and from the aerodrome.

It is interesting to note that the predominating type of casualty received at Wroughton in the early convoys were cases of benign tertian malaria occurring in Army personnel who had served in the Mediterranean area. It was considered that the exposure they had suffered during the landings was responsible for the recurrence of the condition. A gradual rise in the proportion of R.A.F. and a decline in Army casualties was apparent after August and September 1944. This decline coincided with the establishment of large Army base hospitals in the immediate battle area. Long-term cases were held for greater periods and arrived in this country at a more advanced stage of treatment. Before this date the excellent first-aid treatment given by the R.A.M.C. medical officers at the regimental field aid posts on the Continent contributed largely to the good condition of the patients on arrival at Wroughton.

The number of cases admitted reached a peak of 974 in August 1944 and 942 were received in September. From then onwards the numbers gradually decreased, due partly to bad flying weather, and by December had fallen to 481. During this period the largest number admitted on any one day was 224 on September 16; fortunately 80 per cent. of the casualties were classified as 'B' cases and it was possible to evacuate 181 of them the next morning. By the end of 1944 the total number of

casualties who had passed through the C.C.S. had reached 4,798, an impressive figure in view of the bad flying weather of the later months.

On September 18, 1944, instructions were received from the Air Ministry reducing the established beds to 680 and lifting the temporary ban on out-patients. As the figure of 680 included 250 C.C.S. beds and the number of casualties showed a rising percentage of R.A.F. personnel, it was considered impracticable to open hospital beds to out-patients generally, though they were seen by special arrangement with the local station medical officers. On September 21 information was received that, owing to the diminution in the numbers of casualties arriving, the medical holding unit at Blakehill Farm would close down with effect from October 7, although it would still be available for use in emergency. In November, in response to representations from the E.M.S. it was arranged that all class 'A' cases should be admitted to R.A.F. Hospital, Wroughton. Class 'B' cases requiring overnight accommodation in the Swindon area pending transfer to base hospitals by ambulance train were to be admitted to the E.M.S. Hospital, Stratton St. Margaret.

At the end of the year, the medical holding unit at Broadwell closed and from then on all casualties were received at R.A.F. Station, Down Ampney. The casualty clearing station continued to function for some time but the flow of casualties decreased steadily, chiefly owing to the establishment of large permanent hospitals in Western Europe. There was a temporary increase in activity when the prisoners-of-war were flown home from the Far East, but the task for which the C.C.S. was primarily responsible had been completed. Since its establishment in early 1944 it had adequately fulfilled its function, to the satisfaction both of the medical authorities and of the patients, who, within a period of time which only a few years previously would have been considered an impossibility, had found themselves removed from the battle areas, operated on in England and comfortably installed in a base hospital.

Some details of the staff employed and the work done by R.A.F. General Hospital, Wroughton in connexion with airborne casualties in 1944–5 are given in the following tables:

Staffing of Wroughton Hospital February–October, 1944

Month	R.A.F. officers	W.A.A.F. officers	Airmen	Airwomen	P.M. R.A.F. N.S. and V.A.Ds.	Totals
February 1944	20	4	74	241	64	403
March 1944	20	4	82	238	70	414
April 1944	20	4	98	234	74	430
May 1944	23	4	103	289	81	500
June 1944	28	4	122*	355*	99	608
July 1944	30	5	125*	377*	98	635
August 1944	29	6	118	367	99	619
September 1944	23	6	112	372	97	610
October 1944	30	6	100	358	93	587

* Includes small numbers under training.

Admissions and Discharges, Wroughton Hospital and Casualty Clearing Station

Date	General Hospital		Casualty Clearing Station	
	Patients admitted	Patients discharged	Patients admitted	Patients discharged
Week ending:				
September 8, 1944	48	60	133	135
September 15, 1944	70	50	316	313
September 22, 1944	99	50	358	358
	General Hospital and C.C.S. combined			
	Patients admitted		Patients discharged	
October 6, 1944	231		222	
October 13, 1944	285		201	
October 20, 1944	303		334	
October 27, 1944	200		205	
November 4, 1944	298		217	
November 11, 1944	273		334	
November 18, 1944	151		166	
November 25, 1944	117		314	
Month of December 1944	482		477	

The Casualty Clearing Station opened on June 6, 1944, and from that date until December 31, 1944, the total number of casualties from the battle areas reached 4,798; of these 4,722 were transferred to base hospitals or other special centres. The largest single convoy received was a total of 195 on September 16, 1944.

General Hospital

Total number of patients admitted since opening until December 31, 1944	13,445
Total number of patients returned to duty	12,189
Total number of deaths	45
Total number of patients invalided	1,256

Admissions and discharges, 1944

Cases admitted	4,413
Returned to duty	3,980
Invalided	433
Deaths	3

Analysis of Admissions from January 1 to September 30, 1945

Month	Hospital					Casualty Clearing Station		
	Admissions	Transferred other hospitals	Medical Boards	Invalided from R.A.F.	Remaining in hospital at end of month	Admissions	Transferred other hospitals	Remaining in hospital at end of month
January 1945	521	—	256	41	314	465	430	35
February 1945	494	—	271	37	328	737	651	53
March 1945	560	—	226	24	363	829	724	105
April 1945	563	—	240	50	316	1,417	1,438	84
May 1945	588	—	260	63	407	904 (includes 340 prisoners-of-war)	894 (includes 327 prisoners-of-war)	14 (includes 14 prisoners-of-war)
June 1945	516	—	224	41	348	771 (includes 39 prisoners-of-war)	781 (includes 52 prisoners-of-war)	84 (includes 1 prisoner-of-war)
July 1945	612	—	212	51	350	698 (includes 3 prisoners-of-war)	701 (includes 4 prisoners-of-war)	81
August 1945	592	—	260	60	395	594 (includes 2 prisoners-of-war)	624 (includes 1 prisoner-of-war)	51 (includes 1 prisoner-of-war)
September 1945	705	—	230	70	460	555 (includes 4 prisoners-of-war)	559 (includes 1 prisoner-of-war)	47 (includes 1 prisoner-of-war)

R.A.F. STATION HOSPITAL, YATESBURY

In 1938–9 a Royal Air Force Station was constructed at Yatesbury in Wiltshire, to act as a training centre for entrants into the specialist trade of Signals. It was built on a semi-permanent basis by the use of wooden huts of standard pattern and the plans envisaged an ultimate population of 3,000 trainees and staff. In accordance with policy a small station hospital was provided, in view of the relatively young age-groups of the entrants, among whom a high incidence of minor sickness was expected.

The hospital, which opened in February 1939, was constructed of wood, with a total capacity of 61 beds. It consisted of two main wards of 20 beds each, an isolation ward of 17 beds, which were mainly in separate cubicles, and two small officers' wards of 2 beds each. An operating theatre, X-ray and massage department and dispensary, with the necessary office and stores accommodation, completed the medical facilities of the hospital, and 4 dental surgeries were provided in a large hut which adjoined the main corridor. Quarters for a matron and four sisters were constructed in another hut, which also led off directly from the main corridor.

After the outbreak of war, the number of trainees increased rapidly and it became necessary to enlarge the hospital in order to provide facilities for the additional stations which had been built in the neighbourhood. Yatesbury hospital was now responsible for the Salisbury Plain, Wiltshire, East Somerset and South Gloucestershire areas. The additional facilities, the provision of which presented little difficulty because of the hutted construction of the hospital, consisted of four large wards and a separate isolation section of thirty-two beds. At the same time the sisters' quarters were moved to a separate wooden building in the vicinity of the hospital. The total capacity was now 232 beds, a figure capable of increase by 25 per cent. in the event of emergency.

The necessary reconstruction was completed by June 1940. The hospital now consisted of five separate wings opening on either side of a main central corridor running from east to west. On the south side were five large wards, one of which was the old isolation ward, now used as a general ward containing ten beds and seven individual cubicles. Each of the other general wards had a capacity of twenty beds and at the distal end of each ward was a small light and airy solarium accommodating an additional four beds. On the north side facing the south wards were three further wards. The theatre, laboratory, X-ray and physiotherapy departments and the dispensary were situated off the main corridor on the north side of its east end. The new isolation hospital, consisting of two main wards, each with ten beds, and twelve cubicles was in the immediate vicinity of the main hospital and behind, on the north side, were the quartermaster's stores and a steam disinfector.

Historically there is little of outstanding interest in the work of this hospital, which throughout the war years was engaged upon the normal duties of such a unit. In 1940 it participated in the reception of personnel evacuated from Dunkirk and at this period representatives of widely diverse nationalities were treated. Later in the same year it became necessary to set up a Special Treatment Centre which functioned as the chief of such centres in the area until this duty was taken over by Wroughton.

During the first series of air raids on Great Britain the hospital was found to be in the direct route of the German attacks on the Midlands and patients were evacuated to air-raid shelters. A number of bombs fell in the neighbourhood of the station and hospital, but no loss of life or damage to Service property occurred.

In 1944 an experiment was tried in which patients in the N.Y.D.N. wards who, apart from needing a half-hour daily treatment, were otherwise fit, were attached to the station strength and found suitable work. This method proved successful in selected cases, both from the point of view of the patient, who was spared long hours of boredom, and from that of the hospital authorities, who were able to make good use of the beds vacated.

After D-day in 1944 the hospital, being the nearest one to the port of Southampton, was busily engaged in receiving convoys of patients from the Continent and later from the ships returning from the Far East. According to the severity of the case, the patient was either held until a bed was available in one of the general hospitals or treated at the station hospital. This work continued during the remainder of the war and after cessation of hostilities Yatesbury was one of the few station hospitals which remained in use.

CONCLUSION

The above accounts of the work of the R.A.F. Hospitals at home show how the special requirements of the Royal Air Force in various parts of the country were met. The majority were expanded station hospitals on the greatly enlarged R.A.F. stations, and were thus designed to meet local needs, which, however, varied in most stations. The general hospitals dealt with war casualties requiring special or prolonged treatment by experts in aviation medicine and the treatment of the types of injury to which aircrew were specially exposed. A large proportion of the work done in hospitals differs little from one hospital to another and these condensed accounts have therefore as far as possible avoided unnecessary repetition. The special work of the R.A.F. hospital at Wroughton as the main Airborne Casualty Receiving Centre in 'Operation Overlord' has been described in detail.

Plates XIX to XXX illustrate some of the hospitals and their activities.

PLATE XXXI. Mobile field hospitals. Use of breakdown crane in reduction of a spinal fracture prior to plastering.

facing p. 264

PLATE XXXII. Nos. 21 and 22 M.F.H. Dug in and camouflaged operating theatre.

PLATE XXXIII. Nos. 21 and 22 M.F.H., general ward.

PLATE XXXIV. No. 50 M.F.H., outdoor orthopaedic treatment.

PLATE XXXV. No. 63 M.F.H., general view of 'Basha' type wards.

PLATE XXXVI. No. 63 M.F.H., clearing malarious areas.

Mobile Field Hospitals

In the following narrative a brief résumé will be made of the events leading to the formation of the Royal Air Force Mobile Field Hospitals of the Second World War. The events and experiences of the inter-war period will be evaluated and their influence on the formation of the Royal Air Force Medical Receiving Stations, the forerunners of the Mobile Field Hospitals, will be outlined. No attempt, however, will be made to describe the function of the individual Mobile Field Hospitals, as these will be discussed separately in the campaign narratives, to which they more properly belong.

DEFINITION

The following definition of the Medical Receiving Station (M.R.S.) which was later to be developed into the Mobile Field Hospital (M.F.H.) is taken from a description of the unit as framed, before the War of 1939–45, and laid down in *R.A.F. War Manual*, Part II, Chapter XIV, paragraphs 9–12:

'The M.R.S. is a field medical unit peculiar to the R.A.F. Its function is to receive sick and wounded from the collecting zone, including those taken direct from units. The M.R.S. forms the first link in the evacuating zone and enables casualties to be given proper treatment pending despatch to general hospitals in the base area. It is normally located near a rail or river head, though if operations are taking place at so great a distance from its site that the journey from the units to it prejudices recovery of casualties, the M.R.S. may have to be placed in a more advanced position. In the latter event, the possibility of air evacuation of some of the casualties will come under consideration. A M.R.S. is not mobile in its own transport and when its location is to be changed, arrangements for movement are made with the equipment branch of the formation concerned.

'The following principles govern the choice of site for a M.R.S. It should be at least 1,000 yards away from any large railway station or junction, viaduct, dump of material, or air station. It should be at least 500 yards away from a main rail or water way, but should be connected by light railway or trolley lines to an ambulance siding on the main railway, should have good approaches and ample water supply.

'Casualties taken in by the M.R.S. will be evacuated to the base area by ambulance trains or river craft and the rail or river heads for evacuation purposes should if possible be separate from those used for other administrative purposes.'

HISTORY BEFORE 1939

The idea of the M.R.S. originated in 1932 from a staff exercise based on a set problem of operations in the Singapore area, in which the absence of Army medical units for a long period was assumed. This made it apparent that the R.A.F. required a small mobile field medical unit. Tentage, personnel and stores were worked out for a unit transportable by air, built up around the number of hospital patients who could be accommodated in one hospital marquee as a basis, but capable of expansion. It was, however, soon realised that limitation of pay load would make its effectiveness of a low order in view of the weight of its equipment and the number of casualties it might be called upon to treat. In 1935 during the Abyssinian crisis, however, the further development of the M.R.S. came to a head and two units were sent to Egypt under the designation 'M.R.S.' to be located at Kassala and Port Sudan. These were, as it happened, never used, but on the passing of the crisis the equipment was moved and eventually held at Aboukir against further requirements. Further development during 1936 gave rise to the view that the R.A.F. mobile medical unit must have certain features in common with the Army casualty clearing station, but must be considerably more mobile.

In the summer of 1937 plans of the constitution of a M.R.S. had become more concrete, and it was decided to hold a secret mobilisation exercise to try out a provisional unit in the field. R.A.F. Station, Halton, was chosen for this exercise and a unit, comprising 5 officers and 59 airmen, 50 per cent. of whom were reservists, calculated to maintain beds for 30 casualties and provided with its own tentage and transport, was assembled. The exercise included a road trial over difficult country and practice in assembly and the treatment of mock casualties. The establishment allowed for the allocation of 23 medical airmen, 18 aircrafthands and the balance of drivers, clerks, cooks, butchers and airmen to carry out other duties. Six prime movers were provided—four ambulances, one 3 ton tender and one 15 cwt. van—and there was one watertank trailer. Additional transport was borrowed from the station during the period of assembly. Senior officers with practical experience of field medical work from the War of 1914–18, were present, and careful observations, which had a far-reaching effect on the subsequent design and equipment of M.R.Ss., were made on the spot.

DEVELOPMENT OF MOBILE FIELD HOSPITALS ON THE OUTBREAK OF WAR

In France, until the collapse in June 1940, there were two M.R.Ss. which were both immobile and developed from mobile tented units into deep-rooted miniature station hospitals occupying dispersed buildings in safe rural areas. During the same period, a M.R.S. originally destined

for Norway arrived in the Middle East, remaining relatively static until the intensive Libyan winter campaigns of 1940 and 1941, when it had to jettison much of its accumulated equipment and become highly mobile. In the autumn of 1940 a second M.R.S. was sent to the Middle East and functioned as a very busy surgical unit in the Eritrean campaign of the following spring, only to be disbanded and later resurrected for service with the advancing bomber airfields in the Libyan winter campaign of 1941. Two further M.R.Ss. reached the Middle East in time for the Alamein offensive and in the spring of the next year two more were hurriedly assembled and dispatched to North-West Africa to take part in the operations there.

Most of these earlier M.R.Ss. had one great advantage in common, which ensured from the outset a greater degree of smooth-working efficiency and corporate unity than that enjoyed by their successors: their complement included a far greater proportion of experienced regular officers, N.C.Os. and airmen, than was possible subsequently. Thus they were spared many of the initial difficulties with which units formed later were inevitably faced.

As the war progressed it was felt that the name 'medical receiving station', and especially its abbreviation, gave rise to a certain amount of misunderstanding and did not emphasise sufficiently the true character and function of the unit. In March 1943, at the instigation of the D.G.M.S. the name was changed to 'mobile field hospital' or 'M.F.H.' The mobile field hospital, like the M.R.S., was a small medical unit peculiar to the R.A.F. It catered normally for fifty patients and afforded such medical and surgical refinements as X-ray, special treatment centres, medical board and pathology facilities, which in the Army would be associated with much larger medical units such as casualty clearing stations. Nevertheless, although it afforded these specialised facilities, the unit was no larger than a field ambulance and, like it, was entirely self-administered and mobile in its own transport.

Under static conditions a mobile field hospital was capable of considerable expansion, and corresponded in function to the station hospital of the R.A.F. at home. By affording these special facilities to surrounding R.A.F. units it became the medical focal point for these units, which in their turn looked to the M.F.H. for routine specialist treatments or opinions, for medical boarding and as a standing source of medical supplies in emergency. At the same time the M.F.H. provided the normal channel of evacuation for R.A.F. casualties, whether by road, rail or air, and also acted as the local collecting centre for Army cases requiring evacuation by air.

Under mobile warfare conditions, the M.F.H. was the first link in the R.A.F. chain of evacuation and concerned itself mainly with the preliminary resuscitation or treatment of casualties and their prompt

despatch to base by air. During the phases of intense operational activity its work included much major surgery; nevertheless the unit remained fully mobile, ready, if necessary, to move to a new site and set up there as a fully functioning surgical unit within forty-eight hours of receiving preliminary warning notice to move.

CHANGES FOLLOWING EXERCISE 'SPARTAN'

Experience with mobile field hospitals was growing and those units which served in France and the Middle East in the early days of the war grew, of themselves, into vastly different units from the first experimental M.R.S. which took part in the summer exercises of 1937. But although much material, with many reports and recommendations, had accumulated since then, there had been little revision of the unit's composition, whether in vehicles, tentage, barrack or medical equipment.

In order to try out new ideas and equipment it was arranged that a specimen M.F.H. should be set up at R.A.F. Hospital, Wroughton, in Technical Training Command and that a series of M.F.H. teams should be sent there for training. The first specimen unit, No. 50 M.F.H., took part at very short notice, while still incomplete in personnel and equipment, in exercise 'Spartan' which was held in March 1943. The lessons learned from this exercise, coupled with the previous overseas experience of the Commanding Officer of the unit, proved most valuable and enabled much long-needed revision of the scales of M.F.H. equipment, both medical and barrack, to be worked out, so that these units were then far better equipped to meet the changed needs of modern warfare.

The question of the provision of certain specialised vehicles equipped with lean-to tentage to accommodate the operating theatre, X-ray, laboratory equipment and medical stores was very favourably considered by the D.G.M.S., but was subsequently rejected in view of the policy of the elimination as far as possible of specialist vehicles of any sort. The provision of lean-to tentage, though found admirable for many purposes in the Libyan campaigns, was found impracticable in view of the large stocks of tentage held and the manufacturing difficulties with regard to new types of tentage. Although it was found impossible to improve the tentage, there were several changes of medical and barrack equipment which exercise 'Spartan' demonstrated as being reasonable and necessary. These changes were effected by degrees and incorporated in the revised equipment schedule introduced following the exercise.

As a result of exercise 'Spartan' it became more than ever apparent that the requisite facilities for the assembly and formation of such units as mobile field hospitals were those of a training school and P.D.C. combined, for it was necessary that there should be:

(*a*) Normal station accommodation and feeding facilities.

(*b*) An established movements office section of the orderly room, having a good liaison with the Record Office and with M.T.E. and D.

(*c*) Established medical facilities for the examination, inoculation, treatment and boarding and possible regrading of personnel.

(*d*) An established equipment section, with adequate safe storage, to take over the unit's equipment as it arrived and to arrange the kitting of the unit's personnel to the appropriate scales.

(*e*) An established M.T. section with facilities for more than just the day to day maintenance of vehicles.

(*f*) A recognised programme of field training for all personnel and facilities for driving instruction and convoy exercise.

(*g*) Suitable sites for supervised deployment of units under formation where, under instruction, they could practise the field craft being taught to them.

For independent mobile units such as these, liable as they were to have to function in as close co-operation with the Army as with the R.A.F., it was more than ever necessary that their training should be as comprehensive as possible; and should include such essential items as the training of all drivers in day and night convoy driving, the training of all personnel in the handling of arms, aircraft recognition, booby-trap recognition, field hygiene, sanitation and cooking and a sound knowledge of field craft in general. In addition, it was desirable that as many as possible of the unit's non-drivers should be taught to drive the unit's transport. Likewise the varied non-medical tradesmen on the establishment, who included cooks, clerks, carpenters, electricians and chemical warfare fighters, needed more than nominal training in first aid and stretcher-bearing if the unit was to be really efficient, and this demanded a high level of individual keenness, training, and discipline from all ranks.

ESTABLISHMENT OF TRAINING CENTRE AT CHIGWELL

In order to provide the necessary facilities for the rapid training of personnel to meet the needs of expanding warfare, it was decided to set up an establishment where training could be carried out on the lines indicated in the preceding paragraphs. It was fortunate that the basis for such an organisation existed at R.A.F. Station, Chigwell, which, although designed for the training of signals units in the field, was equally appropriate, with comparatively little alteration, for the training of mobile field hospital personnel. In July 1943 personnel of four proposed new M.F.Hs. were mustered at this station. The aim of this unit was to teach as much as could be compressed into six weeks, both from the practical point of view by the handling of all forms of equipment likely

to be encountered in the field, and theoretically by instruction based wherever possible on previous experience. It was hoped that by these methods it would be possible to create units of a very high standard of technical ability coupled with the very necessary team spirit, in the minimum of time.

All personnel, as they reached Chigwell, were medically examined for fitness for overseas, appropriately inoculated and passed directly into the course of non-technical training then in progress. For the first fortnight, during which time the unit's barrack and other equipment was arriving, these men were all given a full-time course of instruction covering defence, handling of arms, recognition of aircraft, tentage, field cooking, field craft, hygiene and sanitation, convoy drill and driving instruction. At the same time, all the junior medical officers who had not completed a course in Tropical Medicine and Hygiene, were sent to Halton to undergo a condensed course in these subjects, to which was also added practical instruction in blood-transfusion technique, using the apparatus supplied for the field, instruction in the treatment and follow-up of venereal diseases as applicable to the field, and a practical demonstration of laboratory apparatus and technique used in field conditions. Dental officers of the units were sent on a special course in maxillo-facial surgery at the Queen Victoria Hospital, East Grinstead.

Further opportunity for valuable training was given by arranging for officers and key N.C.Os. of these units to visit No. 50 M.F.H., which had been working in the field as a member of No. 83 Composite Group since the Group's inception, and had had practice and experience in all the operational moves since 'Spartan'. Here, they were able to obtain valuable information regarding unit organisation and improvisation under field conditions and had an opportunity to observe the workings of a mobile field hospital actually fulfilling its role in an active composite group. The units now being trained and equipped and in every way ready for active service, all personnel, wherever possible, were given embarkation leave.

By 1944 therefore, from the small experimental beginning in 1932, the M.F.H. had developed into a unit not only of importance, but of necessity to the prosecution of any campaign in whatever climate or terrain it might be fought. The old method of establishing a unit on paper with little attempt to integrate it into an efficient organisation had been superseded by the carefully planned methods of Chigwell, where the experience gained over the years was rapidly and effectively taught. The table on page 271 illustrates the growth in the numbers of mobile field hospitals. The increase from two in 1939 to fifteen in 1943, and the final total of twenty-four in 1945, are indicative of the integral part which was played by the M.F.Hs. in the treatment of casualties, which in the main were drawn direct from the battlefields of the various

campaigns. The close contact which the M.F.Hs. of necessity maintained with particular wings and squadrons for considerable periods engendered a spirit of co-operation and mutual reliance, which contributed in no small measure to the ultimate success of the campaigns upon which they were engaged. Plates XXXI to XXXVI illustrate phases in the work of M.F.Hs. in various areas.

Mobile Field Hospitals 1939–45

Name of unit	Date of formation	Date of disbanding
1 M.R.S.*	August 25, 1939	June 19, 1940
2 M.R.S.*	August 25, 1939	June 20, 1940
21 M.R.S.*	June 26, 1940	July 1, 1945
22 M.R.S.*	June 26, 1940	November 17, 1945
24 M.R.S.*	November 10, 1941	October 10, 1945
25 M.R.S.*	August 25, 1942	July 27, 1945
30 M.F.H.	March 22, 1943	July 28, 1945
31 M.F.H.	March 22, 1943	May 18, 1945
50 M.F.H.	February 15, 1943	April 15, 1946
52 M.F.H.	August 23, 1943	August 11, 1945
53 M.F.H.	September 8, 1943	October 26, 1946
54 M.F.H.	September 8, 1943	December 15, 1947
55 M.F.H.	January 18, 1944	May 31, 1946
56 M.F.H.	June 7, 1944	March 31, 1948
60 M.F.H.	July 1, 1943	October 10, 1945
61 M.F.H.	July 1, 1943	October 1, 1945
62 M.F.H.	July 1, 1943	October 1, 1945
63 M.F.H.	July 1, 1943	February 1, 1946
64 M.F.H.	October 18, 1944	July 1, 1947
65 M.F.H.	October 18, 1944	November 1946
66 M.F.H.	November 25, 1944	February 7, 1946
67 M.F.H.	July 1, 1943	October 20, 1945
68 M.F.H.	November 25, 1944	February 27, 1946
69 M.F.H.	November 25, 1944	October 10, 1945
80 M.F.H.	May 1, 1945	December 31, 1945
81 M.F.H.	June 15, 1945	October 1, 1946

* The name was changed from Medical Receiving Station (M.R.S.) to Mobile Field Hospital (M.F.H.) in March 1943.

CHAPTER 6

SPECIAL SERVICES

CENTRAL MEDICAL ESTABLISHMENT

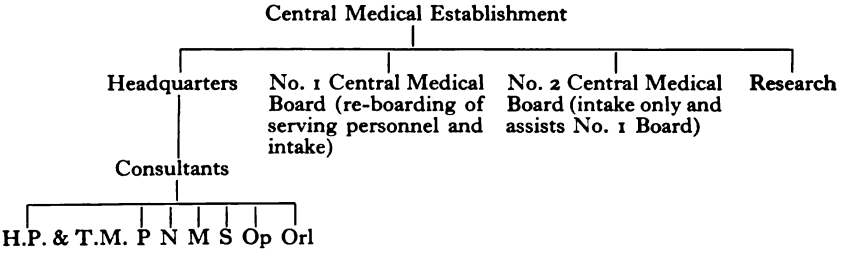
THE function of the Central Medical Establishment is to examine and assess the medical fitness of serving officers and all aircrew candidates for entry into the Royal Air Force, and to supply consultant services.

PRE-WAR HISTORY

The early history of the Central Medical Establishment began in 1917 when there was an invaliding board in London, later attached to the Officers' Hospital at Finchley. Work of the establishment included physiological tests for fitness for flying and development of various eye tests. In 1925 a move was made to Clements Inn where the unit became known as the Central Medical Board Research Laboratory and Medical Officers' School of Instruction. In 1927 selected medical officers were appointed to cover various special subjects; these appointments were later given consultant status. The number of cases attending the unit for examination in pre-war days exceeded 3,000 in 1932 and 1933, while in 1935 there were over 6,000 examinations and a total of 22 medical officers received a course of instruction in particular work.

With the expansion of the Royal Air Force in 1935, No. 2 Central Medical Board, to deal with intake candidates from the Air Ministry Selection Board (non-medical), was appointed. It relieved pressure on No. 1 Central Medical Board at Clements Inn which was then able to concentrate on serving personnel.

The constitution of Central Medical Establishment at the time of expansion in 1935 is shown in the diagram below:



Notes: (*a*) All units located at Clements Inn, Strand, except No. 2 Board, which was at Astor House, Aldwych.

(*b*) Symbols for consultants are:

H.P. & T.M.	Hygiene, pathology and tropical medicine.
P . .	Applied physiology.
N . .	Neurology.
M . .	Medicine.
S . .	Surgery.
Op . .	Ophthalmology.
Orl . .	Oto-rhino-laryngology.

(*c*) Research Section included a consultant in applied physiology.

In peace-time the staff of Central Medical Establishment consisted of a commanding officer (the senior consultant in the rank of air commodore), a board president of group captain rank, the consultants in applied physiology and neurology, pathology and oto-rhino-laryngology (group captains or wing commanders according to seniority), and two or three medical officers (flight lieutenants) for routine medical examinations.

Medical boards in the Royal Air Force were convened at hospitals, command headquarters and at Central Medical Establishment (C.M.E.). Those held at hospitals and command headquarters were of routine character, and in any instance of doubt or serious illness the case was referred to C.M.E. The main bulk of the work at this establishment consisted of (*a*) medical boards on officers and aircrew personnel who had been non-effective sick, or whose fitness had been called into question and (*b*) boards to assess the fitness of candidates for commissions (all branches) and for flying duties. The latter group included all aircrew recruits. Airmen for ground duties were accepted following medical examination carried out under the organisation of the Inspector of Recruiting and were not medically boarded.

In addition, all invaliding boards on officers and routine boards on officer pensioners were, as far as practicable, held at C.M.E. Airmen's invaliding boards and boards on airmen pensioners were also referred there on occasion. Medical examinations in connexion with the issue and renewal of civil 'B' licences, examinations of the civilian staff at the request of the Air Ministry, and the annual medical examinations of the officers serving at Air Ministry formed a further part of the work.

Towards the end of 1938 the demands of 'intake' called for additional expansion and the two Central Medical Boards were supplemented by a third, No. 3 Board. Its purpose was for 'intake' only.

In March 1939 the original C.M.E. at Clements Inn accompanied by Central Medical Establishment's headquarters staff, joined No. 3 Board at Imperial House, Kingsway, where an organisation comprising Nos. 1 and 3 Boards was thus available to deal with the increased number of cases. No. 1 Board (the original Central Medical Board formed at Clements Inn) was employed mainly in the boarding of serving personnel and pensioners and No. 3 dealt with 'intake'. In June

1939, they were joined by No. 2 Board and the functions of Nos. 2 and 3 Boards in dealing with 'intake' were merged.

EXPANSION ON OUTBREAK OF WAR

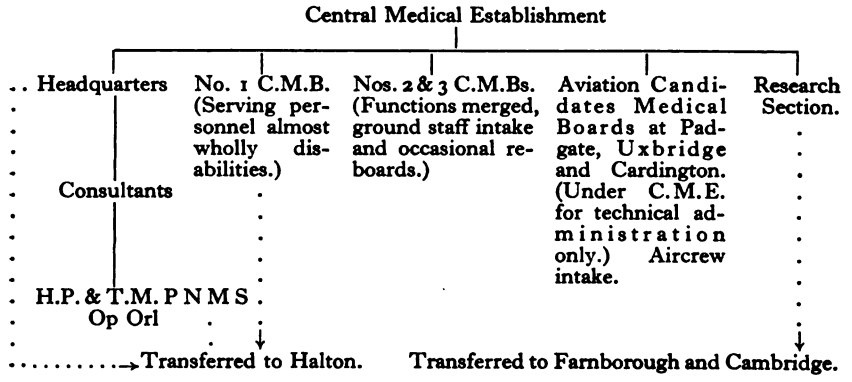
On mobilisation in August 1939, additional medical boards, later referred to as 'Aviation Candidates Medical Boards' (A.C.M.B.) were formed at Padgate, Uxbridge and Cardington to work in conjunction with the Aviation Candidates Selection Boards (A.C.S.B.) set up at these stations. These selection and medical boards dealt, as the name implies, with candidates for aircrew duties and the selection of such candidates by boards at the Air Ministry ceased. They were administered by the groups controlling the Royal Air Force stations where the boards were located and did not come under the complete control of Central Medical Establishment until reorganisation and the formation in 1941 of still further A.C.M.Bs.

At the outbreak of war, owing to the risk of air attack on London and to the expected increase in the numbers of cases (chiefly those of medical and surgical disabilities) requiring X-ray or pathological reports before medical categories could be allotted, it was decided to move No. 1 C.M.B. to the Royal Air Force Station at Halton, near Aylesbury, Bucks, where it would be in close touch with Princess Mary's Royal Air Force Hospital and the Institute of Pathology and Tropical Medicine. Nos. 2 and 3 Boards, still acting as one board, remained in London to deal with the increasing number of candidates, mainly for ground duties, sent by Air Ministry Selection Boards, which had themselves been enlarged, and a few disability cases. It was proposed that these boards should only move out of London if the Selection Boards and Air Ministry moved. The consultants in ophthalmology and oto-rhino-laryngology remained at Imperial House (sometimes referred to as Awdry House, as it was this adjoining building that was used), paying occasional visits to Halton, but making the London Board their headquarters.

In January 1939 the research functions of the Central Medical Establishment had been taken over by the Flying Personnel Research Committee, and the units concerned were dispersed to Farnborough and Cambridge.

At this time and later, changes in their names, numbering and functions, combined with movements and merging of the different boards made a somewhat confusing picture of their identity. Thus, for the sake of simplicity, the boards will from now onwards be referred to by location and function, the numbering by which they were known at various periods being used only when clarity demands.

The position at the time of the move to Halton on September 2 1939 is shown diagrammatically opposite:



Notes (*a*) Units transferred as indicated: Nos. 2 and 3 Boards with Consultants in H.P. & T.M., Op and Orl remained at Imperial House (entrance in Awdry House), Kingsway. Additional consultants appointed in neurology, medicine and surgery.
(*b*) A.C.M.Bs. working with local selection boards.
(*c*) Research transferred to Flying Personnel Research Committee under the D.G.M.S. and comprising Aviation Medicine (Farnborough) and Physiology (Cambridge.).

MEDICAL BOARDS

Awdry House (*London*). Candidates examined by the London Board from the outbreak of war until the end of August 1940 numbered approximately 17,000 and included Polish, French, Belgian, Dutch and Norwegian personnel. Some idea of the numbers and class of case dealt with in London in 1939 and 1940 respectively, may be obtained by taking the figures for a period July 31–August 18 (inclusive), in the two years. Naturally, the classification of the cases differs in the two columns.

1939		1940	
Short service commissions	50	Civilians for administrative and special duties commissions	800
Volunteer Reserve Pilots	51	Airmen administrative and special duties commissions	95
Air Observers	11	Civilians for equipment and accountant commissions	133
V.R. medical officers	—	Airmen accountant commissions	30
Civilian medical practitioners and medical short service commissions	25	Civilians for medical, chaplain and dental commissions	88
Princess Mary's Royal Air Force Nursing Service	12	Commissions for flying duties	147
Others	5	Others	14
Total new cases	154	Total new cases	1,307
Re-boards (including 'B' licence holders)	148	Re-boards (including 'B' licence holders)	380
Grand total	302	Grand total	1,687

In addition to the types of candidates listed in the right-hand column above, mainly sent by Air Ministry Selection Boards, examinations were made of Service invalids arriving from Commands abroad, special cases

referred for opinion by the Medical Directorate at Air Ministry and officers discharged from the Royal Masonic Hospital, part of which was at that time acting as a Service hospital for officers in London. Arrangements were made and accommodation earmarked for this board to accompany the Air Member for Personnel's Department of the Air Ministry in the event of evacuation from London being ordered.

Halton Board (*No.* 1 *C.M.B.*). As already indicated, the Headquarters of Central Medical Establishment, No. 1 Central Medical Board and the consultants in medicine, surgery and neurology moved from Imperial House, Kingsway, into temporary accommodation in two adjacent huts in the education block at Royal Air Force Station, Halton, on the eve of the outbreak of war. The move was made in twenty-four hours and, mobilisation kits having been provided, work started at once. In the meantime, hutted premises specially designed to accommodate the board and its consultants were being prepared.

The accommodation used at first proved inadequate and its location inconvenient, as it was 1¼ miles from the hospital which housed the consultants and to which cases referred for their opinion and for X-ray and other special examinations had to proceed.

On April 1, 1940, work had finished on the new hutted premises near the hospital and the board moved there. The new building provided rooms for the consultants in medicine and neurology, while the proximity to the hospital and Institute of Pathology reduced the time taken in obtaining X-rays and other special examinations. At that time, though its chief work was the boarding of serving personnel, a large number of boards were convened for airmen recommended for commission and extra staff of all kinds had to be obtained for a period of two weeks. Either the Officer-in-charge, Medical Division, P.M.R.A.F. Hospital or one of the consultants in medicine was brought in as additional president.

By this time the complex nature of the types of case began to be apparent and firm decisions on assessment of the individual case were becoming increasingly difficult to make, the tendency being to refer cases for re-board at some future date. Special endeavours were made, therefore, to award final categories with as little delay as possible, in order to avoid obstructing the machinery with re-boards. Some relief from pressure on the Halton Board was provided by the fact that Group Headquarters and the R.A.F. Hospitals were undertaking the medical boarding of the lighter disabilities of the non-invaliding type and awarding sick leave.

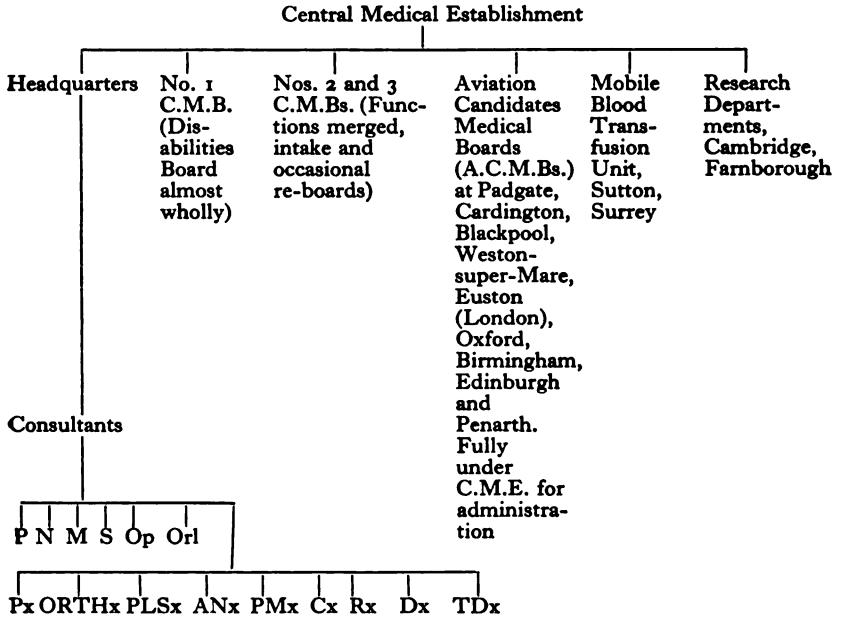
During the early part of 1941, the output of work of the board was still at the high level reached in the previous six months and was tending to increase. Approximately 100 cases per week (an absolute maximum on account of size of staff and accommodation) could be dealt with and appointments were arranged to this end, each day being fully booked.

Absenteeism led to an experiment in 'overbooking', but it was found that this sometimes resulted in great congestion. Bookings were therefore maintained at 100 per week.

Between four and six out of every ten cases seen required neuro-psychological investigation, and it was apparent that psychological problems were the subject of difference of opinion in various quarters, the official view on these matters being insufficiently appreciated by station, group, and command medical officers. In many cases referred on neuro-psychological grounds, evidence was often insufficient to enable the board to give a final considered decision, especially when information came mainly from executive sources.

Towards the latter part of 1940 and in 1941, large numbers of cases of burns, gunshot wounds and other injuries sustained from enemy action during the Battle of Britain were seen at the C.M.Bs. This necessitated the constant attendance of one of the surgical consultants, while the opinion of the civilian consultant in plastic surgery was also sought in many cases. A minor but time-consuming defect at this time was the sparseness of case notes available where patients had been treated in certain Emergency Medical Services hospitals outside the Royal Air Force.

The arrangement of Boards at the end of June 1941, is shown in diagrammatic form below:



Notes: (*a*) Consultant in hygiene replaced in November 1940, by Director of Hygiene at Air Ministry, another surgical consultant added, and civilian consultants in physiology, orthopaedics, plastic surgery, anaesthetics, physical medicine,

cardiology, radiology, dermatology and tropical diseases. Consultant in pathology and tropical medicine now replaced by Officer Commanding R.A.F. Institute of Pathology, Halton.

(*b*) Headquarters and consultants administered at Halton: those in neurology, medicine and surgery (one extra now appointed), board there ; those in ophthalmology and oto-rhino-laryngology in London; civilian consultants (marked 'x') at various points.

(*c*) A.C.M.Bs. extended by opening of seven new boards, as indicated; Uxbridge closed.

(*d*) Mobile Blood Transfusion Unit opened and detached to Sutton for training.

Aviation Candidates Medical Boards (1941). As has been shown in the diagram in the previous section, these boards, which dealt entirely with aircrew intake, were from the outbreak of war distributed in various parts of the United Kingdom and worked in conjunction with their own selection boards. The original boards, of which there were two (later three) at Uxbridge, and two each at Cardington and Padgate, each had an officer establishment of one wing commander, two squadron leaders, and two flight lieutenants or flying officers. Special establishments were, however, created for the newer boards, which were formed at Euston, Oxford and elsewhere.

By March 1941 practical experience had shown that a more general supervision of their work was required, for although they came under Central Medical Establishment for technical administration, they were for all other purposes administered directly by the groups controlling the stations where they were located. This created several difficulties, as the boards were endeavouring to act as self-contained units, while, in addition, continual fluctuation in the number of candidates examined made parallel changes of establishment necessary, none of which were under the control of a single authority. In addition, there was no clearly defined establishment corresponding to the work which had to be done and some difficulty was experienced in obtaining adequate officer personnel for special examination of ears and eyes. Furthermore, the medical equipment for the various boards (of which there might be as many as three at any one station) had to be held on separate equipment ledger sheets. (Forms 823).

A reorganisation was effected in May 1941, at which date all A.C.M.Bs. were brought under the control of the Central Medical Establishment in respect of equipment, attachment of personnel and administration. Equipment was held on charge on one Form 823 maintained by Headquarters, Central Medical Establishment and issued on loan to the various boards. A new scale (Scale A. 16 to A.P. 132) of equipment was drawn up and issued, one or more sets being held by each board, together with surplus items, which when brought up to scale, were taken on charge and re-issued on loan where and when required. Expendable stores were to be obtained from the station at which the board was working, non-expendable items requiring replacement being

issued on demand from Central Medical Establishment, which held surpluses.

With the attachment of personnel in the hands of Central Medical Establishment and a standard establishment for the various types of boards, it was easier and quicker to make suitable adjustments of officer personnel. A standard establishment was laid down for six different types of board according to the number of candidates that had to be examined. These types ranged from Type 1 consisting of 5 officers, 6 other ranks and 1 civilian (the Penarth Board was an example) to the big Type VI Board at Blackpool which comprised 20 officers, 17 other ranks and 9 civilians. In each type there was a wing commander as president, a minimum of 2 squadron leaders to examine eyes and ears and 2 flying officers or flight lieutenants for routine medical examinations. One sergeant and 1 corporal nursing orderly were included in the minimum 6 other ranks which, with a civilian typist, were necessary to ensure the smooth running of the board. Personnel could be moved by the O.C. Central Medical Establishment from one board to another as the work demanded, provided that the total 'block' establishment at all boards was not exceeded.

In the larger boards the minimum establishment just referred to was increased by the addition of another squadron leader (assessor to assist the president), there being not more than 5 squadron leaders on any one board. Similarly, not more than 3 flying officers or flight lieutenants with special knowledge of eyes or ears were appointed to assist the squadron leader specialists. Other rank staff also varied, giving establishments of between 8 and 17, excluding civilians, according to the type of board. Minor adjustments in personnel required to deal with the constant increase or decrease in candidates were not difficult to achieve, while regular inspections of the boards by the O.C. Central Medical Establishment enabled accurate assessment to be made on the work of any given board by comparison with the others. Some saving in senior rank was also effected by the new establishment, which allowed one wing commander-president at each Station Board, instead of two, which had been the previous establishment at Cardington and Padgate, and the original three at Uxbridge.

Details of the establishment of the six types of A.C.M.B., the number of candidates each type was intended to deal with each week, and the location of the boards, are given in the table overleaf.

It will be seen from the table that the estimated capacity of all the nine boards was just over 3,000 examinations a week. Though their function was in theory confined to the routine examination of aircrew candidates they were also used for serving personnel. 'Specialist' cases from local stations requiring expert opinion, principally for eye and ear, nose and throat conditions, were accepted chiefly at Padgate,

Aviation Candidates Medical Boards

Type	Weekly capacity	Officer Establishment	Airmen and Civilian Establishment	Location
I	100	1 Wing Commander, President 2 Squadron Leaders: Ophthalmic, E.N.T. 2 Flight Lieutenants Total: 5 *officers*, 6 *other ranks and* 1 *civilian*	3 Nursing orderlies (1 sergeant and 1 corporal) 2 Clerks (G.D.) 1 Aircrafthand 1 Typist (civilian)	Penarth
II	200	1 Wing Commander, President 2 Squadron Leaders: Ophthalmic, E.N.T. 3 Flight Lieutenants Total: 6 *officers*, 8 *other ranks and* 1 *civilian*	4 Nursing orderlies (1 sergeant and 1 corporal) 3 Clerks (G.D.) 1 Aircrafthand 1 Typist (civilian)	Edinburgh Birmingham
III	250	1 Wing Commander, President 2 Squadron Leaders: Ophthalmic, E.N.T. 5 Flight Lieutenants Total: 8 *officers*, 10 *other ranks and* 2 *civilians*	4 Nursing orderlies (1 sergeant and 1 corporal) 4 Clerks (G.D.) (1 corporal) 2 Aircrafthands 2 Typists (civilians)	Oxford
IV	350	1 Wing Commander, President 3 Squadron Leaders: Ophthalmic, E.N.T. and Assessor 7 Flight Lieutenants (1 ophthalmic and 1 E.N.T.) Total: 11 *officers*, 12 *other ranks and* 2 *civilians*	5 Nursing orderlies (1 sergeant, 2 corporals) 4 Clerks (G.D.) (1 corporal) 3 Aircrafthands 2 Typists (civilian)	Weston-super-Mare. Padgate, Cardington
V	450	1 Wing Commander, President 3 Squadron Leaders: Ophthalmic, E.N.T. and Assessor 9 Flight Lieutenants (1 ophthalmic and 1 E.N.T.) Total: 13 *officers*, 15 *other ranks and* 2 *civilians*	6 Nursing orderlies (1 sergeant, 2 corporals) 5 Clerks (G.D.) 4 Aircrafthands (1 corporal) 2 Typists (civilian)	Euston
VI	850	1 Wing Commander, President 5 Squadron Leaders: Ophthalmic, E.N.T. and 3 Assessors 14 Flight Lieutenants (3 ophthalmic and 3 E.N.T.) Total: 20 *officers*, 17 *other ranks and* 9 *civilians*	9 Nursing orderlies (1 flight sergeant, 1 sergeant, 2 corporals) 8 Clerks (G.D.) (2 corporals) 3 Typists (civilian) 6 Labourers (civilian)	Blackpool

Note: Additional personnel in respect of clerks and aircrafthands were supplied from the stations at which the boards were situated, if the president so desired.

Edinburgh and Cardington, while colour vision tests needed for certain categories and trades were also done at the first two boards in very considerable numbers, over 750 a week being seen at Padgate during the months of May and June 1941. Simple types of disability cases in any serving personnel were also examined and this relieved pressure on boards convened by Group S.M.Os. and often proved an economy in time and money spent in travelling.

Work at Halton and London Boards and at Headquarters, C.M.E. during 1941. Little of special note regarding the work of the London and Halton Boards requires mention at this stage. The London Board which had a weekly average of 320 examinations during the first year of the war was now seeing an additional 100 cases a week during the second quarter of 1941, an appreciable proportion of which were serving airmen, N.C.Os. and warrant officers requiring examination for appointment to commissioned rank. The consultants in ophthalmology and oto-rhino-laryngology, assisted by their wing commander specialists, remained at Awdry House, seeing special cases and continuing special work described elsewhere.

At Halton also a rise in the output of work of No. 1 C.M.B. occurred and by the middle of 1941, an average of 111 cases were dealt with each week. Absenteeism, due to the posting of personnel and the failure of old units to notify board appointments to the new units, averaged seven cases a week. An attempt was made to reduce this by the use of a rubber stamp on the candidate's personal copy of Form 657 (Medical Board Summary) requiring him to report to his unit medical officer ten days before the next board, to ensure that the appointment had not been overlooked. Appointments for boards were given through the post between seven and nine days after application, except in urgent cases, often psycho-neurological, when telephone bookings at relatively short notice were accepted.

In the second half of 1941, the cases dealt with at Halton showed an appreciable increase in numbers at the end of November and the beginning of December. This resulted in the notice required for the booking of appointments being extended from seven days to a fortnight by the end of the year. The establishment of the board remained the same but the 'free' squadron leader post was filled by a neurologist in order to assist the consultant neurologist and to deal with the steady increase in this type of case, which now numbered sixteen to eighteen per day. This had the effect of relieving the consultant in neurology of some of the routine work as he was now only available on two days a week to see this type of case.

An analysis of 1,000 consecutive cases seen at the board during the last two months of 1941 showed that nearly 75 per cent. of the candidates boarded were aircrew personnel. Of these 747 cases, 526 were

pilots, 142 W.O./A.Gs. and 79 observers. Only just over 2 per cent. of the total cases, aircrew and ground personnel, were invalided. Final disposal at one medical board occurred in nearly 30 per cent. of the cases, the remainder having to return for re-board a variable number of times. Distribution of examinations by the various consultants showed that out of just over 1,100 examinations, 380 were made for neurological and psychiatric reasons by the specialists concerned; nearly 300 examinations were made by the medical consultants, 140 by the surgical specialists and nearly 60 by the orthopaedic specialists. The remainder of the examinations were made by the ear-nose-and-throat and ophthalmological consultants, only 85 examinations did not require the advice of any consultant, and out of 1,109 examinations one-tenth were by more than one consultant.

Headquarters, C.M.E., remaining with No. 1 Board at Halton, took over in November 1940 the administration of the Aircrew Casualty Disposal Scheme, an organisation instituted under No. 24 Group in October of that year, for the purpose of visiting and transferring, where necessary, sick and wounded aircrew admitted to civil, and in some cases Service, hospitals. This had the object of ensuring that the best possible treatment was obtained for them and that they returned to full fitness for flying duties as early as possible.

Two other administrative responsibilities were vested in C.M.E. in the first quarter of 1941, the Mobile Blood Transfusion Team and the Aviation Candidates Medical Board. The Transfusion Team was formed to obtain blood from civilian and Service personnel for use by personnel of the Royal Air Force. (*See* Volume II, Chapter 9).

The establishment of C.M.E. has not as yet been detailed and may be conveniently mentioned at this juncture. During August 1941, it consisted of a total of 137 medical officers, excluding 20 attached for instruction at the physiological laboratory, Farnborough. These were distributed in the following manner:

Headquarters, C.M.E. (*Halton*): 1 group captain, later an air commodore, and 1 squadron leader.

Physiological Laboratory: 1 group captain post, filled by a civilian expert, 1 wing commander, 1 squadron leader and 3 flight lieutenants.

Blood Transfusion Team: 1 flight lieutenant.

Aircrew Casualty Disposal: 1 flight lieutenant post later filled by a pilot officer of the Administrative and Special Duties Branch.

Consultants and Senior Specialists: 1 air commodore, neurological, 8 group captains (2 medicine, 3 surgery, 1 neurology, 1 ophthalmology and 1 oto-rhino-laryngology) and 4 wing commanders (2 ophthalmology, 1 oto-rhino-laryngology and 1 neurology).

Halton Board (No. 1 C.M.B.): 1 group captain, 2 wing commanders, 3 squadron leaders and 6 flight lieutenants.

London Board (No. 2 C.M.B.): 1 group captain, 1 wing commander, 4 squadron leaders and 5 flight lieutenants.

Aviation Candidates Medical Boards: 9 wing commanders, 25 squadron leaders and 57 flight lieutenants or flying officers.

N.C.O., Airmen and Civilian Establishments for Headquarters, C.M.E., No. 1 Board (Halton) and No. 2 Board (London) were as follows:

Headquarters: 1 warrant officer, 2 flight sergeants (one of them located at the London Board), 1 sergeant, all nursing orderlies; 6 airmen clerks, including 1 corporal; 2 airmen telephone operators, 2 airmen M.T. drivers and 1 civilian clerk and a labourer—total = 14 airmen and 2 civilians. Two additional clerks were allowed for consultants, and 1 for aircrew casualty disposal.

No. 1 Board: 8 nursing orderlies, including 1 flight sergeant, 1 sergeant and 2 corporals; 6 clerks including 1 corporal; 2 aircrafthands and 2 civilian cleaners—total = 16 airmen personnel and 2 civilians.

No. 2 Board establishment was similar to that of No. 1 Board except that a civilian clerk made up the 6 clerical staff and there was an extra cleaner and one labourer—total = 15 airmen personnel and 5 civilians.

A consolidated statement of the work of boards done during the six months ended August 1, 1941, is detailed below:

Candidates	Aircrew	60,936
	Others	10,899
Re-boards		3,387
Invaliding, recategorising for airmen on ground duties		278
Consultant and specialist cases		1,600
Colour vision tests		29,654
Miscellaneous examinations		107
Grand total		106,861

In 1942 a major event in the history of both C.M.E. and No. 1 C.M.B. occurred, namely the return of these two units to London from R.A.F. Station, Halton. This move was carefully considered and it was felt that the accessibility of London greatly outweighed the risk of enemy air attacks, which, as it happened, were already showing a decline. Accommodation had been found in Kelvin House, Cleveland Street, London, W.1. C.M.E. moved in May 1942, and No. 1 C.M.B., the mass X-ray headquarters and aircrew casualty section were transferred in June of the same year, this short interval being designed to avoid the confusion and total disruption of work which would have resulted from a simultaneous move of all these departments.

When installing the boards in their new quarters, several major items of new equipment were considered necessary and approval for their provision was sought and obtained from Air Ministry. The equipment consisted of new X-ray diagnostic sets, electro-cardiographic apparatus

and the necessary equipment for a small pathological laboratory. The urgent need for this equipment was evidenced by the fact that the X-ray Department with machines installed on October 12, 1942, took X-rays of 130 candidates by the end of the month, the period when no X-ray facilities were available at C.M.E. having been bridged by the kindness of Middlesex Hospital which, being situated within 200 yards of C.M.E., offered to take any skiagrams during this period. A considerable amount of alteration was necessary in order to give the necessary privacy to examination and consulting rooms. Two additional consulting rooms were necessary, as the move of the consultants in ophthalmology and oto-rhino-laryngology from Awdry House to Kelvin House was scheduled for early 1943.

No. 1 C.M.B. No. 1 C.M.B. functioned throughout 1942 as the principal disability medical board for the Royal Air Force and when the move to London was authorised it was considered a suitable time to make application for a larger staff. This claim was considered more than justified in view of the ever-increasing waiting list of the board and when the additional staff was provided, it was possible for the board to handle over sixty candidates daily.

Aviation Candidates Medical Boards. Throughout 1942 these boards were kept very busy examining the numerous recruits who were entering the Service and who were selected as potential aircrew. As the work of these boards was in no way different from their previous duties, only a list of the boards in operation at this period is appended: Imperial House, Kingsway (No. 4 A.C.M.B.), Weston-super-Mare (No. 5 A.C.M.B.), Padgate (No. 6 A.C.M.B.), Euston (No. 7 A.C.M.B.), Cardington (No. 8 A.C.M.B.), Penarth (No. 9 A.C.M.B.), Blackpool (No. 10 A.C.M.B.), Edinburgh (No. 11 A.C.M.B.), Oxford (No. 12 A.C.M.B.) and Birmingham (No. 13 A.C.M.B.). In the latter part of November 1942, No. 5 A.C.M.B. Weston-super-Mare moved to Doncaster and No. 10 A.C.M.B. Blackpool was disbanded. In the year 1942 the following numbers of candidates were examined by the Boards:

January	8,939	July	7,136
February	7,906	August	6,793
March	6,347	September	8,723
April	6,157	October	9,078
May	5,847	November	7,929
June	6,216	December	6,775

Total 87,846. (This figure represents, therefore, the number of candidates for potential aircrew for 1942.)

Ancillary Boards. In addition to the duties carried out by the permanent boards, it was necessary on several occasions for boards to be formed to meet a particular need. These commitments were met by detaching personnel from the permanent boards wherever possible or by detailing suitable medical officers already serving in the region concerned. In January 1942, a medical board was set up in the Isle of Man

for the purpose of examining personnel for ground commissions and aircrew duties. Throughout the year a board was formed in the first week of every month at Belfast to examine candidates selected by the Travelling Trade Testing Board in that area. In September 1942, a temporary board was formed at St. Athan to examine 989 candidates for flight engineer duties.

Progress of the Boards in 1943. By the commencement of 1943 the entire system of medical boards was working smoothly with sufficient elasticity in its organisation to deal with the minor changes of policy which became necessary from time to time. The commitments of the Central Medical Establishment had reached their peak for the war years.

An increase in the number of boards on personnel 'weeded out' by the mobile mass miniature X-ray units occurred during this period but this increase was roughly equalled by the falling-off in numbers of candidates put forward by the Aviation Candidates Selection Boards and on no occasion in this year was it found necessary to alter the composition of the boards. In February 1943, a month which can be considered typical for the year, a total of 8,342 candidates passed through the combined A.C.M.Bs. while No. 1 C.M.B. London inaugurated 1,044 medical boards on all types of cases. It was noticeable that the rate of re-boarding increased, due mainly to the large number of candidates who presented themselves with injuries. In these cases it was impossible and undesirable for the board to attempt to give a firm decision at the initial board. This applied particularly to orthopaedic and burn-plastic cases.

As mentioned above, No. 5 A.C.M.B. Weston-super-Mare was moved in its entirety to Doncaster, where an Aviation Candidates Selection Board had been set up. The Board, a Type IV, was found insufficient to deal with the number of candidates which was averaging approximately 450 per week and it was necessary to upgrade the board to a Type V.

In the latter part of February, the consultant in oto-rhino-laryngology was transferred from Awdry House, Kingsway to Kelvin House. This was a considerable advantage as it allowed C.M.E. to have all the necessary departments for boarding under one roof and, furthermore, saved patients considerable time and discomfort.

In the latter part of the year it was found necessary to move two of the mass X-ray units; one of the sections at Blackpool was transferred to Padgate to assist No. 6 A.C.M.B. and the section at Skegness was moved to Cranwell. At this period the work of the mobile mass X-ray units was very considerable, and more than 10,000 personnel were X-rayed each month by the combined units.

REVIEW OF POSITION IN 1944

A review of the position shows the effect of the beginning of the general release of R.A.F. personnel which was just beginning to be

larger than the intake. However, a considerable number of personnel due for release were in need of medical boards and the drop in the work of the boards was not as much as might have been expected. Nevertheless, the authorities found it possible to close down two of the A.C.M.Bs., No. 8 at Cardington and No. 9 at Penarth, in August and October respectively. The closure of these boards helped to balance the loss of medical personnel who were themselves affected by the release.

A brief tabulation of the work of the Central Medical Establishment and its subsidiaries for the month of February 1944, is given below:

	Candidates
No. 1 C.M.E.	1,391
A.C.M.Bs. Total	6,942
No. 4 Imperial House	179
No. 5 Doncaster	1,084
No. 6 Padgate	964
No. 7 Euston	2,056
No. 8 Cardington	811 (Closed August 1944)
No. 9 Penarth	437 (Closed October 1944)
No. 11 Edinburgh	664
No. 13 Birmingham	747

Travelling Medical Board Northern Ireland, 91 candidates.

Mass miniature X-ray units Total . 12,395

	Male	Female
No. 1 Blackpool	1,318	115
No. 2 Padgate	988	948
No. 3 Innsworth	791	209
No. 4 Skegness	2,104	—
No. 5 St. Athan	1,951	618
No. 6 A.C.R.C.	3,353	—

In May 1944 a careful review of the entire position of the Central Medical Establishment and its sub-divisions was made, both in respect of its commitments and also in relation to staffing from the medical and civilian point of view. By now the effect of the 'run down' of the R.A.F. was being felt and it was possible for staff of all types to be reduced, although, as always, adjustments had to be made to meet local needs. The reduction in personnel can be briefly summarised as follows:

Reduction in Medical Officers: 2 wing commanders, 5 squadron leaders, 18 flight lieutenants. Total = 25.

Reduction in Other Ranks: 1 flight sergeant, 1 sergeant, 3 corporals, 29 aircrafthands or aircraftwomen. Total = 34.

Thus the staff left to man the Central Medical Establishment and its sub-divisions remained as follows:

Medical Officers: 3 air vice-marshals, 2 air commodores, 19 group captains, 16 wing commanders, 38 squadron leaders, 48 flight lieutenants, 1 flying officer. Total = 127.

R.A.F.: 3 warrant officers, 4 flight sergeants, 25 sergeants, 11 corporals, 24 aircrafthands. Total = 67.

W.A.A.F.: 12 section officers, 4 sergeants, 4 corporals, 121 aircraftwomen. Total = 141.

This staff was responsible for the manning of the following units:

Central Medical Establishment

Physiological Laboratory, Farnborough.
Acoustic Laboratory (now at Kelvin House).
Aircrew Research Section, Oxford.
No. 1 C.M.B., Kelvin House.
H.Q. Chest Radiography Section (controlling 1–6 Mass X-ray teams).
Mobile Blood Transfusion Unit.

Aircrew Medical Boards			Boards
No. 4 A.C.M.B. Imperial House	weekly	turnover	200
No. 5 A.C.M.B. Doncaster	,,	,,	350–400
No. 6 A.C.M.B. Padgate	,,	,,	275
No. 7 A.C.M.B. Euston	,,	,,	350–400
No. 8 A.C.M.B. Cardington	,,	,,	275
No. 9 A.C.M.B. Penarth	,,	,,	120
No. 11 A.C.M.B. Edinburgh	,,	,,	160
No. 13 A.C.M.B. Birmingham	,,	,,	160

In October 1944 there was a considerable adjustment in ranks of the senior specialist medical officers and 14 of the consultant officers holding the rank of group captain were upgraded to the rank of acting (unpaid) air commodore. The specialists affected were 3 surgical, 3 neuropsychiatric, 1 medical, 1 ophthalmology, 1 orthopaedic, 1 oto-rhinolaryngology, 1 anaesthetics, 1 gynaecology, 1 venereology and 1 in tuberculosis and mass miniature radiology.

REVIEW OF POSITION IN 1945

In 1945 the rate of discharge of personnel from the R.A.F. far exceeded the rate of National Service entrants, and it was possible to make very considerable reductions in the numbers of boards required for the reduced intake and personnel due for release. As has been pointed out previously the release programme involved medical officers equally with other personnel and the Boards experienced some difficulty in finding sufficient medical personnel in some of the specialities such as ophthalmology and oto-rhino-laryngology.

No. 6 A.C.M.B., Padgate, and No. 11 A.C.M.B., Edinburgh, were closed in January 1945, closely followed by No. 13 A.C.M.B. Birmingham in February, and No. 5 A.C.M.B., Doncaster, closed in

June. This involved a reduction in the potential boarding capacity of the Central Medical Establishment, as a whole, of between 950–1,000 candidates a week, but freed 29 medical officers, 35 other ranks and 6 civilians from whom it was possible to provide trained reliefs for the remaining boards as they lost personnel by release. It will be seen, therefore, that the position was again approaching the situation obtaining in 1939, when the boards were located entirely in London, although at the end of 1945 the two London A.C.M.Bs., No. 4 Imperial House and No. 7 Euston could deal with approximately 800 candidates a week. No. 1 C.M.B. suffered no change, in fact the establishment was increased by the addition of 1 sergeant and 1 corporal nursing orderly and 5 W.A.A.F. clerks G.D. to deal with the increased amount of documentation which was required.

The R.A.F. Physiological Laboratory, South Farnborough, a section under the direct control of C.M.E., was closed down on April 23, 1945, and the section was incorporated into the R.A.F. Institute of Aviation Medicine. The Aircrew Research Section located at Oxford was closed down in September 1945 and the work that had been undertaken at this establishment was then carried out at the R.A.F. Institute of Aviation Medicine; these moves had the advantage of concentrating all the work of research in its various phases in one area.

In the latter part of the year the work done at No. 4 A.C.M.B. showed a marked increase, the average never dropping below 211 cases a week, whereas the average of No. 8 A.C.M.B. Cardington, was around 140 per week. The boards were designed to deal with 200 and 350 cases respectively. Thus it was possible to withdraw staff from Cardington and to increase the London Board, an additional squadron leader being added as Deputy President and Assessing Officer.

During the war period many useful lessons were learned concerning the type of organisation needed to deal with the large number of candidates who were referred to medical boards for rapid and accurate assessment. The A.C.M.Bs., while offering all the facilities of the normal medical board, had to deal with the increasing numbers of psycho-medical problems which were encountered as the war progressed, and as a result of the creation of the additional specialist departments which became necessary, much valuable knowledge of matters peculiar to the R.A.F. was gained.

MASS MINIATURE RADIOGRAPHY

PRE-WAR HISTORY

The original work on Mass Radiography was carried out in America in the early 1930s and was later taken up in Germany about 1938. It was first introduced to Great Britain in 1938–9 by the Prophit Committee, when investigations were carried out among contacts with a definite

family history of tuberculosis and among volunteers from different tuberculosis centres; as a result of these investigations, the committee stated in their report that the only method for dealing with the problem of tuberculosis on a large scale was by mass radiography in the first instance, followed by clinical examination of suspected cases.

Early Pre-war History. In 1937, the consultant in medicine put forward a suggestion that all candidates for aircrew selection should have their chest X-rayed and that later, if possible, this should be applied to all recruits for the R.A.F. At this time this meant using a full-size X-ray plate for each individual and it was considered that the expense and time involved did not justify the adoption of this proposal.

The first suggestion for carrying out mass miniature radiography came from a Flying Personnel Research Committee meeting in March 1939, following the deliberations of the Prophit Committee. In October 1939, an unsuccessful attempt was made to obtain two mobile X-ray units, but the first mass X-ray unit was delivered to the R.A.F. in September 1941, as a gift by the British Red Cross. Experimental work with this unit was carried out on boy apprentices at R.A.F. Station, Halton, under the guidance of the consultant in medicine, the specialist in chest diseases and the specialist in radiology. Some 3,000 personnel were examined.

In September 1941, large numbers of volunteers were being medically examined at the Aircrew Reception Centre in London for fitness for aircrew duties and it was decided by Air Ministry to instal this first mass X-ray unit as an adjunct to these aircrew medical examinations. The value of mass radiography in a Service such as the R.A.F. was soon realised. Efforts were made to obtain further mass X-ray sets and, as a result, five mobile X-ray units were obtained through Anglo-American lend-lease and these were brought into operation during 1942.

GENERAL ORGANISATION

At an early stage, the initial training of personnel to operate mass radiography units was discussed between the specialist in chest diseases and the specialist in radiology, and it was agreed that all X-ray units would have to be administered by a Central Mass Radiography Headquarters. This was established under the aegis of the consultant in medicine, and later the consultant in chest diseases, at Central Medical Establishment. The Royal Navy had started mass radiography in 1939 and some valuable advice was obtained from them regarding staffing of mass radiography units. (*See* Chapter 13, Medicine and Pathology Volume.)

From the outset, it was agreed that there would be a separate medical officer in charge of each unit, and that these should be medical officers who had had previous experience of chest diseases, rather than radiologists. The specialist in chest diseases and the consultant in medicine

were of the opinion that the mass X-ray units should be responsible for following up cases clinically and not only from the diagnostic and purely radiological point of view.

As these medical officers were recruited into the Service and selected for mass radiography training, they were sent to the Central Medical Establishment for training under the specialist in chest diseases and the officer-in-charge of mass radiography. This training was designed to produce uniformity, in regard to both the diagnosis and disposal of chest diseases. The remainder of the staff of mass radiography units consisted of a sergeant radiographer, a nursing orderly, two photographers, two clerks and two airmen (general duties). These staffs were also trained at Central Medical Establishment and they were given their first introduction to a mass radiography unit at the Aircrew Reception Centre in London, which was used as the unit for staff training.

By the middle of 1942, all six mass X-ray units were in operation, controlled by the officer-in-charge of the headquarters section at Central Medical Establishment. It was difficult to place these units in order to cover satisfactorily a Service as large as the R.A.F., which was expanding very rapidly at that time, but by selecting large recruit training centres and recruit receiving centres and by keeping two units as mobile units, visiting the larger R.A.F. stations, a vast number of R.A.F. and W.A.A.F. personnel were mass X-rayed between 1942–5.

From 1942 to 1946 the units continued with little or no alteration in their organisation or policy. The R.A.F. scheme for mass radiography had as its aim that the units should be clinical and not purely radiological units, that is, each unit had wherever possible, hospital facilities for physical and bacteriological examination on the same or an adjoining station, and the medical officer-in-charge of the mass X-ray unit did not merely sort out those cases which appeared on radiological findings alone to be fit or unfit for service, but was responsible for their admission to hospital for investigation and kept in constant touch with them during these preliminary investigations, until finally, in consultation with the medical specialist, the individual's ultimate disposal was made. Mass radiography headquarters at Central Medical Establishment was not only responsible for training personnel and administering the units but was also available at all times for a further opinion on difficult cases which arose at units and was also responsible for the compilation and filing of all records and films.

RECORDS (1942–5)

At an early stage it was realised that all films and records should be filed at the Central Headquarters, rather than by the individual units themselves. These units were moving frequently, as the demand arose, and it was considered unwise to burden them with an ever-increasing

amount of films, and further, it was advantageous that any mass radiography film or report required, should be obtainable from one central source.

All individuals passing through a mass radiography unit were given a serial number with an alphabetical prefix, indicating the unit which had taken the film; this serial number was automatically photographed on each miniature film and was also inserted on all large X-ray films which were taken of the same individual, and it was by this serial number that individual films were traced. This serial number was also stamped on the flap of the individual's Form 48.

The miniature films were stored originally in rolls on cardboard trays which were stacked on top of one another in ordinary filing cabinets. The large X-ray films were filed under two headings—those showing an abnormality and those considered to be normal—and were kept in progressive order of mass X-ray numbers on shelves in metal cabinets, a shelf being set apart for each individual mass X-ray unit.

At the time each individual was mass X-rayed and given the next available serial number of the unit taking the photograph, he was also given a mass X-ray card with a similar serial number; this card bore personal details of the individual and it was inserted in the X-ray apparatus at the time that the X-ray was taken, so that there was little likelihood of there being any misunderstanding as to the individual X-rayed. Where some abnormality was detected, this, together with notes on clinical investigations and final disposal of the case, was written on the mass X-ray card and these cards were later filed at the Mass Radiography Headquarters.

In the early days it was realised that considerable statistical information could be obtained from mass X-ray work and for this reason a numerical 'classification of diseases' was devised, which covered all abnormalities under numerical headings. For instance, the numeral 2 represented active pulmonary tuberculosis, 2(*a*) indicated that the sputum was positive and 2(*b*) indicated that the sputum was negative, while the number 13 represented congenital abnormalities of no significance, and, again, the number 29 indicated that the individual had been invalided from the Service. By this means it was possible to file all mass X-ray cards at headquarters according to the disease or abnormality from which the individual was suffering, and furthermore, it was possible to discover in a very short time the number of cases of any disease that had been picked up by any unit in a given time, by merely counting the cards bearing the numerical representation of that disease.

APPARATUS (1942–5)

All apparatus for mass radiography in the R.A.F. used 35 mm. film and each individual set could also take normal X-ray plates up to

17 in. × 14 in. Various types of apparatus were used in the early stages; the first set, a gift of the British Red Cross, was a Solus Unit, those obtained from Anglo-American lend-lease were Westinghouse Units, and finally, a Watson Unit was obtained. Technical details of apparatus need not be discussed here. Each unit consisted of an X-ray tube which, when operated, produced rays passing through the individual and impinging on a fluorescent screen, and it was this fluorescent image of the individual's chest which was photographed and thus produced the 35 mm. picture. By this it will be seen that the 35 mm. picture was not a true X-ray picture but a photograph of a fluorescent screen. In fact, a more accurate description of mass radiography is that used by the Americans when they refer to 'mass miniature photo-fluorography'.

In the choice of mass radiography apparatus during the war years availability rather than preference was the determining factor. Messrs. Watson, following recommendations by the Medical Research Council on 'Tuberculosis in War-Time', were the first British firm to design a set solely for mass radiography; this was produced in 1942–3 and had many advantages over other British sets which were normal X-ray sets, modified for mass X-ray purposes.

The main difference between the Westinghouse apparatus and other mass X-ray units was that the Westinghouse sets were known as condenser-discharge machines and they could be operated off a normal 220–225 A.C. supply, through a normal 15 amp. plug, whereas the majority of other sets required a special electric supply, often requiring as much as 120–140 amps.

The 35 mm. films were viewed by projection with special lantern-type projectors adapted for 35 mm. film, the image being thrown on a small screen. It was found that the most satisfactory type of screen was one made of dental plaster-of-paris in a special mould, approximately 10 in. × 10 in. with a glass face; plaster-of-paris was found one of the most satisfactory media for screens because when the surface became dirty through handling and frequent use, it could be cleaned very easily with a razor blade. It was found that the ideal size of a projected image was approximately 6 in. × 5 in.: if an attempt was made to enlarge upon this, a certain amount of detail was inevitably lost.

Repair and Servicing. From an early date it was realised that the repair and servicing of mass radiography sets was of the utmost importance because it was obvious that if a set broke down and was out of commission for several days, thousands of recruits could pass into the R.A.F. without an X-ray. For this reason an R.A.F. servicing team consisting of senior N.C.O. electricians was established at the mass radiography headquarters at Central Medical Establishment. The team was approximately five in number and very quickly became expert in mass X-ray repairs and they were ready at all times to visit any unit requiring their

services. The excellent work done by these N.C.Os. was largely responsible for keeping mass radiography going during the war years.

Mobile Units. Although the five units received through Anglo-American lend-lease were, in fact, mobile units, it was not found economical to run all these as fully mobile units. Consequently the apparatus was taken from the vans and used at the training centres, and other points, on a semi-static basis, but when a greater demand for a mass X-ray unit arose elsewhere, it could be moved at comparatively short notice.

Two units were, however, used as true mobile units and each consisted of two vans mounted on American Chevrolet chassis. One was the X-ray van housing the X-ray apparatus, together with a small motor generator to be used where electric supply was not obtainable, or fluctuant. The other van was equipped as a mobile dark room. These mobile units visited larger R.A.F. stations. The stations were forewarned that a visit by the mobile mass X-ray unit would take place. On arriving at the station, certain arrangements had to be made before the work could commence: firstly, a suitable large room had to be located as a waiting-room, outside which the X-ray van could be parked in very close proximity. Secondly, an office was required for the clerical administration of the unit, together with the compilation of records and attendances. Thirdly, an office had to be obtained for the medical officer-in-charge to carry out interviews and physical examinations. It should be noted that frequently it was found more convenient to remove the X-ray apparatus out of the X-ray van into a small office opening off a larger room which could be used as a waiting-room. Operation of mobile units was therefore not simple and two or three days sometimes elapsed before the personnel of the station visited started to be X-rayed. Nevertheless, numerous stations were visited and thousands of R.A.F. and W.A.A.F. personnel were X-rayed.

PROTECTION OF X-RAY ROOM STAFF

From the outset of mass radiography, it was realised that a vast number of exposures would be made daily and that there was some risk of involving the staff of these units in an overdose of radiation. Under normal working conditions the number of exposures might reach a total of 400 in a day and the quantity of X-rays generated consequently exceeded that usually encountered in a normal X-ray department. With this in mind it was considered essential that adequate precautions should be taken.

When a mass X-ray unit was opened on a station, considerable care was taken in siting the actual X-ray set to ensure that the X-ray tube was facing towards an outside wall, or, if this was impossible, to ensure

that the walls of the X-ray room were suitably protected with lead or were of sufficient thickness of brick to make this unnecessary. Furthermore, arrangements were made for the radiographer, and anyone else of necessity in the X-ray room during exposure, to have a sufficient number of protective screens available behind which to stand at the moment of exposure.

Protective aprons were provided for all personnel whose work necessitated their being in the X-ray room for anything more than a few moments. It was found that aprons impregnated with barium paste which hung down from the shoulders, covering both the anterior and posterior surfaces of the body were more comfortable to wear than those made of lead, which only covered the anterior surface.

A further precaution was adopted in the early stages by each member of the staff carrying a piece of dental film in the pocket of his working dress—this was developed after one week's work, blackening of the film indicating some exposure to radiation. This estimation of exposure was somewhat crude but from 1944 onwards, arrangements were made with the National Physical Laboratory to supply special test films to be worn during working hours and these were returned to the laboratory for estimation of the total radiation received during that period. These tests were carried out quarterly.

All personnel attached to a mass X-ray unit had a blood count done at an early date and it was agreed that the minimum standard expected for an individual before commencing work would be four million red cells, 80 per cent. haemoglobin, and six thousand white cells. These blood counts were then repeated once every quarter, and any marked deterioration below these figures was carefully checked. Where necessary, the individual was taken off X-ray work.

CLINICAL POLICY

All entrants to the R.A.F. and W.A.A.F. had the usual examination by a civilian medical board before call-up. This may have taken place some months before joining the Service. Among them certain sections of the R.A.F. personnel were subjected to a further strict physical examination on entry as they were volunteers for special duties. It followed that those with physical signs or symptoms and many with family history of chest disease would have been weeded out at these preliminary examinations. Therefore, most of these special entrants, who formed about half the R.A.F. personnel under review, came into the category of the presumably healthy at the time of first attendance at a mass X-ray unit.

The scheme of operation for a mass X-ray unit was to use radiography and clinical means as a method of separating the normal from the

abnormal in several stages. First, all those individuals whose miniature films were not assessed as normal when projected for viewing by the officer-in-charge were separated from the remainder. They usually numbered from 5–10 per cent. of those originally examined, and the individuals concerned were recalled for a full-size film of the chest. These large films were read while wet, when it was found that approximately one half were normal and required no further action. This decision was checked when the films were dry. The individuals showing an abnormal large film were then subjected to a complete clinical investigation—that is, history taking, physical examination, and such pathological investigations as blood sedimentation rate and sputum examination as appeared appropriate. A further separation was again made. Those individuals whose abnormalities were judged to be of no clinical importance were returned to duty. The remainder continued under observation, either as out-patients or in sick quarters, until such time as diagnosis and decision as to their disposal could be made.

This stage of final diagnosis and disposal could usually be reached by the officer in charge of the unit. Cases of difficulty were normally referred to the officer in charge of mass radiography at Headquarters. Where the investigations required—for instance, bronchoscopy—were beyond the facilities available locally, transfer to a hospital was arranged.

In certain cases, final diagnosis could be made at the stage of out-patient investigation; others required a period of observation as in-patients for ultimate diagnosis and disposal (e.g. active or inactive tuberculosis as a final diagnosis and transfer to sanatorium or tuberculosis officer as disposal after invaliding).

There remained a further group in whom the lesion, at the first complete examination, was either anomalous (e.g. query pneumonia, query tuberculosis), or, while definitely tuberculous, was of small extent and apparently inactive but in a dangerous age group. Such individuals were placed under observation in accordance with King's Regulations. They had stamped on their medical documents the following:

'It is recommended that this individual be placed under observation, be recategorised temporarily to Grade III for . . . months, be excused guards, marching and P.T., and be re-examined by a medical specialist or at a mass X-ray unit in . . . weeks, when a report of the clinical findings and an X-ray film of the chest should be forwarded to Headquarters, Mass Radiography, Central Medical Establishment, for decision. The X-ray film will be returned after inspection.'

By this means it was possible by serial X-rays and full clinical reports to arrive at an opinion on diagnosis and disposal. Usually by the expiration of this period of observation the underlying pathology would be more easily assessed by changes in the film, or in the physical signs, or in both.

POST-WAR YEARS

During the war years the six mass X-ray units had been X-raying various types of individual recruits coming into the Service, but by no means all recruits, and also airmen under training at large training centres, but again not all serving airmen. When demobilisation began in 1945, two units were transferred to Hednesford to X-ray all personnel returning from overseas and immediately due for release from the Service; these units later moved to R.A.F. Station, Warton, in Lancashire. By the beginning of 1946, however, demobilisation was continuing in such large numbers that an extra unit was required to cover all the personnel concerned.

Just at this time, two German X-ray sets were obtained, complete with their mobile trailers. The trailers themselves were not of much value to the R.A.F. as they were out of date, and introduced the problem of obtaining spare parts, so they were abandoned at an early stage. The X-ray sets themselves, however, were of sound construction, having been made by Messrs. Siemens before the war. These sets were put into operation and were used when examining personnel before demobilisation at R.A.F., Warton, from 1946 onwards. A certain amount of difficulty was experienced with regard to spare parts for these German sets but this was overcome by modifying the sets to take British manufactured spares.

After the war it was considered that the eight mass X-ray units available in the R.A.F. should be arranged to cover the maximum number of personnel, but bearing in mind the great importance of X-raying all recruits. In order to accomplish this four units were established as follows:

Padgate	for the National Service recruit
Cardington	for the volunteer recruit
Wilmslow	for the W.A.A.F. recruit
Hornchurch	for the boy entrant, apprentice, and trainee

This left two units still X-raying personnel being released from overseas at Warton and another unit which became the first post-war mobile unit. As the numbers being demobilised gradually decreased, one of the units was transferred from Warton to R.A.F., Hednesford, where it X-rayed all personnel before going overseas.

The aim of the mobile unit after the war was to operate on a geographical basis, moving from one station to another, regardless of Command or Group, and X-raying as nearly as possible all officers and airmen on the stations visited.

Post-war Mobile Units. The American vehicles used during the war to carry mobile mass X-ray units gradually became unserviceable towards the end of 1945, replacement parts became increasingly difficult to obtain and the vehicles were consequently replaced in 1946.

When looking for suitable new vehicles for mobile mass X-ray units, the search was for vehicles large enough to accommodate all the requirements of a mass X-ray unit, waiting-room, clerical office, medical officer's office and dark room, so that no additional accommodation, other than for sleeping and eating, would be required from the stations visited.

Eventually the type of vehicle best suited to the work was considered to be a modified 'Queen Mary' trailer and three of these trailers comprised a complete mobile mass X-ray unit.

Post-war Headquarters. Since the inception of mass radiography in 1941 a vast number of people had been X-rayed by the end of 1949. This involved a very considerable amount of films and records, with the result that the Mass Radiography Headquarters at Central Medical Establishment had to be reorganised.

The miniature films are now filed in special filing cabinets divided into numerous small compartments, just sufficient in size to take a roll of approximately 100 exposures. The mass X-ray cards now occupy a considerable card index system; and since 1949 arrangements have been made for the results of all mass radiography work to be punched on Hollerith cards. The large X-ray films are now stored in special racks in old X-ray boxes, as the original method became out of hand, the stacks of films for each individual unit becoming too heavy and too cumbersome to move.

The establishment of a mass radiography headquarters responsible for filing all records has proved its worth very frequently in the post-war years, when there has been a considerable demand for the original mass X-ray films of individuals who have developed chest disease after their release from the Service. This work, though tedious at times, is, of course, of the utmost importance to the individual concerned.

SUMMARY OF WORK DONE AND UNITS VISITED (1941–5)

No. 6 MassX-ray Unit. This was the first unit to start operating and was installed at the Air Crew Reception Centre (A.C.R.C.), Regents Park, London, towards the end of 1941. It remained there, examining aircrew volunteers, until August 1944, when it moved to Torquay. In June 1945, it moved to Bridgnorth:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1941	1,491	—
1942	46,438	—
1943	64,911	404
1944	29,501	2,779
1945	3,744	273
Totals	146,085	3,456

No. 1 Mass X-ray Unit. This unit was opened at Blackpool in February 1942, to deal with recruit intakes. Except for a short period on a mobile basis in January 1945, it remained at Blackpool until it moved to Hednesford in June 1945, to examine ex-overseas releases:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1942	44,340	1,864
1943	17,425	1,457
1944	16,907	852
1945	655	897
Totals	79,327	5,070

No. 2 Mass X-ray Unit. Opened in June 1942 at Blackpool to assist No. 1 with recruit intakes. It became a mobile unit in June 1943, and became static again in May 1945 at Cosford, where all ex-prisoners-of-war were examined:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1942	8,789	1,280
1943	15,100	4,050
1944	18,027	12,353
1945	17,344	1,707
Totals	59,260	19,390

No. 3 Mass X-ray Unit. Opened in May 1942, at Morecambe; moved to Innsworth in February 1943 and to Wilmslow in May 1944. Throughout this time it was engaged almost entirely on W.A.A.F. recruit intakes. In June 1945, it moved to Hednesford to examine ex-overseas releases:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1942	—	38,078
1943	6,491	25,821
1944	5,265	11,155
1945	43,777	1,453
Totals	55,533	76,507

No. 4 Mass X-ray Unit. Opened at Skegness in May 1942 and was occupied with recruit intakes until November 1944, when it operated on a mobile basis until July 1945, when it returned to recruit intakes at Padgate:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1942	23,167	230
1943	16,097	181
1944	12,854	1,758
1945	37,485	3,126
Totals	89,603	5,295

No. 5 Mass X-ray Unit. Opened July 1942, at Filey, and was on recruit intakes until becoming mobile in June 1943, and later becoming static at Warton at the end of 1945 on ex-overseas releases:

	Record of Work	
	R.A.F.	*W.A.A.F.*
1942	8,213	218
1943	8,490	7,032
1944	18,609	7,415
1945	24,217	2,684
Totals	59,529	17,349

Total numbers of X-rays taken 1942–5	
R.A.F.	489,337
W.A.A.F.	127,067
Total	616,404

PLASTIC SURGERY AND BURNS

THE SITUATION IN 1939

In order to present a picture of the administrative arrangements which were necessitated by the war a brief review of the situation as it was in 1939 is first required. It will then be possible to describe the organisation as it was built up when the need became apparent.

Briefly, it may be said that the R.A.F. entered the war with no recognition of any need to set up special arrangements for the treatment of burn and facial casualties other than those provided by the general surgical organisation and the appointment of a civilian consultant in plastic surgery. Figures are not available for the number of burn and scald cases in the R.A.F. before 1940 but, as a generalisation, it may be recorded that neither in numbers nor in degree of seriousness did they occasion any particular concern or interest. It may be conjectured that the characteristics of aircraft in those days gave occupants a greater chance of escape from fire; those who were not killed outright by impact stood a very fair chance of being thrown clear of the débris. Few burns cases were seen in R.A.F. hospitals and, of those, it was rare to see a case of really bad burns as we understand them to-day.

The surgical treatment of burns was dominated by the success which, for nearly twenty years, had attended the method of coagulation by tannic acid solution after operative débridement and cleansing. The only memorable event which disturbed confidence in this technique was the report following the treatment of burn casualties which had occurred in the German pocket battleship *Deutschland* when it was bombed off the coast of Spain in 1937. Several infected burn casualties were treated in the Military Hospital, Gibraltar, and the surgeon's report cast doubts upon the value of coagulation therapy in military surgery.

The position regarding the treatment of facial and jaw injuries was very similar. The few cases which required expert treatment came under the care of the civilian consultant in plastic surgery, who visited the Royal Air Force hospitals at Uxbridge, Middlesex and Halton, Buckinghamshire. No single medical or dental officer in the Service had received any basic training in, or had any experience of, this specialty.

CIVILIAN PREPARATIONS IN 1939—THE E.M.S. CENTRES

The full story of the Emergency Medical Services and its Maxillo-facial Centres is told elsewhere. (*See* E.M.S., Vols. I, II, and Volume on Surgery, Chapters 8 and 9 of this History.)

So far as the Royal Air Force was concerned, the civilian consultant in plastic surgery, Mr. A. H. McIndoe (afterwards Sir Archibald) was established at the Queen Victoria Hospital, East Grinstead, Sussex, where a planned hutted centre was erected in the grounds. Other centres were at Park Prewett Hospital, Basingstoke, under the care of Sir Harold Gillies, and at Hill End Hospital, St. Albans, under Mr. Rainsford Mowlem. E.M.S. centres were established throughout the United Kingdom, but these three became particularly associated with the reception of Royal Air Force casualties and with the training of Service surgeons, nursing sisters and selected orderlies. Geographically these centres were situated in the neighbourhood of London, and it was considered that they would be able to treat the more serious burn and jaw cases which were beyond the scope of the general surgeon. By the end of 1939 there had been insufficient war activity to change this view either in the Service or in the civil sphere.

1940. THE BATTLE OF FRANCE—THE BATTLE OF BRITAIN

Until the end of April 1940, only thirteen non-fatal burn casualties had been recorded. The immediately ensuing months brought these cases in greater numbers; and it then became evident that, however good the results of coagulation treatment in civilian burns, this form of treatment was highly unsatisfactory in the extensive, deep and contaminated burns encountered in warfare. This accorded with the view of those who had treated the casualties from the *Deutschland*.

The need for adequate and thorough cleansing of burns before coagulants were applied had been stressed by memoranda, but two things were very evident by midsummer: firstly, that the R.A.F. was to encounter severe burns of very significant parts, namely the face and hands, and that these burns would be deep and extensive; secondly, that the results from tannic acid treatment were exceedingly poor, and that the morbidity among most valuable trained aircrew was far too high, resulting in a disturbing wastage.

Interest was focused upon the technique of treatment and decisions were made immediately to remedy its faults. In July 1940 the Royal Air Force consultants in surgery and the civilian consultant in plastic surgery formed a sub-committee on burns and advised the following:

(*a*) Abolition of the closed coagulation treatment of burns and the substitution of an open method of treatment by normal saline, constant-temperature baths combined with painless, atraumatic dressings.

(*b*) Cessation of the treatment of burn cases as general surgical patients in general wards, where they were liable to cross-infection from general surgical cases.

(*c*) The early collection of burn casualties into special centres to be designed and sited especially for this purpose, where they would come under the care of teams of surgical personnel trained in resuscitation and the plastic surgical principles of early skin coverage and healing by skin grafts.

The advice that tannic coagulation should be abandoned would, in normal times, have been argued by medical societies and in literature until the profession as a whole became convinced and individual surgeons, of their own volition, changed their opinions and their technique, but within the R.A.F. the recommendation was adopted forthwith and implemented by administrative action. A directive was issued and circularised for the compliance of all R.A.F. medical institutions. Owing, however, to the scattered areas, frequently outside R.A.F. control, in which aircrew casualties landed in emergency, initial treatment was more often carried out by civil hospitals where surgeons had not seen for themselves the urgent need for abandoning tannic acid. Only a few months earlier these essentially civilian and independent hospitals and practitioners had been organised into the Emergency Medical Services and an E.M.S. memorandum had advocated the treatment by tannic acid. This memorandum was cancelled and personnel of the E.M.S. were advised by their own authorities of the importance of the problem and the desire of the R.A.F. that their casualties should not be treated by tannic acid but that saline treatment should be commenced. In November 1940 there was a discussion on the treatment of burns at the Royal Society of Medicine and the profession was informed of the change of view in the *Lancet* of November 16, 1940.

The old order did not change nor yield place to the new without marked professional controversy, for tannic acid coagulation found its protagonists as well as its antagonists, and it was only to be expected that individual surgeons would prefer the technique which they had been using successfully for years. Until results of different methods of treatment became available and were compared, it was difficult to effect the change without becoming autocratic, but the Air Ministry instituted an efficient method of notifying casualties to the Central Medical Establishment so that consultants and surgical specialists of the R.A.F. could

rapidly visit aircrew casualties in civil hospitals, urge the technique approved and evacuate the patients to Service hospitals when they deemed it advisable. This was necessary because once a burn had been tanned in the initial phase of treatment the damage had been done and could not be undone. By these means and by discussions with colleagues, a ready response was speedily forthcoming.

The saline method required apparatus of a complicated and expensive nature for the treatment to be really efficient, but saline packs were recommended as the initial treatment after cleansing. The evolution of the apparatus will be discussed later.

BURNS CENTRES

It was appreciated that the burns case was a problem in a general surgical ward. Ideally, it should be possible, after débridement, to regard such cases as 'clean' and to ward them with uninfected surgical patients. Unfortunately, this ideal was rarely achieved in war-time and burns patients were most often 'infected'. They were then placed among 'dirty' surgical cases and, in open wards, cross-infection could hardly be avoided.

Because the burn dressings were usually time-consuming they were often relegated to a late position on the list; because they were distressingly painful and disfiguring and usually offensive, the cases were usually to be found tucked away in a corner of the ward; among the many surgical patients they could not receive the painstaking care and supervision vital to the proper and later accepted basic principles of burn treatment. These were, firstly to save life by controlled intravenous plasma transfusion during the first few days of shock; secondly, to prevent infection and cross-infection of burned areas; thirdly, to prepare the affected areas for the reception of new epithelium, whether by regeneration from surviving deep layers of skin or by free skin-grafting, at the earliest possible moment and thereby eliminate unstable scars and avoidable deformities arising from the contracture of unnecessarily heavy scars. The Committee on Burn Treatment recommended therefore, the segregation of these cases into special Burns Centres.

It was necessary that these centres should be self-contained areas within, or adjacent to, a general hospital in order to benefit from its ancillary services, particularly bacteriological and transfusion facilities but also general and orthopaedic services (for many burn casualties suffered other injuries requiring the attention of most of the surgical specialists). It was essential that each bed should be capable of isolation by screening and of being moved easily and smoothly about the centre to and from the side of the saline bath and into side wards should infection with virulent organisms be detected. The Committee recommended that the maternity centres of Service general hospitals could most easily

be adapted as burns centres, being constructed for a very similar purpose, namely the control of cross-infection, in the practice of obstetrics. The practice of midwifery ceased, saline baths were installed, labour wards were converted into minor operation theatres in which surgical treatment of burns could be practised and nurseries became side wards. In some cases doors had to be widened and floors made smooth to allow the easy movement of beds.

The bed situation required special attention. Service hospital beds were, and to a large extent remain, wheel-less and immobile, the legs resting upon small, wooden blocks. They were low and narrow. Special beds were approved and ordered, the chief features being that they could be supported upon large (4 in. diameter) wheels by the simple depression of a lever at the foot end of the bed, they were of a height to diminish the fatigue of stooping during nursing and facilitate lifting, and they were wide enough to allow the easy and safe use of cradles for warming and supporting bedclothes, the administration of transfusions and the secure adjustment of pillows and blocks required to elevate arms and hands which had been burned. The head-piece of these beds could readily be adjusted within the framework of the bed to form a sloping rest for pillows, or could be entirely removed to permit access to the head of the patient. Throughout the period of intensive use of the burns centres these beds proved themselves to be a great advance on the standard hospital bed. Of tubular construction, they were easily and effectively cleansed, the dust traps of the standard angle-iron structure being absent.

Linen for the beds had to be scaled more generously than usual to meet the particular requirements of these centres. Blankets had been proved to harbour organisms and sheets rapidly became soiled. Frequent sterilisation of these items was essential and a very generous stock had to be held. Mattresses required sterilisation and more frequent teasing to diminish discomfort. Waterproof sheeting was necessary in order to prevent the soiling of these items. Dressings were used in large quantity, particularly *tulle gras*, gauze and cotton wool.

The Siting of Burns Centres. The policy was that burn casualties should be transferred to these special centres as soon as possible. Experience taught that it was opportune to transport these patients in the initial five to seven hours; if later, burn cases should not be transported until the manifestations of shock had been controlled, usually after one or two weeks. Geographical and strategic considerations had been taken into account in the siting of the large hospitals of the Royal Air Force and it was decided that four of these hospitals should contain burns centres. These were Halton in Buckinghamshire, Ely in Cambridgeshire, Rauceby (near Sleaford) in Lincolnshire and Cosford (near Wolverhampton) in Staffordshire—thus forming a 'front' of, from north to

south, Rauceby, Ely and Halton within the concentration of Bomber Command aerodromes in 1941, with Cosford amidst the training centres and the E.M.S. established centres at St. Albans, Basingstoke and East Grinstead among the Fighter zones in the south-east.

East Grinstead, in Sussex, was in the forefront of activity during the Battle of Britain and had received many burns casualties from this operation and from the evacuation of Dunkirk in May 1940. It was the base at which the civilian consultant in plastic surgery to the Royal Air Force, Mr. A. H. McIndoe, was working. It remained throughout the war as the foundation upon which the R.A.F. burns centres functioned, where R.A.F. specialists were trained and were refreshed, and to which were evacuated the most severe cases whose treatment presented the more abstruse problems in plastic surgery and those whose problem of reconstruction would involve treatment for many months or even years.

The Training of Specialist Teams. The first to enter into training for the specialised treatment of burns casualties were nursing orderlies. During the early months of 1940 a prototype of the saline bath had been designed and constructed at East Grinstead and the need for strong male assistance became evident. A few selected nursing orderlies were attached to East Grinstead, St. Albans and Basingstoke. At first the object was to help the nursing staff in the heavy labour of lifting patients into and out of the baths. Very soon these keen young men took over the care of the bath apparatus and the treatment of the patients during the bathing process and subsequent dressings. For this they proved themselves ideally suited, provided that selection was based upon physique, intelligence and enthusiasm. Exceptional stature was not required, sound stamina was more important than great strength. These few orderlies were the forerunners of many others similarly qualified, some indeed trained by these original orderlies as they were dispersed to Royal Air Force Centres, but most trained at East Grinstead, St. Albans and Basingstoke. The period of instruction varied with conditions at individual centres around an average of six months.

Any history of the treatment of burns in the R.A.F. during this period would be incomplete without acknowledgement of and tribute to the magnificent work of these nursing orderlies. They became excellent dressers, taking the greatest interest in their cases, developing a friendly rivalry with their colleagues and a loyalty to their team; above all, their patience seemed inexhaustible and they always preserved an atmosphere of confidence and optimism to bring hope to their patients, whose injuries were so often ghastly.

Towards the end of 1940, training of surgeons was commenced at East Grinstead by the attachment of a surgeon of reasonable general experience. The period of training was six months (from December 1940 until July 1941), during which time, residing within the hospital, the

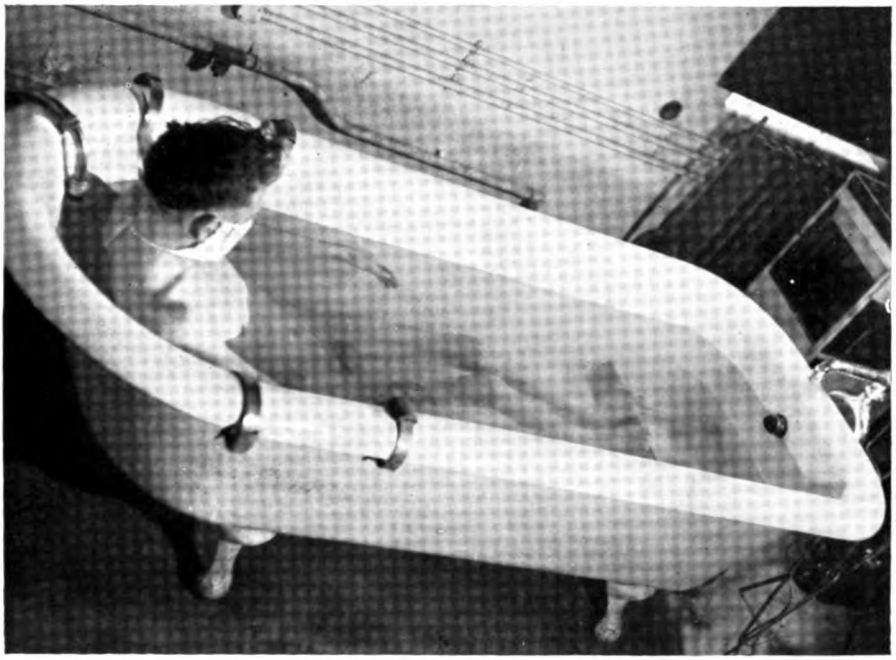


PLATE XXXVII. Patient under treatment in a saline bath. Note foot rest and radiator.

PLATE XXXVIII. Saline bath installed in special bathroom with sliding doors for easy access of stretchers.

[facing p. 304

surgeon was taught the fundamentals of plastic and jaw injury surgery and the particular care of burns cases. By the middle of 1942 three surgeons who had undergone this 'long' period of training were available to the Service, most of the practising surgeons in the R.A.F. had attended short courses of instruction designed to standardise the early stages of treatment in places where no centre was available, and one surgeon with longer experience of plastic surgery had entered the Service in July 1941. This officer eventually opened the Royal Air Force Plastic Surgery Centre at Halton in early 1943. Training continued throughout the war and towards the end surgeons served for longer periods at East Grinstead, for two reasons. There was no longer urgency to supply surgeons trained in this branch to the burns centres as these vacancies were filled by those who had already been trained. Also, more experience in the full art of plastic surgery was required at East Grinstead, where the problems of reconstructive surgery were greatest, as the most severe cases were transferred there to be under the supervision of the consultant.

Twenty-five senior and junior surgeons of the Royal Air Force attended these long and short courses: of these only one was a permanent regular officer; by mid-1946, eighteen months after the cessation of hostilities in Europe, the others had been demobilised with the exception of one who remained on duty at East Grinstead until demobilised two years later.

It was not considered necessary to send nursing sisters on prolonged courses at East Grinstead. Short attachments of one month were made, some only a fortnight, as it was considered that the technique was only an accessory to their general training. They required only to observe the technique for this short period in order to go elsewhere and apply what they had learned. Their full education was completed by experience in the Service Burns Centres.

The Saline Bath. A prototype of the saline bath was set up at East Grinstead during mid-1940. The requirement was a large capacity bath containing physiologically 'normal' saline solution maintained at a constant temperature. Such a bath was designed by the consultant in plastic surgery in collaboration with Air Ministry Directorate-General of Works. The first difficulty was to design apparatus which would control salinity by simple adjustment. It was complicated by having to be constructed from material which would be unaffected by the corrosive action of salt. Ebonite was selected. All tanks, pipes, taps and fittings had to be of this material. The final principle was to make concentrated brine in large tanks and dose this into an inflow of warm water before it entered the bath. The bath having been filled with water, a measured amount of brine was added. Temperature was maintained by a flow of fresh, normal saline into the bath.

Difficulties were experienced in obtaining these fittings owing to the activity of industry at this urgent period of the war. Delays occurred which were unavoidable. However, the prototype worked well and only minor elaborations and perfections were subsequently made. Two features demand special notice. First, baths were sited so that beds could be wheeled easily up to the side of the bath, in order to facilitate transfer of the patient. (*See* Plates XXXVII and XXXVIII.) Second, owing to the electrical conductivity of the saline, it was of great importance that the bath and all metal parts should be effectively and methodically 'earthed'. Dressing trolleys and a radiant heat lamp of 1,000 watts were provided for each bath. The saline bath treatment of burns is fully described in the Volume on Surgery, Chapter 7.

Opening of the Centres. There was no definite date upon which these centres became equipped and operational. Patients were admitted as soon as it was possible to treat them, but it was not until some time later that the full equipment became available and the centres were able to operate at maximum efficiency. Approximately, function started thus:

Centre	*Beds*	*Baths*	*Date*
Halton . . .	14	3	July 1941
Ely . . .	11	2	August 1941
Rauceby . .	10	2	December 1941
Cosford . . .	13	2	July 1942

At St. Athan, in South Wales, a saline bath was improvised and the Bunyan-Stannard oiled silk envelopes were made available to all Royal Air Force hospitals and station hospitals, so that treatment by saline immersion could be commenced where transfer to a burns centre was impracticable.

In Scotland the needs of the R.A.F. were met by the Emergency Medical Services under arrangements made with the Department of Health in the spring of 1942 and similar arrangements were made in Northern Ireland. Overseas greater use was made of the Bunyan bags and arrangements for saline baths were improvised.

Personnel. The centres were normally staffed by one senior surgeon in charge, who had completed a 'long' course of training, aided by a junior. Three nursing sisters were required, one for night duty, and five nursing orderlies trained and appointed as burns treatment orderlies. It was an advantage that these centres were part of general hospitals, for although they were carefully segregated in order to maintain the strict individual technique which was necessary, in times of stress help could be obtained from the staff of the main hospital.

Work of the Centres. In the nature of things, burns centres experienced slack periods suddenly interrupted by phases of intense activity calling for all their resources. On the average each centre admitted between 100 and 120 patients annually, of whom approximately 50 per cent. were

aircrew involved in flying accidents or enemy action. The mortality among the aircrew admitted to a burns centre was generally low, in the region of 5 to 10 per cent., but, of course, variations occurred. These figures are not in any way indicative of the overall mortality due to burns in the Royal Air Force; burning was responsible for a high percentage of fatalities throughout the war. For example, in the first four months of the war there had been 85 cases in Home Commands of burns with or without other injuries; of these all but four died, the vast majority before any medical help could be provided.

An incident which occurred soon after the opening of the burns centre at Ely is worth recording. Half an hour after a telephone message, seven burned men were admitted together; they had formed part of a guard on dispersed aircraft at an airfield a few miles away. It was mid-winter and six of the men were asleep in a Nissen hut heated by a stove. In the early hours this stove needed to be re-lit, which the seventh man achieved by applying rags soaked in aviation fuel and lighting them. In the warm stove the fuel vaporised and the resulting explosion awoke the six sleepers. Presumably in their awakening hot gases were inhaled, for all had severe burns of mouth and upper respiratory passages. On admission, about one hour after the event, tracheotomy was performed on one patient; it was carried out on another later that morning and, in all, three cases had tracheotomy tubes inserted by the second day. Of this group five died within four days and the sixth a few days later, there being only one survivor. Their burns were severe apart from the respiratory passages, but the mortality was determined by the latter. This experience emphasised the need for sufficient staff at the centres.

By contrast, a case is recorded in which an airman, injured in an aircraft crash, had both legs and thighs incinerated, with burns of trunk, hands and face in less degree. The legs were amputated below the trochanters soon after admission. He survived; indeed, before he left the hospital he married one of the staff!

Records. The usual Service medical record forms (Form 41) were adequate only to record notes on general injury and material progress of burns patients. For detailed clinical purposes notes were kept on special forms. These had spaces for charting the extent and depth of burned areas; to economise in time rubber stamps of outline drawings of face, hands and whole body were designed and issued to the centres. Charts were prepared for comparing details of blood counts, haemoglobin percentages and bacteriological flora cultured from the affected areas. To get a true picture of a patient's progress it was necessary to scrutinise all these findings closely and the process was time-consuming. Frequently the handwriting was illegible and the forms poorly compiled, the salient facts being hidden among descriptive notes of lesions and progress.

To describe a burn in writing is not easy. It is by itself even less informative than describing a fractured bone. Clinical photographs were essential for records and observation of progress. Each centre was equipped with Leica cameras, a clinical photographer, dark room and enlarging apparatus. Standardised views of different parts of the body, to display the extent and, as far as possible, the depth of burns were laid down; hands, for example, were photographed to display and record the extent of the range of function of the fingers. By comparison of these photographs progress could be judged far more effectively than by the written word alone. The clinical photographer also copied and reduced X-ray films for inclusion in the records of the orthopaedic department.

The amount of 'paper work' in a busy centre was excessive and constituted a serious diversion of the clinician's time from the care of his patients. For example, the sudden influx of seven dangerously ill patients quoted above involved the filling in and signing of twenty-one forms of notification of dangerous illness, fourteen requests for pathological examination and seven case notes before real progress could be made with their care. A high percentage of burns patients were officers and aircrew and medical board forms had to be prepared in addition to completion of case notes before any of these patients could be discharged. A clinical secretary, who was a shorthand typist, was therefore provided for each centre. (*See* also Volume on Surgery in this Series. Chapter 7).

THE MAXILLO-FACIAL CENTRES

At the outbreak of war there was no dental surgeon trained in the specialised care of jaw injury nor had the general surgeon any particular experience of these matters. The attachment of surgeons to East Grinstead to study plastic surgery in particular relation to the treatment of burned patients brought them into contact with the other activity of that centre, the specialised treatment of jaw injury which is commonly referred to by the term 'maxillo-facial injury'.

It was obvious that the work of surgeons in this field was strictly curtailed in the absence of a dental colleague trained in the control and care of jaw injuries. In September 1941 a dental surgeon of the Royal Air Force was first attached to East Grinstead for training. One doubly qualified dental surgeon who had experience of this work in civilian life, was attached for duty to the plastic surgery centre at Hill End, St. Albans towards the end of 1941, to assist in the treatment of R.A.F. cases admitted there; he also acted as Registrar for these cases, later being provided with a small staff to deal with routine Service matters.

The regular officer attached to East Grinstead in 1941 was the first dental surgeon to be sent for training in this specialty. The course lasted six months; at the termination of this period he was posted to the hospital at Ely to open there the first Royal Air Force Maxillo-facial

Centre in midsummer 1942. The Royal Air Force at this time appointed Mr. W. Kelsey Fry (afterwards Sir William) to be their Civilian Consultant in Dental Surgery, the first to be appointed. Dental mechanics were attached to East Grinstead to learn the technique of preparation of cap-splints and the various attachments required in the fixation and control of fractures of the jaw bones. (*See* Surgery Vol., Chapter 9.)

Dental services in the hospital at Ely until mid-1942 consisted of the provision of a dental surgery and the attendance of a visiting dental officer from a nearby station once weekly as a routine and when called in an emergency. The scheme for maxillo-facial treatment called for the provision of greater space and more elaboration of the equipment of the dental surgery. A room next to the surgery was appropriated and works services installed the necessary gas, water and electricity supplies to the furnaces, sink and electric motors required by the mechanic. The approved technique for the control of fractures was the use of cast silver cap-splints fitted to the teeth, as being a more positive and absolute fixation than interdental wiring; this involved the making of splints for individual cases. An elaborate laboratory, placed near the dental surgeon so that he could easily supervise the work of his mechanic, was essential for the purpose.

The establishment of the hospitals had to be adjusted to carry the dental surgeon and mechanic upon the strength of the unit; until this time, except where it was convenient, as for example overseas, hospitals did not carry dental personnel upon their strength. Usually the dental staff were posted to the station and the surgeries were located at the station as distinct from the hospital, the dental surgeon being called in by the hospital staff as and when necessary. As a result of conferences early in 1942, the appointment of a dental consultant and the training of general surgeons in the care of jaw injuries, closer contact and collaboration became possible and the Service benefited by being able to take care of these cases more efficiently and with greater speed. It was not always possible to send such patients long distances to the E.M.S. Centres upon which reliance had hitherto been placed; in addition, these centres were dealing with large numbers of cases arising from civilian casualties in bombing attacks.

The long course of six months' training was applied to dental officers selected to specialise in this branch, and others were attached to East Grinstead for short courses of two weeks in order to produce a large number of surgeons capable of affording efficient first-aid control of jaw injuries. The partly trained plastic surgeons and dental surgeons of the burns centres and the maxillo-facial centres formed teams located at the larger hospitals. This was not quite enough in itself. A maxillo-facial centre was opened at Ely Hospital in June 1942 and within the next three months Halton and Cosford were similarly equipped. Rauceby

and Wroughton (Wilts) later opened centres. It was still necessary to take specialised help nearer to the scene of reception of the casualty, so that each centre formed mobile teams to go out at call to special cases.

The mobile teams had call upon transport, and special cases of instruments were prepared and issued to the dental surgeon to enable him at very short notice to provide first-aid measures in the fixation of jaw injuries. Depending upon circumstances, teams were completed by anaesthetists and theatre sisters as occasion required. A call upon this type of team came speedily after the formation of the first. A casualty was received in a station hospital with a gunshot wound of angle of the mandible; the missile divided the base of the tongue after fracturing the mandible and lodged in the opposite side of the face. The surgeon intended to suture the tongue which, uncontrolled, fell back and obstructed the airway. Early in the anaesthesia there was severe spasm of the glottis and free haemorrhage into the pharynx. The surgeon performed tracheotomy and called out the team, based some sixty miles away. The expert anaesthetist took over, the tongue was sutured and the mandible controlled by wiring, blood transfusion was given and the patient was fit to be transferred to the centre two days later.

PLASTIC SURGERY

As has been recorded, no trained plastic surgeon existed in the R.A.F. in the early days of the war and the Service had to rely entirely upon its civilian consultant and the E.M.S. Centres, particularly those at East Grinstead, St. Albans and Basingstoke (Park Prewett) and, in Scotland, Stracathro Hospital, Brechin; Bangour, West Lothian and Ballochmyle, Ayr. By the later months of 1941 and early in 1942 surgeons who were trained in the rudiments of plastic and maxillo-facial surgery became available. Their training had been too short to enable them to be anything but novices in this extensive and complex specialty, but their introduction had been concentrated and thorough. Each soon dealt with the immediate needs of his burns cases and spread the field of activity to collaboration with the orthopaedic surgeon in his cases where skin wounds complicated treatment of fractures. Soon only the most severe cases were being transferred to East Grinstead. To supervise and advise the surgeons at the burns centres, the civilian consultant undertook a tour each fortnight to visit each centre.

In 1943 the Royal Air Force Plastic Surgery Centre was opened at Princess Mary's Royal Air Force Hospital, Halton, on the top floor of a building designed as its infectious diseases annexe. Little adaptation was required for the purpose of plastic surgery, this annexe having its own operating theatre. It was near the general hospital and so enjoyed the full facilities of staff and equipment, with immediate access to pathological

and bacteriological laboratories. To this centre came transfers from the burns centre at Halton in addition to facial gunshot and bomb injuries and orthopaedic problems requiring the aid of plastic surgery. There was accommodation for forty beds, divided into four 8-bedded and two 4-bedded wards. It acted as an intermediary between the burns and maxillo-facial centres and the E.M.S. Centre at East Grinstead with its consultant in this branch of surgery. The burns centres were not established for long-term cases but for the reception of early cases and their immediate care. The long-term surgery of reconstruction and relief of disabilities and disfigurements demanded prolonged hospital care with intermission during which rehabilitation was essential. It was proper that the next stage in development of the service should be the establishment of this separate centre for the practice of plastic or reconstructive surgery.

ANCILLARY SERVICES

This necessarily brief survey of the conception and development of plastic surgery in the Royal Air Force would be incomplete without reference to those other activities, allied closely to its own, which are described under separate chapters. Several administrative points come to notice in the care of these patients.

Originally six months was the period within which a patient must be rendered fit or invalided. This was too short to retain burned patients in the Service. The period was prolonged until eventually the long-term scheme became operative, which, in selected cases, enabled patients to be retained in the Service and kept under treatment for two and a half years. By this provision the benefit derived from reconstructive surgery was retained for the use of the Service in very many instances. Similarly, at first holders of acting rank who were incapacitated lost that rank and with it the higher rate of pay, at a very early stage of their incapacity. Later, this period was also extended, especially where the incapacity was due to specific conditions of service.

These concessions were of very great importance to burns cases from the point of view of morale. In few conditions is it so important to maintain a hopeful progressive outlook as it is in the treatment of severe burns, which are prone to bring lethargy and despair in their immediate train. The early deprivation of rank, pay and career militated heavily against those earlier cases.

The care of personnel who were too badly injured to be retained in the Service, but might be employed in civilian life if suitable work could be found, became a particular care of the Air Ministry, which formed a special department (P.5) for the purpose. This department was extremely helpful in its liaison with the Ministry of Labour in finding suitable employment for such patients.

In this connexion history would be incomplete without mention of the 'Guinea Pig Club' formed by the banding together of those Royal Air Force patients whose burns had been sufficiently severe to require transfer to the personal care of the Consultant at East Grinstead; this was the sole requirement for membership, the aim of the club being the welfare of its members. At an annual meeting each member able to attend is surveyed by the Consultant and any surgery which may still be required is arranged. At the same time inquiries are made into the welfare of each member. With the help of Air Ministry (P.5.) and, in particular, of the R.A.F. Benevolent Fund this club was able to announce that, of over 600 members, only one was failing to earn a sufficient living in 1950.

Considerable interest was taken by the general public in the activities of this club both during and after the war years and it was due in part to the good offices of the many friends of the organisation that the morale of the patients was kept at an exceedingly high level during the often protracted period of treatment. The club organised outings of all descriptions for the member patients, and did much to help them to forget or disregard the disfiguring nature of their injuries and overcome their reluctance to appear in public.

The centres which were set up to promote effective rehabilitation of burns and plastic patients are described separately. Here it must suffice to record the special value of the work they did in this speciality. Prolonged stay in hospital is the worst treatment for most of these cases, yet in plastic surgery, probably more than in any other speciality, time is a great healer and the surgeon assists nature from time to time in the progress of a case towards finality. The intervals between definitive treatments were spent in these rehabilitation centres, which concentrated upon the return of function and the resolution of tissues after injury, so vitally important in the case of burned hands.

Special dietaries were necessary for burns centres and for treatment of jaw injuries. High protein diets were prescribed for burns cases early in 1941 on a local basis and later, in 1942, this need became officially recognised and was circularised to all Royal Air Force hospitals. Cases with jaw injuries required very special care. Diets had to be arranged in small semi-fluid feeds two-hourly in order to give adequate nourishment to patients whose jaws were splinted and fixed together, otherwise the fatigue of taking larger quantities at the set meal times occasioned waste and insufficient intake.

Little has been said of the work of the station medical officers in connexion with burns. Tannafax jelly was the original issue to all sick quarters as the dressing for burns. With the discontinuance of tannic acid treatment, medical officers were advised to protect burns from contamination by enclosure in sterile, or at least clean, lint or linen. Vaseline

gauze was advised where definitive treatment might be delayed, but was not an ideal first-aid application. Plasma transfusions were made available to all sick quarters early in the war but the underlying policy urged upon all was transfer to a burns centre, or at least to an efficiently established hospital, immediately, as the prime objective. In May 1944 a D.G.M.S. pamphlet on *First Aid Treatment in Burns* was prepared and issued.

Liaison between flying and medical personnel was maintained continuously in an effort to minimise the risk of burns from petrol leakage in damaged aircraft. In 1940 and 1941 different types of flying clothing were experimented with, but research into the fireproofing of materials did not yield any really satisfactory results, as the resulting suits were too bulky for flying purposes. Throughout the entire war period, however, equipment was constantly modified and the final standard flying-suit, consisting of an inner woollen overall and an outer overall of a canvas-type material, offered very considerable protection against burns. It was found that many burns of the face and hands were due to aircrew failing to wear their helmets, goggles or gloves and every effort was made to publicise the very real protection afforded by these articles of equipment. Numerous instances occurred of personnel escaping from badly damaged aircraft, their only injuries being burns sustained on areas of the body left uncovered due to carelessness, as for example, by holes in gloves. Later in the war, the risk of burns was lessened still further by the improved design of aircraft which incorporated, wherever possible, features specially designed to reduce the risk of fire.

The exact number of cases treated by the various burns centres and other units over the war years is difficult to assess, particularly as many of the cases were suffering from multiple injuries and were, at one and the same time, under the care of several specialists. The following figures are, however, reliable and are indicative of the numbers of cases which passed through one of the larger centres. From its inception for the treatment of Royal Air Force casualties until 1945 a total of more than 1,300 burns cases were treated at East Grinstead and of this number 877 were from the United Kingdom. Of the total number of cases, 740 may be considered to be satisfactorily settled in civilian life, through the aegis of the 'Guinea Pig Club', Air Ministry (P.5.) and the R.A.F. Benevolent Fund.

REHABILITATION

When a patient recovers from an injury or illness there is usually a period during which he is fit enough for discharge from hospital but not sufficiently recovered to resume duty even of a light nature. In the past it was customary to grant a period of sick leave before return to duty.

In 1940 the R.A.F. introduced a system of treatment which was broadly divided into three parts: the necessary surgical or medical hospital treatment, the early restoration of function, and the removal of the patient from a hospital atmosphere to surroundings conducive both mentally and physically to early recovery with further treatment. Rehabilitation, as the last two parts of this system of treatment are called, was developed after the Battle of Britain at the Officers' Hospital, Torquay, and at the Convalescent Depot at Blackpool, and was introduced in part into the routine orthopaedic treatment at R.A.F. hospitals elsewhere. Specially trained orderlies gave five minutes' exercise each hour to patients in the wards to improve general body tone, and special exercises to individual cases, on the instruction of medical officers. At the same time every effort was made to make rehabilitation as pleasant as possible by abolishing many routine rules and regulations and by creating the atmosphere of a country club. The success of such a procedure hung in the balance in the early days until it was realised by the patients that the success of the relaxation of general discipline depended upon personal discipline and good behaviour.

The system adopted proved so beneficial that in 1941 it was decided to expand the existing centres and create new ones. Torquay Hospital and the Blackpool Convalescent Depot were enlarged and other rehabilitation centres were opened at Hoylake and Cosford. In 1942 it was necessary to expand the scheme still further and Loughborough College, with its playing fields, gymnasium, and swimming baths, was taken over.

Rehabilitation had, by then, become so much a part of the system of treatment that it was eventually extended to patients with simple conditions, such as herniae, before operation, so that their abdominal muscle tone could be improved in advance and so that they would know what exercises to do after operation; in this way weeks were saved in getting patients back to full duty. They were also encouraged by every mental and physical means to move their muscles and joints themselves within the limitations set for treatment. Each ward had its own rehabilitation orderly and once the patient was up and outside he came under the supervision of a specially trained physical instructor, who worked under a medical officer. The early restoration of confidence in the use of a damaged limb or spine was rapidly effected and the spirit to get well was infused into new convalescent patients by the example set by those who were well on the way to recovery after similar injuries. Those undergoing rehabilitation were kept fully occupied by getting six hours' treatment a day in one form or another, and, while they were left to their own devices in the evenings, concerts, dances and other forms of recreation were organised and could be attended at will. As many as 82 per cent. of patients were fit to resume full duties in their trades at

the end of their stay at a rehabilitation centre, and in a shorter time than similar injuries treated by more conservative methods. Others were sent back to hospital for further treatment when necessary, after which they were always anxious to return to their original rehabilitation centre to complete treatment.

This introduction to the subject demonstrates that the treatment of seriously injured traumatic cases falls into two distinct, separate phases. In the first, hospital treatment is needed to save life and to start the patient on the return to health; in the second stage the patient is out of danger and is no longer in need of skilled medical and surgical attention but nevertheless he is still functionally only at the beginning of the road back to complete mental and physical health. It was for this extremely important second phase that the rehabilitation centres were responsible. As the work of these various units was very similar, and in fact every effort was made to standardise treatment, it is perhaps best to illustrate the scheme by describing first the work at one of the best known general hospitals in the early days of the war and then to consider a medical rehabilitation centre during the latter part of the war, where the organisation, having profited from past experience, was reaching its peak of efficiency. The first unit to be described will be R.A.F. Officers' Hospital, Torquay, where the scheme was first started, and the second the R.A.F. Medical Rehabilitation Centre at Loughborough, a typical example of a well-established centre.

ROYAL AIR FORCE HOSPITAL, TORQUAY, JUNE 1940—MARCH 1941

At the beginning of the war the Air Ministry requisitioned the Palace Hotel, Torquay, for use as an officers' convalescent hospital, and the hospital was opened in October of 1939. It was designed to take all types of cases, medical, surgical, orthopaedic and neuropsychiatric, and was ideally situated from an environmental point of view, with its proximity to the sea, lovely gardens and magnificent approach and putting course, swimming pool, squash courts, gymnasium and indoor tennis courts.

There were four main problems confronting those in charge of the organisation of this hospital:

(*a*) how best to maintain discipline in a group of patients, a large number of whom were at the end of their career, particularly in a town where there were some three thousand Royal Air Force aircrew cadets, who were at the beginning of theirs ;

(*b*) how to produce an organisation within the hospital so that these patients might be made mentally and physically equivalent to what they were before they became sick or injured ;

(*c*) how to satisfy the professional urge of the medical staff of the hospital ;

(*d*) to decide how to make the best use of the various excellent facilities available at this hotel.

As a result of the experience gained during the first few weeks, it was realised that the application of the ordinary, accepted Service discipline was inappropriate for the control of, for example, the average fighter pilot who had been wounded in aerial combat with the enemy. The psychological truism that these patients would in almost every case project their aggressive instinct, which at that time had been stimulated to the highest degree, on to the doctor, the hospital or both was only too apparent; also any action on the part of the executive staff of the hospital would produce an equal or greater reaction on the part of the patients. At that time great difficulty was experienced in retaining patients either willingly or unwillingly within the confines of the hospital—Torquay was at that time overcrowded with evacuees, generally of the more affluent type, from London, and these pilots were looked upon as heroes and were correspondingly treated. Many complaints were received from Royal Air Force Police Authorities regarding the behaviour of these patients in the town. The design of the building was not applicable to retaining up-patients under control. It was found to be an entirely different problem from that of a general hospital where the majority of patients are confined to bed. Strict Service discipline was found to fail on practically all counts, as these patients in the majority of cases had nothing to lose, and even those whose mental state of aggressiveness gave them an overpowering urge to return to flying, thought they could best achieve their objective by making a nuisance of themselves in the hospital. At that time rehabilitation was a little-known word. It was a conception that was born out of necessity due to the urge in the Royal Air Force to send its skilled personnel back to the fight, as pilots at that time were urgently required; and it was essential that every member of the Royal Air Force should be put back on his job after the shortest possible period of non-effectiveness.

A staff meeting was called and a frank discussion of these problems took place. The basis of the approach to the subject was the 'inculcation of the will to get well'. In a number of cases the urge to get well was there, and an analysis of the cases in hospital showed that approximately 15 per cent. would get well anyhow without influence by any organisation; another 15 per cent. due to burns, bad orthopaedic injuries or an unsuitable neuropsychiatric constitution would never get well, leaving some 70 per cent. who could be influenced by medical and surgical treatment, mass suggestion, and an appropriate organisation designed to rehabilitate them in the widest sense to be fit to perform their duties in the Royal Air Force.

In order to retain patients within the hospital confines willingly, the original suggestion of having a bar to sell wine and beer, but no spirits,

was put forward. Dances were organised, at first on a monthly and then a weekly basis, concerts for patients by patients were arranged, and endeavour was made to put the excellent cinema which was already in the Palace Hotel, into working order; this unfortunately failed in the early stages due to lack of technical equipment and knowledge. The magnificent gymnasium, which was being used as a barrack room for airmen, was made available for patients by requisitioning a house as an airmen's hostel; another house was taken over to store the furniture of the Palace Hotel, which was at that moment occupying all the available space in the two indoor tennis courts; golf competitions on the excellent putting and approach course were organised; squash competitions for the not-so-fit, and for the fit were established; a swimming gala was held once a fortnight; regular swimming classes—probably the best non-weight-bearing exercise—were instituted. Thought-provoking activities such as short talks and lectures were gradually made a feature of life in this hospital. All these innovations came slowly, and not without overcoming difficulties of prejudice and acute shortage of appropriate staff.

One of the first problems to be solved was that an appropriate personality should be obtained to act as a physical fitness officer for this hospital. Fortunately, a suitable officer was already working with the Initial Training Wing of No. 54 Group and this instructor was eventually posted to the hospital staff. An appropriate physical training instructor was also required, and again a suitable officer was obtained. In order to correlate the various mental, physical and social activities required to make this organisation a successful one, a patients' entertainment committee was formed, consisting of a senior member of the medical staff acting as chairman, members of the medical staff and four volunteers from the patients. This committee met weekly and the programme for the week was agreed upon. The patients welcomed the new idea that this organisation could be run by patients for patients. They felt that they were an integral part of the establishment, and that their wishes could be implemented, provided that the aim, that is, 'the inculcation of the will to get well', was maintained. A hospital magazine started as a weekly typescript sheet and this very soon developed into a printed magazine called the *Torquay Tatler*, a self-supporting paper paid for by the advertising space. In the first issue a light-hearted explanation of our aims was written by the late Wing Commander Donald Bateman, and this article was reprinted and handed to every patient on arrival. It was entitled *Drugs without Tears*. As the publication of this pamphlet was an important stepping-stone in the education of the patients, it is reprinted here in its entirety as Appendix A.

In an endeavour to solve the problem of conditioning some twenty to thirty new, injured and possibly disgruntled officers every week, a senior

officer met all the up-patients every Monday at one o'clock in the games room. Here the programme for the week was announced, misdemeanours of the past week were made to look absurd, and the maintenance of discipline was encouraged by influencing public opinion. The organisation at this time was making slow but steady progress and it was indeed fortunate that at this stage the Air Member for Personnel himself was admitted as a patient, and becoming convalescent soon realised the ideals and aims of the hospital and requested that some of the problems be summarised in a semi-official letter to him. As this is an important letter it is quoted in its entirety at Appendix B. It will be seen from this letter that the hospital, by summarising some of the information obtained from the patients, was able to help in the problem of maintaining operational efficiency. Even at this time this method of handling difficult Royal Air Force personnel was not yet entirely accepted by the official mind.

A milestone in the evolution of this hospital was the first visit of the civilian consultant in orthopaedic surgery. A pioneer in rehabilitation in civilian practice, he understood at once the problem of this hospital. An orthopaedic centre was formed and all up-patients spent the entire morning in the gymnasium exercising their injured limbs by remedial exercises and appropriate games. The organisation of these exercises and games was very carefully planned and, despite the diversity of the injuries which the patients had sustained, it was usually possible to group them into classes of similar injuries at approximately the same state of repair. The classes were devised to take the patients progressively through a series of exercises, beginning with the simplest and in many cases passive exercises and ending at a stage at which strenuous team games were attempted. It is stressed, however, that the patients were always very carefully, although unobtrusively, supervised by both the medical and physical instruction staff, in order to prevent them from attempting more than was wise at their stage of recovery. Considerable ingenuity was needed to devise exercises which were both helpful and interesting and which could be attempted by patients often wearing heavy and restricting casts. Nevertheless, it was found possible for patients encased in complete plaster jackets to engage in such games as squash and volley-ball, a practice which would have been considered inadvisable in the days before the war. The object behind all these exercises and games was to instil a team spirit, so that progress became not an individual problem but a communal obligation. Thus a friendly feeling of rivalry was created between the classes and in this atmosphere it was an easy matter to encourage the weaker brethren by the obviously faster progress of other similarly injured patients. In order to retain the patients within the confines of the gymnasium for the whole morning, a milk bar staffed by wives of the staff and friends of the establishment was built adjoining the consulting room. It was appropriately decorated

with a frieze of an injured airman on crutches arriving at the hospital, going through the exercises, and eventually walking away a man fit mentally and physically to return to his job. The background of the bar was that of a Wellington aircraft in flight, with a Spitfire on the left, and a Hudson on the right, symbolising Bomber, Fighter and Coastal Commands respectively. Milk shakes and coffee were served and even the less-active patients came down to watch the games and remedial exercises.

By October 1940 considerable progress had been made. Discipline was improving and patients were taking much more exercise willingly. Unfortunately great difficulty was experienced in heating the indoor covered tennis courts to a sufficient degree to enable injured personnel to take exercise, and this drawback was never entirely overcome. The problem of the 'bright lights' of Torquay had not been solved, but many more patients were staying in the hotel at night. The bar was a great success and no difficulty was experienced in maintaining control. The bar staff were briefed on pain of dismissal not to serve alcoholic refreshment to a patient without the permission of his medical officer. An atmosphere of endeavour seemed to pervade the establishment. The Battle of Britain had been won and the emotional fervour sweeping the country at the time seemed to be epitomised in the keenness the patients were showing to get back to work.

At this time the Battle of Britain had produced a fair number of neuropsychiatric casualties among Royal Air Force officers and it was decided to send these to Torquay, as Matlock was not found to be completely satisfactory for these cases from an environmental point of view (*see* account of Matlock Hospital, Chapter 5). The advent of a neuropsychiatrist and these non-selected cases was resisted strongly by the medical authorities of the hospital, as it was felt that, if the proportion of neuropsychiatric cases became greater than that of the orthopaedic cases, then the spirit of endeavour and the will to recover would be jeopardised. Moreover, the fact that a patient was sent to the neuropsychiatrist for consultation tended to stigmatise him in the eyes of his fellows as a 'mental' case, an entirely erroneous assumption in the majority of instances. A point here to be remembered is that every physical trauma as a result of flying in the face of the enemy produces some degree of psychological injury and sometimes these cases also were referred to the neuropsychiatrist. An endeavour was made without success to limit the number of purely neuropsychiatric cases to one to every ten orthopaedic cases. A small dilution had a good effect on the neuropsychiatric cases, by virtue of the high morale of the orthopaedic cases, and had no deleterious effect on the morale of the latter patients; unfortunately, the numbers of unselected neuropsychiatric cases grew and great difficulty was experienced in maintaining the morale of the hospital as a whole, and the continued cult of activity in general.

The Royal Air Force approach to the problem of rehabilitating Service personnel, which was considered by many to be rather revolutionary in its conception, had by this time attracted a great deal of interest from both the medical profession and the laity. Numerous reporters visited the hospital and considerable publicity was given to the aims and objects of the establishment. The Surgeon-General of the American Army Air Force was among the visitors and, to judge from subsequent comment in the American Press, found much of interest in the organisation and management of the patients.

In the early days the whole project had justifiably been looked upon with some misgiving, but the obvious success of the scheme changed the official attitude and wholehearted co-operation and assistance became available on all sides. One major point had become abundantly clear from the survey of events to this stage, namely, that rehabilitation centres should be set up entirely divorced from the general hospitals. This view was founded on the theory that the atmosphere of a general hospital, with its diversity of patients, a percentage of whom inevitably, despite all possible treatment, would become permanent invalids, did not provide the psychological background so necessary to a rehabilitation unit. It was decided therefore, in order to obtain the maximum benefit, to set up entirely separate and self-contained medical rehabilitation units. The next section of the narrative will show how this object was achieved.

MEDICAL REHABILITATION UNIT, LOUGHBOROUGH, 1944

By December 1943 nearly three years later, very considerable further progress had been made and at the Medical Rehabilitation Unit, Loughborough, a first-class organisation for the orthopaedic rehabilitation of officers was being implemented, although, owing to lack of gymnasia and technical accommodation generally, the organisation in respect of airmen was not yet at such an advanced stage.

The principle of rehabilitation had by this time been accepted by all the authorities as a valuable and necessary adjunct to the treatment of traumatic injuries, burns and many medical conditions. General acceptance of the new therapy, while enhancing its prestige, had at the same time increased the difficulties of organisation and administration, for the numbers of patients passing through the M.R.Us. grew rapidly and it was not easy to provide suitable premises, equipment and staff. It was furthermore becoming apparent that the old routines and methods which had proved so suitable for the traumatic cases from the Battle of Britain were inappropriate for the diversity of cases which were now being accepted.

In the early days the majority of cases had been aircrew personnel and nearly all had been commissioned, but now the commissioned patients

were in the minority. It was clear that classes would have to be separate for commissioned and non-commissioned ranks and that senior N.C.Os. and airmen would have to be dealt with in different classes. This segregation had to be carried a step further, inasmuch as classes had to be organised to cover all the different parts of the body, so that a man might be placed, for example, in the 'leg' class. Even this classification might have to be sub-divided to allow for the different stages of repair which the injuries had reached.

Three main types of instructors were included in the large numbers of staff which were required for the expanding organisation. Medical officers with particular knowledge of rehabilitation were responsible for the purely medical side of the treatment and for general supervision of the organisation of the classes. Their task was not always easy, for while patients, without being driven, were encouraged to progress, considerable clinical acumen and watchfulness were necessary to ensure that they did not undertake exercises which were too strenuous for their immediate physical condition. The physical fitness officers in charge of the development of the exercises and training, provided the necessary psychological incentive by virtue of their personalities, being frequently chosen from among the well-known figures of the world of sport, who were often adept at maintaining the difficult balance between authority and informality. The physical training instructors, who were the actual instructors of the individual classes, were usually senior N.C.Os. who had taken very comprehensive courses in physical instruction and had a considerable knowledge of rehabilitation, massage, general anatomy and physiology. They were invariably fine athletes. All these instructors worked together as a team with the common objective of achieving maximum physical fitness for their patients in the minimum of time.

Other important members of the staff of the M.R.U. were the accountant officer and the education officer. Many patients, separated suddenly from their homes, found considerable difficulty in making suitable financial arrangements for their families and the advice of the accountant officer on problems such as these could be of great value, for it was psychologically impossible for a man to make progress if, in addition to his injury, he was burdened with financial worry. The education officer, in addition to his main function of directing classes on instructional subjects, also acted as adviser to those patients whose physical disabilities would preclude them from returning to their original trades. Patients were frequently quite unable to determine for themselves the type of work which might earn them a reasonable living, and often the ingenuity and tactful approach of the education officer led a man to take up work for which he would previously have considered himself quite unsuited.

It had been seen at R.A.F. Hospital, Torquay, that the expression of the ideals of the hospital in terms of a simple slogan, namely, 'The inculcation of the will to get well' had proved of considerable value. At Loughborough this aim was in a sense restated as 'The will to re-establish the patient mentally, socially, physically and technically'. It was towards these ends that the energies of the staff were directed and the following paragraphs will outline the steps taken to achieve their object.

The mental state of the patient was often poorer than his physical condition. The sudden transition from an active life to a hospital bed in a matter of hours was sometimes a shock comparable with any which might be produced by an actual injury. In some cases this was followed by a period of introspection during which the patient felt his injuries to be incompatible with any form of living in which he was interested. Brooding over his condition, he was left dull and apathetic, with little interest in his future and still less in the immediate need to try to gain a foothold on the road to recovery. A first-class athlete, faced with the possible loss of a leg, is a typical example of a case which would almost certainly require considerable mental adjustment.

The effect of the first impressions created in the minds of disgruntled patients on arrival at the medical rehabilitation unit was considered to be of the utmost importance. It was arranged that all new patients should be interviewed in the library by a staff of specially trained W.A.A.F. officers. At this interview every effort was made to publicise the amenities of the establishment and large notice boards itemising the social events of the week were prominently displayed. Each patient was handed a copy of the M.R.U's. standing orders. These were issued in the form of a liberally illustrated pamphlet with applicable *motifs* by well-known artists and included an article outlining clearly the aims of the establishment. The interest of the patient was usually aroused and by this means he quickly became familiar with the routine of the unit.

In most cases a receptive frame of mind was soon induced and every effort was made throughout the course of treatment to foster continued good morale. This was largely achieved by means of the social activities of the unit. Cinema shows and other stage entertainments, including shows organised by the patients themselves, became a regular feature. No effort was spared to provide a high standard of entertainment, as it was felt that the mediocre would do more harm than good. Dances were organised regularly and patients were encouraged to invite partners whenever possible, the hospital authorities doing their best to make these entertainments a success by providing bands, light refreshment and the other small amenities so important to this type of function.

Side by side with the numerous social activities there were excellent opportunities for education and for activity calculated to stimulate the mind. The excellent library was available both during the day and in the evenings. Debating societies and 'quizzes' flourished and serious instructional lectures, given by well-known speakers, proved a very popular feature with most patients. Activity in this sphere was not limited to the confines of the hospital. Visits to many factories and large firms were varied by excursions down a coal mine and on these occasions the Red Cross Society provided both escorts and, if necessary, financial assistance. The unit also ran its own paper as a monthly typescript sheet of articles, caricatures and cartoons, providing an outlet for patients with a literary 'flair' and enabling staff to disseminate information of interest to the patients. Taken collectively these activities, both social and educational, helped to provide the psychological background which was so very necessary in the majority of cases.

The physical aspect of the work of this unit is described in some detail in Appendices C and D. The organisation of the technical side presented considerable difficulty as it required appropriate staff, workshops and equipment. Practically every branch and trade in the R.A.F. was represented by patients who went to this unit, and it was found important that a man, when he left, should not only be equipped mentally and physically to do his job but should have confidence in his technical ability to perform it. A link trainer was fitted for the instruction of pilots, all of whom had to pass the link trainer course to the satisfaction of the instructor and the commanding officer, and the medical officer in charge of the case gained useful information from a patient's attitude while in the link trainer. Airman fitters (engines and airframes) were attached to the workshops and, in addition, tool kits and the engines and airframes upon which to work were provided. At first, a little difficulty was found in persuading the appropriate authorities to supply modern engines and airframes. Patients were found to resist working on obsolete engines which they knew would not be in use when they got back to their units. This drawback was later overcome and patients worked on engines similar to those used by their own squadrons or maintenance units. Similarly a wireless transmission workshop was installed and equipped with modern sets, and later, crashed radio equipment from aircraft was obtained so that patients could strip the sets down and rebuild them. The air gunners were provided with an armament workshop in which every type of machine-gun and cannon was represented. A good rifle range and clay-pigeon shoot were available together with Boulton and Paul and Frazer-Nash turrets. An instructor who had been a patient was in charge of each workshop and weekly reports were rendered to the medical officers in charge of cases. For navigators there was an appropriately equipped navigation room, which

also served as an intelligence room. The weekly intelligence reports from all Commands, accompanied by the weekly summary of the R.A.F. and the U.S.A.A.F., were supplied. Maps of the war fronts were hung so that the day-to-day changes in the position of combatants could be recorded. This enabled patients to keep in touch with the movements of their squadrons in particular and the Air Force in general.

The work of the unit was considered by the authorities to be of such high standard that it was judged proficient to assess patients in their trades before discharge from the unit. Patients were sent from hospitals with the following annotation, 'to proceed to M.R.U. Loughborough, where his ability to perform technical duties in the R.A.F. can be assessed in the rehabilitation workshops'. Accordingly before each man left Loughborough his ability to perform his duties in the R.A.F. was assessed by the instructional staff and notified to the medical officer in charge of the unit to which he was posted.

SUMMING UP

In the two foregoing accounts an attempt has been made to outline, in a relatively small space, an organisation which has grown from a small nucleus into a large and highly organised system. At its inception, the idea was justifiably looked upon with some doubt, but at its peak of success the organisation had the whole-hearted co-operation of all the authorities and utilised the services of many highly skilled medical officers and instructors. In the Royal Air Force there were at one time five separate M.R.Us. and all the larger hospitals were equipped with the facilities required to start the patients on the initial stages of treatment before transfer to the M.R.Us. proper. In 1945 the number of beds equipped had reached a total of over a thousand, a figure which dispelled any possible doubt as to the value of rehabilitation in a diversity of medical and surgical cases, and reflected credit on the organisation itself, particularly the authorities who had backed the project in its early days. The number of cases that passed through the M.R.Us. was both large and diverse and it is worthy of record that the establishments were able to rehabilitate large numbers of our prisoners-of-war in the later stages of the war, a task which must have been far from the minds of the original organisers, although perhaps the success of the M.R.Us. in this direction proved their adaptability. Throughout the war the M.R.Us. rehabilitated over thirty thousand patients and created an organisation which medical authorities all over the world have seen fit to copy both in method and in spirit.

Plates XXXIX to XLII illustrate some of the activities of Rehabilitation Centres.

APPENDIX A

HOSPITAL BROADSHEET

DRUGS WITHOUT TEARS

September 1, 1940

This is the first time that the hospital magazine has appeared in print. It is a proud moment. Hitherto it has been offered to its small public in typescript. Now, although not wishing to increase the size of our public, we do wish to appear before them clothed in greater dignity and in a more durable form. So—as we are—here we are. It would seem, therefore, not inopportune to make full use of this moment by summarising the varied features of the life of this institution. Such a record may serve to amuse those who have seen the hospital grow and to modify the apprehensions of those to whom hospitals connote tedium and morbidity.

Though a man comes sick to hospital he should leave it ready for work. He should go away healthy, happy and vigorous. So it comes about that during the latter part of his stay in this institution he should be possessed in large degree by all three of those qualities. So should many others who are in the same stage of recovery as he is himself. These persons make an ever-changing, but permanent, group of lively and active individuals. We do not keep them here for their own amusement, but we do keep them until they are in such a condition as to be welcome back to units when they are discharged from here. To achieve this end we give them (or try to give them), that which any reasonable and common-sense man would seek for himself in his effort to promote his own recovery from illness.

We give them a bar; the only one in any R.A.F. hospital. True, we sell only beer, sherry and soft drinks, but after all if you drink beer you can feel fuller, and spend less money, than if you are using any other drink. And if you want whisky you can always—but what do you think this place is, anyway? a hospital? If you get yourself pneumonia you'll get the whisky; and on the house too. That bar took a lot of struggling for; good men battled long and hard against bureaucracy for it. Good behaviour will keep it going. Is this putting too much of a strain upon the R.A.F.? Time will tell us! There is, of course, a scientific basis back of all this; we want to know whether Fighter Command drinks more than Bomber Command, or whether A. & S.D. leads the field—which last reminds us; perhaps we should have sold whisky after all.

So much for alcohol. What else? No one can get fit on liquor alone. To relieve the boredom of inter-bar hours we provide other amenities. Two squash tournaments a week; the first for the very fit, the second for the not so fit. A mixed doubles tennis tournament every Monday; bring your own partner or ask us to find one for you. Not bad? Each Sunday after dinner (or supper, you snob) a lecture of as wide an interest as possible; Leonard Crawley on golf, Leonard Crawley on cricket, Leonard Crawley on—but you get the idea? Variety and interest every time. On Tuesday evenings we have 'short talks'; being five patients talking each for twenty minutes on any subject that they really know something about; as for example, Squadron

Leader Joelson on 'How to keep a Chimpanzee', Pilot Officer Schilling on 'How not to starve as a Film Extra', and Flight Lieutenant Roberts on 'Life in Hollywood'. But—no fooling—this is a good evening and we get a lot of fun and interest from it.

There are other things that should have been put in with the games. Once a fortnight there is a swimming Gala in the baths.

Where else? The standard is low—very low; in fact if you can't swim you are still allowed to enter for the races; you just dive in and drown. There is a weekly golf tournament on the approaching and putting course. That is a medal competition. But we sometimes have a knock-out tournament also. The theory of this one is simple, and interesting; it just goes on until all those who are left in the competition have left the hospital—then we start another one. Rather cute, eh? No winners, no prizes. Just like your club at home. Well that's the idea; we want you to feel at home—and who do you think is going to figure out about that prize we are always offering if the final should ever get played.

Sometimes, in fact quite often, we have a dance until a discreet 2330 hours; sometimes a concert, which we hope won't go on for nearly as long as that. We get big stars at the concerts; Nick and his Hill-Billy Band were a sensation —but definitely yes, they were. We get E.N.S.A. too. I mean the whole thing is good, you see?

We do our best to avoid monotony. I have already described some of the ways in which we do this. But we go further. A patient may—by appointment, through the proper channels, and with no more delay than the dignity of the Service demands—see a doctor. In fact once a week he's *got* to see a doctor. But honestly, no harm usually comes of it.

From the foregoing it should be clear that unless each patient comes properly equipped he will not get the best advantage out of this institution. We strongly recommend that he comes with some form of disease; if he does not his stay is likely to be extremely brief. We also recommend that he choose some disease that doctors can cure—this naturally limits his choice very much—but failing this his stay is likely to be tediously long. To use the word equipment more precisely however, we would point out that if you do not bring tennis things you cannot play tennis, no squash things no squash, no bathing suit no bathing and so forth. But we *do* provide tennis racquets, squash racquets and golf-clubs. We provide the implements but not the clothes. To be absolutely precise, we can fit anyone up for any game lending him the outfit for a few days until he has acquired his own; but as this is only a temporary measure we suggest that it is best to come provided with your own things from the start.

Finally, we have an organisation called the Patients' Entertainments Committee which meets each week and which makes arrangements for the coming week, listens to any complaints which may be raised and tries to put into operation any improvements which may be suggested.

And, in case you have not got the right idea about what we are and what we do by now, we are willing to answer any questions by correspondence. But we do not cash cheques. For this you must make arrangements with your own bankers in the town.

APPENDIX B

LETTER TO THE AIR MEMBER FOR PERSONNEL

R.A.F. Officers' Hospital,
Torquay,
Devon.
16.11.40

Dear Air Marshal,

Herewith are Wing Commander Rumball's notes on the occurrence of fatigue and flying stress in operational fighter pilots. These notes have been compiled from interviews and examinations of fighter pilots, approximately 50 each week for the past month. I think the points which need stressing are as follows:

(1) The feeling, under the present conditions, of the inevitability of death or a period of invalidism due to wounds or fatigue.

(2) The importance of alternating employment at an O.T.U. at the end of the peak plateau of their efficiency; i.e. 200 hours. I think that if a man is returned to an O.T.U. when he is feeling fighting fit and anxious to continue fighting, you are certain then of getting him away at the optimum moment. He then can be returned to operational duties after a short period at the O.T.U. Under these circumstances, I think that he would maintain the peak plateau of his efficiency for a much longer period.

(3) I feel that frequent periods of short leave are preferable to infrequent long periods, and dates of this proposed leave should be known to each individual pilot.

(4) Until some changes as above outlined become effective it is almost inevitable that a large proportion of first-class pilots will become medical problems.

If these recommendations could be carried out, then the problem of fatigue and flying stress would become less acute, and the principle of conservation of skilled personnel maintained.

My Commanding Officer has let me see the Director-General, Medical Services' minute to you concerning rehabilitation of aircrews. It seems to me that the fundamental issue has perhaps eluded him. The word 'rehabilitation' has come to have rather a restricted connotation in the medical world; and it is in this sense that he has regarded it. We, on the other hand, have used it in its fullest sense. To him it has meant the functional physical restoration of cases of bone and muscle injury; to us it has meant the *mental, emotional and physical* restoration of each individual. To us it has meant the fullest re-equipment of each individual, mentally and physically for his specific job, and the excitement of his will to perform it.

We have endeavoured to achieve these ends—and think we have been in some degree successful—by the following means. We have restored physical function by standard medical and surgical means and by planned courses of physical exercise. We have employed pleasant physical exercise in every case in the hospital for the purpose of maintaining morale by occupying the mind and body in communal effort, this being the first step towards overcoming

ennui and inertia in tired persons—to which group belong nearly all our patients. This exercise has taken the form of mildly competitive squash, tennis, golf and swimming under the first-rank personality of our games officer.

But that is not all: nor indeed is it enough. We have provided also such mental occupation as prevents boredom and engenders a feeling of warmth and united effort in the institution. This warmth is indispensable; in its absence all attempts to restore morale inevitably fail. This end we have tried to encompass by providing within the hospital such a range of diversions as to render it unnecessary for a patient to go outside in search of amusement. This reduces the strain upon each patient's pocket; a most important consideration since it is financial worry that so often retards the recovery of mental ease in young pilots. That is why we had to ask for a bar in the hospital; it is better that a patient should drink inexpensively under observation than extravagantly and at large. The foregoing diversions take many forms. Salient forms are: concerts organised by patients for patients, lectures every Sunday night (the subjects always being carefully scrutinised), weekly 'short talks' in which an exchange in life experiences is indulged in by members of the hospital, and finally various other indoor games and activities.

All the engagements so far outlined are co-ordinated by the Patients' Entertainment Committee (composed of staff and patients) which meets every Sunday morning. This committee deals with every complaint and desire that the patients represent, it is a form of liaison between staff and patients, and it welds all activities of the hospital into a united whole. No one is forgotten, all are employed, and the corporate spirit of the R.A.F. predominates.

That is what I mean when I talk of 'rehabilitation'. *That* is what is nowhere provided for non-commissioned aircrews in a separate establishment; and what is needed by them perhaps more than by officers. We think that we have elucidated the principles involved and that we have proved their worth.

The Air Member for Training paid us a visit yesterday evening and appeared to be extremely interested in the use that could be made of experienced pilots, who are unfit for operational flying, but could be used for training. He read Wing Commander Rumball's report and as I had said that I was writing to you, he wished me to mention that he would have liked to talk to you about it. Rumball and I have collected the necessary material to talk to Air Vice-Marshal Babington at any time now, should you wish us to meet him.

I hope you are keeping fit and are managing to get some sleep.

Our Poles gave us some extremely good folk-singing at our concert last night. The leader of the Hill-Billy turn was the new Fighter Command V.C., Flight Lieutenant Nicolson.

Thank you very much for your kind letter, which gave all of us great pleasure.

Yours very sincerely,

C. J. S. O'Malley

Air Marshal E. V. Gossage, C.B., C.V.O., D.S.O., M.C.
Air Member for Personnel,
Air Ministry,
London, W.C.2.

PLATE XXXIX. Rehabilitation. Advanced rehabilitation class.

PLATE XL. Rehabilitation. Ball class on roof.

facing p. 328

PLATE XLI. Rehabilitation. Woodwork class.

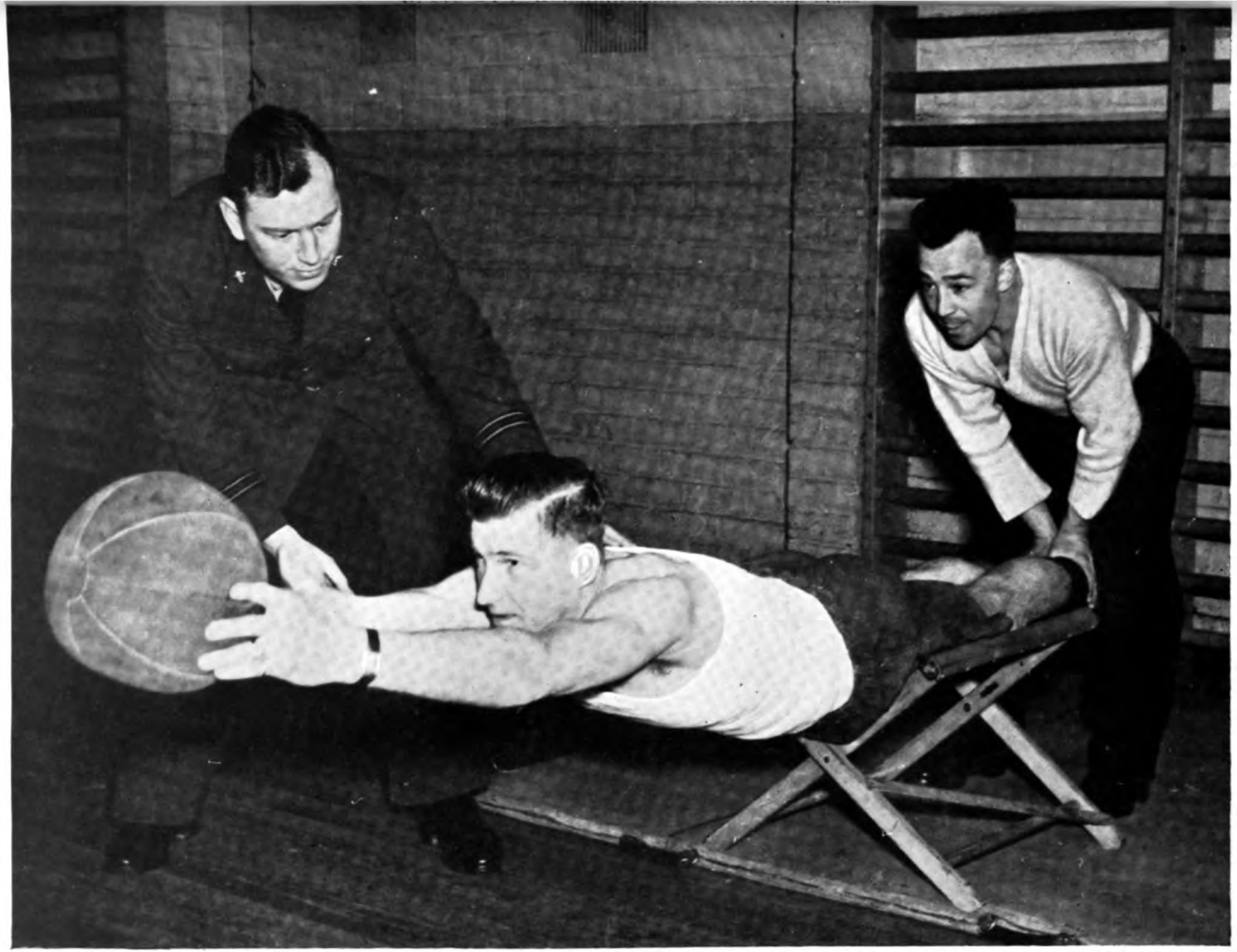


PLATE XLII. Rehabilitation. Individual back exercises.

APPENDIX C

BASIC SCHEME OF REHABILITATION EXERCISES

(Compiled by a Medical Officer with experience of M.R.Us. at Blackpool and Loughborough).

In August 1941, rehabilitation in the R.A.F. was in its early stages.

Blackpool Centre catered for orthopaedic and non-orthopaedic cases. The two types of case were entirely different entities and as such they were treated. There was one medical officer in charge of all the medical cases and there were on the average four medical officers for the orthopaedic cases.

I intend to indicate the progress which has occurred mainly with the orthopaedic patients.

As new patients were admitted they were allotted by the orderly room in equal numbers to each medical officer, i.e., if 20 patients arrived in one day and there were four medical officers, each medical officer was allotted five patients irrespective of their type of injury. They were examined on the next day and then allotted an instructor who supervised their exercises.

At that time we knew that patients were either in an active stage or a fairly inactive stage and as such, groups were divided into an early and late group. Every type of early injury irrespective of whether it was an injury to the spine, leg or arm, worked in the same group and the patients in the one group belonged to all the medical officers. The type of remedial activity was a general form of exercise bringing in special leg, arm, spine, etc. exercises.

The early cases were instructed to attend the physiotherapy department for their electrical and heat and massage treatment and the time of attending was left to the masseur in charge of the case. Therefore, it was very common to see in the middle of an exercise period several patients leaving a class in order to have their physiotherapy. It was also common to see patients with leg injury receiving only a minimal amount of specific leg exercises but carrying out a major amount of general exercises including those for the arm, spine, etc.

It was also difficult for the medical officer to know which of the patients was his own because of the fact that they were a mixed group, and, as the essential part of rehabilitation was for the medical officer to see his own cases undergoing activity, this was a major point.

Very modified games were played because of the lack of space and this was noted much more in the winter. There was only a small amount of apparatus in the early days and this consisted mainly of rowing machines, static cycles, a walking platform on rollers and several wrist exercisers.

This system carried on for several months before it was decided to attempt to obtain more apparatus. Quadriceps pulleys, arm pulleys, punch ball and ship's wheel were obtained and by a method of trial and error it was discovered that the quadriceps pulleys served very little useful purpose and in certain cases were even detrimental. The arm pulleys were found useful, the ship's wheel with a modification which consisted of a resistance plus an attachment whereby the wheel could be easily moved up and down in relation to the patient's height, was a very useful thing for spinal cases and also arm cases.

The punch ball was found to be useful and the sports equipment which we obtained was also of the utmost value.

A further stage of the progress then occurred, in that it was considered that the step up from the early to the late classes was too big and therefore an intermediary or transitory class was introduced. This class became of the utmost importance in that it consisted of patients who had just moved from the early class in addition to patients who were almost ready for the late class and sometimes three instructors were put in charge of this class. They devised different graded activities for the patients in that class. This was an important step but it still left the fact that classes were mixed, and in the middle of 1942 it was decided to divide the patients into different disability classes, each class being in charge of an instructor. The classes were divided into:

1. Knee and femur class.
2. Tibia, ankle and foot class.
3. Arms and Spines class.

Each class was sub-divided into three groups, Full Weight-Bearing Group, Medium Weight-Bearing Group and Non-Weight-Bearing Group for lower limb injuries, and in the case of the arms and spines into Fully Active Group and Intermediary Group and the Early Mobilising Group. This, without doubt, was a definite step in the progress of rehabilitation of large numbers of patients because, following this group division, it was decided that each group should concentrate on exercises which were specific for their disability in order to obtain the best results in the shortest time.

It was also noted at this time that the patients in the early class were remaining in this class for a fairly long time and this was found to be purely due to the fact that the majority of these patients were attending the physiotherapy department where active exercises were only few and far between. It was, therefore, decided to attempt to make the masseurs rehabilitation-minded and they were instructed that in addition to giving their treatment they must give remedial activities, teaching patients to walk, mobilising their stiff joints with resisted exercises and finally to instil into them that the non-weight-bearing group was a rehabilitation group with the physiotherapy side purely as an essential ancillary.

In each specific group and class the patients belonged to all the medical officers and the difficulty of knowing who was their patient was still present. In early 1943, it was decided to place one medical officer in charge of one disability group, and, therefore, if the medical officer in charge of the arms and spines group saw the arm group working, he knew that every patient in that group was his and therefore came into much more intimate contact with the patients during their rehabilitation exercise periods. It was much easier to know your patients, know their disabilities and capabilities, to take them out of their class for individual work if they were backward and therefore hasten their recovery period.

In early 1944, an attempt was made to overcome the difficulty of the backward patient who was unable to progress with the keen and less injured individual, and one instructor was then placed in charge of a group known as the individual group. This instructor throughout the day worked out his

own timetable and he was allowed to take backward patients from their general classes, the patients being allotted to him by the medical officer, and give them two periods a day of purely individual exercises according to their disability. The personal touch was of the utmost importance in this type of case and there was no doubt that they benefited from it.

It should be pointed out here that the timing of the rehabilitative exercises was an essential factor in maintaining the progress of the patient. By a method of trial and error the exercise period, which in the early stages was on the average of a 40 minute to one hour period, was brought down to a period of 20 minutes maximum. This was found to be the maximum time for any one period and this active period was followed by 10 minutes rest and relaxation. The 20 minute period appertained to all classes. It can be seen therefore, that the active day was divided into 20 minutes of activity, 10 minutes rest, then again 20 minutes activity and 10 minutes rest, and so on.

This was the state of affairs at No. 1 A.C.D., Blackpool when I was posted to R.A.F. Medical Rehabilitation Unit, Loughborough to take charge of the Airmen's Wing. On arrival at the Airmen's Wing the scheme of rehabilitation, in my opinion, was not up to the standard which had been attained at Blackpool.

The physiotherapy departments were utilised purely for physiotherapy and there was no real active work being carried on.

The classes were not divided into disability groupings and the period of exercise was on the 40 minute standard. It was decided by the other medical officers and myself to reconstitute the whole of the rehabilitation programme and carry on in the same manner as at No. 1 A.C.D. Blackpool.

The main difficulty lay in the fact that at that time the unit had only the use of the small ante-room gymnasium at the Grove; and in order to fit the large number of patients into the accommodation provided, a staggered programme was arranged whereby at the most there were two or three disability groups working in the small gym.

The staggering was effected in this manner. As one group left the gymnasium they proceeded on their cycling period and the group which had been cycling proceeded to the swimming bath, the group from the swimming bath beginning their remedial period in the gymnasium. The important factor which allowed the programme to work successfully lay in the one fact that each group had to be prompt on their exercise period. It could be foreseen easily that if one group remained in the gym. 5 minutes too long the next group which was supposed to go into the gym. would be delayed 5 minutes. Also if the cycling class came back 5 minutes late the group waiting to go out on cycles was delayed 5 to 10 minutes also. It was instilled into the P.T.Is. that accurate keeping to the timetable was the most essential factor in the working of the programme.

After a period of one to two months, permission was received to use the Officers' Wing gymnasium. This prevented overcrowding of the gym. at the Grove and facilitated the working of the programme.

It was impossible to hold an individual class because of the lack of space, but after a short period of trial it was decided that the Medium Weight-Bearing leg class and the intermediary arms and spines class should consist of small

individual groups of patients roughly at the same stage undergoing different types of exercises at the same time.

The P.T.I. in charge of this group would sub-divide his group into small units of maybe 2 or 3 patients, supervise a certain type of exercise for a short while and then allow the patients to carry on, he himself then taking another small group, and so on. The exercises were varied by the instructor and he was able to supervise the full group as a whole.

The medical officer was instructed to take a good deal of interest in this one group and help out where necessary and very often one would see the medical officer taking out individual patients from this group for a certain amount of individual exercises.

The early mobilising-cum-physiotherapy department was then brought up to what I feel is the best method for early rehabilitation. An extra annexe was taken over at the Grove which consisted of two rooms. This was in addition to the medium sized physiotherapy department already existing. A rehabilitation orderly was placed in charge of each early mobilising group and it was his job to supervise the individual active exercises of the patients in that group.

A masseur worked in conjunction with the rehabilitation orderly and the different patients were taken from their working group for their treatment throughout the day and following their treatment were returned to the charge of the rehabilitation orderly. The masseurs themselves were rehabilitation minded and individual specialised exercises were given in addition to their treatment.

This process of supervised individual active remedial exercises in the early stages became, without doubt, a very important factor in the hastened progress of the patient and attempts were made to improve the technique of the staff in this respect.

The division into the three main classes was not ideal, because one felt that the arms and spines class should be sub-divided into two classes, and there should also be a separate class for all femur cases. However, due to the shortage of technical staff, one could not do this. But in the case of the arms and spines class an alteration was made, and whereas one had previously the intermediary arms and spines class and the late arms and spines class, now a separate arms class and a separate spines class was formed.

The remedial activities of the arms class were taken by one instructor who allotted different types of exercises for disabilities involving the wrist and hand, for those involving the shoulder, and so on, and their stage was graded by using different graduated resistances. Therefore, one would see a wrist case doing Indian club work and small ball work and the elbows and shoulders doing weighted bar work under the supervision of the one P.T.I. and all working in the same class.

The use of the different weighted metal bars in the exercises was very satisfactory because a patient with a weak arm could use a very light bar and a patient with a strong arm could use a much heavier bar and, although doing the same movements, the actual exercise was entirely different because of the different weight of the resistance, i.e. the metal bar.

The spines were sub-divided in the one group into the intermediary and late spines, taken by the one instructor who devised the different types of

exercises for the two stages in the one class. This was much more satisfactory and there was no doubt that the recovery rate was hastened.

Finally, the set up for the actual rehabilitation which is being carried on at the moment is as follows:

The three main classes are now known as:

A Flight (Tibia, ankle and foot)
B Flight (Knees and femurs)
C Flight (Arms and spines).

Each Flight is divided into three main sub-groups, in the case of the lower limbs the non, medium and full weight-bearing groups, and in the case of the arms and spines into the early, medium and late groups.

In charge of each Flight is the medical officer. Working in his team are the masseur and rehabilitation orderly for the non-weight-bearing or early group, two instructors, if staff allows, in charge of the medium weight-bearing or medium group, and one instructor in charge of the full weight-bearing or late group.

These members work as a team. Each instructor was chosen by the commanding officer, the medical officers and the physical rehabilitation officer as the ideal type of personality appropriate to an establishment of this kind, and they were attached in the majority of cases to this unit for a trial period, and if suitable retained.

Each instructor remains with his own group throughout the day and he is with his group when they are doing their true rehabilitative exercises, their swimming, games, organised rambles, cycling, wood-chopping, boating, etc.

The programme has been arranged so that there is no monotony. Each period is a 20 minutes' period followed by 10 minutes rest and relaxation. Each group is changed from a remedial to, say, swimming, then to cycling, then to games and the final workout entails during one day four 20 minutes' remedial periods, two games periods, one or two cycling periods and two short periods in the swimming bath. The patients thus are not allowed to become bored and it has been proved that, although their programme is a very active one, they cope with it very easily because of the short working periods and frequent rests. Their interest is maintained by varying the different 20 minutes as mentioned above.

An essential point is the presence of the physical rehabilitation officer who should definitely take an active part in the true rehabilitation. His presence in the gym alone ensures that the instructors carry out the correct curriculum. He himself should take out the difficult cases for a certain amount of individual supervision and generally should be the contact between the doctor and the instructor. He should hold the instructors together as a team and ensure that each instructor is a specialist for his own disability group, thereby forming a unified team of specialists, which I feel is much better than having a team of instructors who know general rehabilitation quite well, but are not excellent in supervising the work of one group.

I would like to point out at this stage that, having been in charge of numerous instructors during the last few years, there is no doubt that, all things being equal, each instructor will find his own place in rehabilitation and whereas one instructor would be ideal for taking the fully active group,

another instructor would be useless for this group but ideal for taking the individual remedial work which is so necessary in the intermediary group. Therefore, I think that the instructors in charge of the different groups should not be changed about too often and should be allowed to be in charge of their one group for 9 to 12 months, or even longer.

APPENDIX D

R.A.F. MEDICAL REHABILITATION UNIT, LOUGHBOROUGH

Progress Report for the years December 1, 1942—November 30, 1943 and December 1, 1943—November 30, 1944

Officers' Wing

TABLE 1

Cases under Treatment

	1942–3	1943–4	Total
Remaining November 30 .	49	61	
New admissions . . .	870	1,421	2,291
Totals	919	1,482	

TABLE 2

Disposal of Cases Discharged from M.R.U. between December 1, 1942, and November 30, 1943, inclusive

	Returned to full duty	Returned to limited duty	AtBt	ApBp	Re-admitted to hospital	Repatriated	Totals
By Board at M.R.U.	319	220	182	1	–	–	722
By Board at C.M.B.	12	46	–	–	7	9	74
By M.R.U. without board . .	–	–	–	–	62	–	62
Totals . . .	331	266	182	1	69	9	858

TABLE 3

Disposal of Cases Discharged from M.R.U. between December 1, 1943 and November 30, 1944, inclusive

	Returned to full duty	Returned to limited duty	AtBt	ApBp	Re-admitted to hospital	Re-patriated	Disposal not known	Totals
By Board at M.R.U.	483	253	276	1	118	–	–	1,131
By Board at C.M.B.	41	71	–	19	6	–	–	137
By R.C.A.F. Medical Board	5	5	–	–	–	24	–	34
By R.N. Medical Board	–	–	–	–	–	–	4	4
By Army Medical Board	–	–	–	–	–	–	1	1
R.T.U. for Repatriation	–	–	–	–	–	8	–	8
Totals	529	329	276	20	124	32	5	1,315

TABLE 4

Disposal of Cases Returned to Duty and Boarded at M.R.U. between December 1, 1942, and November 30, 1943

	Full duty	Limited duty		Totals
		Limited duty	Ground duty (Aircrew)	
Aircrew	255	107	39	401
Non-aircrew	64	74	–	138
Totals	319	181	39	539

TABLE 5

Disposal of Cases Returned to Duty and Boarded at M.R.U. between December 1, 1943, and November 30, 1944

	Full duty	Limited duty		Totals
		Limited duty	Ground duty (Aircrew)	
Aircrew	403	122	42	567
Non-aircrew	80	89	—	169
Totals	483	211	42	736

TABLE 6

Medical Classification given to Officers Boarded at M.R.U.— Fit for Limited Duty

Year	A1hBh	A2B	A2hBh	A3hBh	A4hBh	Totals
1942–43 .	4	11	57	35	113	220
1943–44 .	18	18	56	53	108	253*
Totals .	22	29	113	88	221	473

* One hundred and sixty-seven cases remained at M.R.U. on November 30, 1944.

Airmen's Wing

TABLE 1

Cases under Treatment

	1942–3	1943–4	Totals
Remaining November 30 .	78	170	—
New admissions { Orthop. .	1,129	1,582	2,711
New admissions { Med. Surg.	68	98	166
Totals	1,275	1,850	

TABLE 2

Cases Discharged from M.R.U. and their Disposal

	1942–3	1943–4	Totals
No. of cases discharged to full duty . .	725	1,187	1,912
No. of cases discharged and re-categorised .	163	227	390
No. of cases discharged and re-mustered .	10	3	13
Total discharge to duty . . .	898	1,417	2,315
No. of cases invalided	78	96	174
No. of cases re-admitted to hospital. .	129	107	236
Totals	1,105	1,620	2,725

In 1942–3 14 cases were attached to M.A.P.
In 1943–4 23 cases were attached to M.A.P.

TABLE 3

Permanent Downgradings of Cases Discharged from M.R.U.

	1942–3	1943–4	Totals
Grade II .	4	2	6
Grade III .	19	19	38
Totals .	23	21	44

TABLE 4

Aircrew Medical Boards Held

	Full flying duties of trade	Fit glider pilot	A2B	A2hBh	A3hBh	A4B	A4hBh	AtBh	AtBt	P.U.A. 1, 2, 3 Fit Grade 2	P.U.A. 1, 2, 3 Fit Grade 3	ApBp	Total number Boards held
Period 1942–3 .	109	1	1	2	7	1	3	2*	23	2	2	14	167
Period 1943–4 .	113	5	1	–	2	1	1	6†	24	–	4	12	169
Totals . .	222	6	2	2	9	2	4	8	47	2	6	26	336

* Attached to M.A.P. Factory. † Includes 3 to M.A.P. Factory.

Explanation of Grading Terms

Fit Full Flying.=Assessed by Air Crew Medical Board.
Fit glider pilot.=Assessed by Unit Medical Officer.
A1hBh =Fit full flying duties, home service only.
A2B =Fit limited flying duties.
A2hBh =Fit limited flying duties, home service only.
A3hBh =Fit combatant passenger duties, home service only.
A4B =Non-combatant passenger.
A4hBh =Non-combatant passenger, home service only.
AtBh =Temporarily unfit flying. Fit ground duties, home service only.
AtBt =Temporarily unfit all duties.
P.U.A. 1, 2, 3. Fit Grade 2.=Permanently unfit all flying duties. Fit grade 2 ground duties.
P.U.A. 1, 2, 3. Fit Grade 3.=Permanently unfit all flying duties. Fit grade 3 ground duties.
ApBp =Permanently unfit all forms of Air Force duties under existing standards.
(Reference to Medical Grades, King's Regulations (2nd Edition) para. 1434.)

HOSPITAL CATERING

At the outbreak of war the dieting of patients in R.A.F. hospitals was based on prescribed scales of certain main items of diet, which were issuable in varying quantities per individual patient according to the class of diet ordered. The diets classified on these scales were: 'Ordinary', 'Chicken', 'Fish', 'Beef Tea', and 'Milk'. Foodstuffs required in addition to the main items of diet were described as 'Extras' and were chosen from two additional food tables, one for patients on 'Ordinary' diet, and the other for those on diets other than 'Ordinary'. In cases where none of the classified diets was suitable the ambiguous term 'No Diet' was entered on the patient's diet sheet and all articles of food required for that patient were issued as extras.

This system was not entirely satisfactory, as it was not always possible to obtain diets suitable for special cases. In addition, the lack of qualified catering personnel, trained hospital cooks, and also in many cases the continued use of antiquated and inadequate cooking equipment and facilities, led to the production of monotonous and sometimes unsuitable food. The system of accounting for the food was very complex, and required many hours of clerical labour besides long experience to operate it successfully.

In 1939, keeping pace with the expansion of the Royal Air Force, there was a very considerable increase in the number of hospital beds, but even so the demand for accommodation often threatened to exceed the supply and it was essential that beds should be vacated as soon as possible in order to admit fresh patients. Bearing in mind that correct dieting while in hospital hastens the recovery of a patient and that the provision of well-cooked and attractively served food is of great psychological value, the authorities considered that very extensive improvements in hospital catering were now necessary. The type of food supplied, its presentation, the actual cooking appliances and the time-consuming method of accounting, all required investigation.

Consequently in January 1940, a committee was formed under the chairmanship of Sir James Ross, with general terms of reference to inquire into the dieting at R.A.F. hospitals. It was decided to try out two new systems of dieting at R.A.F. Hospitals St. Athan and Cosford, and the committee considered it advisable to give them a reasonable period of trial before reporting on them. It was also decided experimentally to employ hospital catering officers at general hospitals, and seven members of the W.A.A.F. qualified by experience in catering, were selected, commissioned in the rank of section officer and posted one to each of the general hospitals in October 1940. In the same month Sir Harold Hewitt took over the chairmanship of the committee from Sir James Ross.

The committee completed its inquiries in February 1941 and submitted a report outlining its recommendations to the Under Secretary of State for Air. Of the two new systems tried out, that at St. Athan was found to be the more effective, in that it encouraged the use of initiative and catering skill by eliminating hard and fast rules, and with the employment of whole-time hospital catering officers there was every reason to believe that the dieting of patients in hospitals would be greatly improved. It was recommended for general application to all R.A.F. general and station hospitals.

This system dispensed with individual allowances of foodstuffs in accordance with the class of diet ordered, and based the amounts issuable on a maximum and minimum scale of all commodities required daily to feed one hundred patients, representing a cross-section of various classes of diet required. Four main classes of diet were named: 'Full diet', 'Light diet', 'Fluid diet', and 'Special diet'. It was left to the hospital catering officer to draft suitable diet menus, and to collaborate with medical officers in arranging diets for special conditions of sickness under the general class of 'Special diet'. (*See* Appendix.)

The procedure of accounting for diets was made less cumbersome than formerly, and it was possible to train personnel in a very few days to undertake the necessary clerical work involved. Individual patients' diet sheets (Form 1202) were abolished; these had always been unpopular with all concerned, especially medical officers and nursing sisters. Under the new scheme the diet was entered on the patient's medical case sheet (F.41), the class of diet, i.e. full, light, etc. only being necessary; from these the ward sister indented on Form 1531 for the estimated numbers of the various diets required. The necessary quantities of foodstuffs were then issued from the provision store to the kitchen for the preparation of meals, other items such as bread, butter, milk, fruit and similar commodities being issued direct to the wards.

A record of all issues made was kept on Form 1218, the quantities allowed by scale and the actual quantities issued being entered in separate columns. The differences between the amounts allowed and the amounts issued were entered in the record of 'over and under issues', which showed cumulatively the total quantity of each commodity over or under issued. The actual issues were then posted to the main Stock Ledger (Form 823) which was balanced at the end of each month, and from which a monthly costing was prepared showing the quantities of all foodstuffs consumed and the average cost per diet per day.

The Under Secretary of State for Air approved the committee's recommendations which included, in addition to the new dieting system, the following:

(*a*) The employment of W.A.A.F. hospital catering officers at all R.A.F. general and station hospitals.

(*b*) The special training of cooks in hospital catering.

(*c*) The employment of waitresses for domestic duties and serving food in the wards and patients' dining rooms, wherever possible.

(*d*) The employment of equipment assistants for clerical duties in connexion with the receipt and issue of food supplies.

(*e*) The supply of modern kitchen equipment, and appliances for preparation, cooking, and distributing food from the kitchens to the wards.

In May 1941 the Air Ministry issued instructions for these recommendations to be implemented, and the new dieting system was introduced at all R.A.F. general and station hospitals. The additional W.A.A.F. hospital catering officers required to fill the necessary establishments were selected and after a course of training at the R.A.F. School of Cookery, Halton, were posted to hospitals in September 1941. At the same time courses of training for cooks (hospital) were opened at the R.A.F. School of Cookery, Halton, and P.M.R.A.F. Hospital, Halton. In order to obtain the necessary number of trained cooks (hospital) at the earliest possible date, these courses were extended to several other large hospitals.

Meanwhile, arrangements had been made for the provision of new equipment. This consisted chiefly of electrical appliances, which included electrically heated food trolleys to convey hot food from the kitchens to the wards. Thirty-six of these trolleys were given by interested American and South African ladies and were distributed to various hospitals. The additional numbers required for the remaining hospitals were obtained through Service sources. This particular equipment proved very satisfactory; the trolley was wheeled to the patient's bedside and, wherever possible, he was given a choice of two hot dishes.

The employment of W.A.A.F. waitresses in wards and patients' dining-rooms resulted in an improvement in the serving of meals. In the past it had been the duty of the medical orderly to fetch and carry food and in this task he was frequently interrupted to attend to necessary nursing duties. Waitresses were employed wholly on the work of serving meals, which were consequently served promptly, the courses following each other evenly and without delay.

The duties of the W.A.A.F. hospital catering officer were not confined to the preparation of diet menus in collaboration with the medical officers. She visited the patients in their wards, giving the very sick particular individual attention and endeavouring to study their taste and fancy from day to day. At the same time, she supervised the progressive training of the cooks and, wherever possible, other personnel connected with the dieting of patients. It was her aim to ensure that these personnel knew how to make food look, smell and taste appetising and how to serve it attractively. Special attention was given to diabetic patients and similar

cases, every effort being made to provide the maximum possible variety within the prescribed diet.

The advantages of the new methods of catering were rapidly apparent to the medical officers and ward sisters and their willing co-operation ensured the success of the scheme. One of its great advantages was that it was no longer necessary, except in respect of milk and eggs, to adhere strictly to the limitations of the national rationing scheme. The need for economy was not overlooked, however, and the consumption of tea, sugar, butter and margarine was kept within the limits of the ration allowed for airmen in squadron messes. Meat was usually substantially underdrawn in relation to the maximum quantity allowed per hundred patients per day. Better methods of catering eliminated a great deal of unnecessary waste; less food was made to go further and better results were achieved.

By the time hostilities ceased in Europe in 1945, the progressive education and by now extensive experience of all personnel connected with catering in R.A.F. hospitals had enabled a very high standard to be reached. This standard was far in advance of that which existed before the war and the results fully justified the work of the committee set up in 1940.

APPENDIX

Nomenclature of Diets

1A—Full Diet. Officers.
1B—Full Diet. Airmen and Airwomen taking meals in Patients' dining room.
1C—Full Diet. Airmen and Airwomen taking meals in Wards.
2 —Light Diets. All Ranks.
3 —Fluid Diets. All Ranks.
4 —Special Diets. All Ranks.

Nature of Diets

(*a*) *Full Diets* are for patients who are under no dietary restrictions.

(*b*) *Light Diets* are for patients who have passed the acute stages of illness and who, while under no dietary restrictions, require the enticement of delicate foodstuffs and building up with easily digested and assimilable food.

(*c*) *Fluid Diets* are for patients during short stages of acute illness and for patients with jaw injuries. These can normally be successfully catered for by the arrangement of a Standard Fluid Diet menu. Where the acute stage of illness is prolonged the patient will require special consideration and his diet should be categorised as ' Special ', see below.

(*d*) *Special Diets* are for patients such as diabetics and gastric cases whose diet is part of the treatment of their illness. These special menus are prepared by the catering officer in conjunction with the medical officer and nursing sister in charge of the case.

THE CHAPLAINCY SERVICES

Chaplains were posted to the Royal Air Force General Hospitals during the war in accordance with policy laid down for all Royal Air Force units. There was, however, one important modification of its application: the Chaplains' Branch was canvassed from time to time to find out which of its members had a vocation to such work, it being realised that the special nature of the task required that those who undertook it should be temperamentally suited to it. The hospital padres, therefore, were often volunteers.

The main work of the padre fell into the following categories:

(*a*) Divine Service.

Religious services for all denominations were held every Sunday in the chapel wherever possible and in addition there were services in the wards, each lasting about half an hour. So enthusiastic and responsive were the patients that it sometimes happened that the decision as to which wards should have services had to be made by a show of hands the previous day. One padre used to take thirteen services each Sunday in the hospital. Arrangements were also made whereby patients who were confined to their beds were able to take Communion. Each communicant knew beforehand the exact moment when the chaplain was due to arrive at his bed, and he was screened and ready to make his Communion.

(*b*) Religious Instruction.

As on ordinary units the padre held the customary round of Bible classes, religious discussion circles and choir practices for those who were able to attend them. These included members of the permanent staff. In exceptional cases patients were prepared by the hospital chaplain for Confirmation; but the preparation of those who expressed a wish to be confirmed was normally deferred until they returned to their units, where it could be undertaken more thoroughly by their own padre.

(*c*) Sick Visiting.

An important part of the daily routine was bed-to-bed visiting in the wards. Some devoted five hours a day to this work. Dangerously and seriously ill patients were visited daily and the rest as often as the padre could get round to them. He tried as far as possible to be seen in each ward at least once a day. When making a systematic visitation in a ward he sought to do it in an unpredictable manner and not necessarily to complete it at any one time, so that the patients should not feel that they were being visited mechanically. He also went round each new batch of wounded men on arrival in the casualty reception centre, talking to them and collecting messages to pass on by telegram or letter to relations and friends.

(*d*) Next-of-Kin.

One task which repeatedly fell to his lot was the welcoming of relatives of 'dangerously ill' or 'seriously ill' cases. Frequently he was in charge of their accommodation arrangements locally. When a dangerously ill patient was not expected to recover, the task of breaking the news to the visitors was perhaps delegated to him.

(*e*) Funerals.

In the event of death the padre assisted in the arrangements which had to be made for the burial in the regional cemetery or for the dispatch of the body to the home parish for interment. In every instance he wrote to the next-of-kin to offer them his sympathy and to ask in what way he could be of further assistance. He took steps to ensure that the grave was photographed, if the burial took place overseas, and the photographs sent to them. From time to time, when relatives were dissatisfied with the brief notice of death which they had received, they wrote to the padre for fuller information—a letter which he answered in consultation with the appropriate medical officer.

(*f*) Hardship Cases.

In their sickness and enforced idleness men were apt, at times, to be overwhelmed by their domestic problems. It was often the responsibility of the padre to put them in touch with welfare or legal advice organisations, who either communicated with them by letter or sent a representative to interview them. Invaluable help was given by the religious organisations for social service and by the voluntary services. In the event of estrangement between husband and wife, there were times when the padre was able to meet the other party or to invite the local clergyman or the padre on a nearby station to mediate. Alternatively, he asked S.S.A.F.A. or one of the other societies to visit the house.

(*g*) Classes for Patients.

A padre has been known to act as Education Officer and to be responsible for providing classes for up-patients.

(*h*) Recreation.

Sometimes it fell within his province to supervise the recreational needs of the sick. He arranged excursions to local garden parties, concerts, sports and other amusements. He directed the indoor entertainments, such as gramophone recitals, concert parties, debates, lectures and ward shows. He also in some instances looked after hospitality schemes and recuperative leave arrangements. In the absence of an appropriate representative of one of the welfare societies he attended to the patients' 'comforts'. He kept in close touch with the religious and philanthropic institutes.

(*i*) Adoption of Units in A.C.S.E.A.

Certain hospitals in the United Kingdom acted as 'guardians' for a time to 'ward' units in A.C.S.E.A., such as mobile field hospitals. The padre was one of those who were called upon to attend to the collection and dispatch of 'comforts' and to act as correspondents.

SUMMARY

In conclusion, in all his ministrations to the sick the padre was animated by the conviction that sickness was a state of imperfection contrary to the will of God. In the words of the 'Report on the Ministry of Healing' of the Lambeth Conference of 1930: 'Every sort of curative treatment assumes, obviously, that disease is an evil to be combated. Theologically stated, this means that health, or an orderly condition of body, mind, and spirit, is God's primary will for His children, and that disease, as a specific violation or falling short of this orderly condition, is not only to be combated, but to be combated in God's name, and as a way of carrying out His will. . . . However disease may be brought about, and in whatever way it may be overruled for good, it is in itself an evil. . . . For the purpose of healing, prayer and sacrament should be used in conjunction. . . . While religious methods are applicable to all cases of sickness, they would seem to be most appropriate where moral or intellectual difficulties and perplexities have contributed to the disorder'. Bearing this in mind the padre sought in the name of religion to co-operate with the medical staff by seeking to remove deep inner unrest wherever he found it. When he encountered irreconcilable elements in the minds of the patients who confided in him he essayed to resolve the conflict. In their indisposition many, who in ordinary circumstances would not have done so, felt impelled to pour out their troubles and to ask for guidance. Hence the importance attached by the padre to bedside talks. Again and again he came away from a bed convinced that disharmony within the inner life of the invalid had played an important part in his sickness. As far as possible he tried to help him to rectify the maladjustments to life which were impeding his progress. By virtue of his spiritual status he was able to bring to the penitent an assurance of forgiveness for wrongs committed such as the psychiatrist could not implant. He was, however, careful not to trespass upon the domain of the psychiatrist, by confining his attention to sacramental ministrations, spiritual direction, prayer and worship, and to general suggestions of persuasion, reassurance and re-education in the sphere of personal problems, whether spiritual or otherwise. He did not hesitate to accept all invitations to undertake such welfare and entertainment duties as would assist in making the patients' emotional energies adequate to their condition, thereby helping to establish a state of mind which would accelerate the healing forces of nature and so forward the work of recovery.

THE BRITISH RED CROSS SOCIETY AND THE ORDER OF ST. JOHN OF JERUSALEM

This section has been written to cover briefly a few of the many aspects of the work undertaken by the British Red Cross Society and Order of St. John of Jerusalem in relation to the needs of Royal Air Force hospitals and other medical establishments.

Brief reference has been made to the rapid expansion of the activities of the Joint War Organisation, which were necessary in order to provide adequate facilities throughout the changing circumstances of the War of 1939–45.

It is emphasised that although the resources of these bodies were available to all three Fighting Services alike the approach to the problems of each particular Service of necessity differed in some respects. Some idea of the scope of the work of this organisation may be gained from the fact that its expenditure on services for the wounded and sick of British and Empire Forces amounted to approximately £17,000,000 and for British and Empire prisoners-of-war to approximately £14,000,000.

HISTORY OF THE JOINT WAR ORGANISATION

The initial purpose of the 'Red Cross' movement was to ameliorate the conditions of the wounded and sick of armies in the field. That primary ideal has never been relinquished, and to it have been added further aims, such as the care of prisoners in time of war, the improvement of health, the prevention of disease and the mitigation of suffering.

The agreement setting up the Joint War Organisation of the British Red Cross Society and Order of St. John of Jerusalem and providing a joint war service was sealed on September 2, 1939. Contacts had been established with the three Service Departments in order to gain preliminary knowledge of what might be required of such an organisation and on September 3, 1939, fifteen departments were ready to operate. The undertakings of the Joint War Organisation (J.W.O.) comprised two kinds of services—those of supply and those of personnel, the services of supply being sub-divided into stores, equipment, transport and accommodation.

The personnel working for the J.W.O. comprised for the most part members of the British Red Cross Society and the St. John Ambulance Brigade, but some were engaged by the J.W.O. itself. The activities of its personnel in London were organised through H.Q. Departments, elsewhere at home through Joint County Committees of the Society and the Order, and overseas through British Red Cross Commissions. At an early stage in the war requests for the mobilisation of V.A.Ds. were received from the Royal Air Force for service at home and overseas. There were over three hundred V.A.Ds. working with the R.A.F. and they lived in the sisters' mess and enjoyed full officer status.

The War Organisation arranged with the Services that it would supplement basic hospital equipment by additional stores, 'comforts', ambulances, X-ray apparatus and similar appliances and maintain convalescent hospitals for officers and convalescent homes and auxiliary hospitals for other ranks. As the war developed other services for the sick and wounded of the Forces were undertaken, and these were in the nature of supplementary services properly contained within the generic term 'comforts'.

In October 1939 the War Organisation reminded the Service Departments that, if they were required to operate overseas, it would be necessary to appoint commissioners to the theatres of war to work with the Directors of Medical Services. This arrangement was accepted in principle, and in November 1939 representatives of the War Organisation went to France to ascertain what organisation a British Red Cross Commission with the British Expeditionary Force would need. It was agreed that its function might include the provision of:

(*a*) hospital or other stores
(*b*) transport of sick and wounded
(*c*) hospital or convalescent accommodation
(*d*) accommodation and transport for relatives of sick and wounded who were allowed to visit them at general hospitals
(*e*) arrangements for the tracing of missing and prisoners-of-war.

By the end of 1939 the Commission was officially recognised. It was short-lived as a result of the early withdrawal of our Forces, although in that short time considerable quantities of stores were issued to general hospitals, casualty clearing stations, convalescent depots and ambulance trains, and premises were selected for convalescent homes. On June 22, 1940, the Red Cross Commission with the B.E.F. came to an end. Commissions subsequently operated in the Middle East, North Africa, South Europe, North-West Europe and South-East Asia. But the War Organisation's services for the wounded and sick of the Forces were not confined to those areas in which British Red Cross Commissions operated; for those elsewhere overseas it supplied hospital stores, medical equipment and personal 'comforts'.

British Red Cross services for the wounded and sick were not limited to the distribution of hospital stores, even in the early days of the Commission's activities. Thousands of books and magazines went to its library service for desert hospitals, conveniently sized sectional bookcases being supplied for the tents and huts, and portable book boxes for small mobile units. A mobile cinema visited the hospitals, and the Commission expeditiously and efficiently carried out repairs to wireless sets, gramophones, electric fans and electric heaters. Hospital ships and ambulance trains were provided with Red Cross 'comforts' and supplies, and medical establishments of the R.A.F. and sick bays of the Royal

Navy were similarly supplied. At places where the wounded were transferred from trains and hospital ships they were given refreshments from the Commission's canteens.

THE MIDDLE EAST AREA

In 1940 the Red Cross Commission in the Middle East was established and became the focus for the Red Cross and other voluntary organisations serving in that region and beyond. From July 1940, when active operations began along the Libyan Front, until the Italian and German armies were driven out of North Africa in May 1943, the first care of the Middle East Commission was for the wounded and sick of the British and Commonwealth Armies fighting in the Western Desert.

Some of the Service hospitals, being sited at a distance from centres of population, were denied easy access to entertainments and other attractions. British Red Cross transport for up-patients and convalescents to enable them to make periodic visits to the towns eased the position. But there were days when they could not go beyond the hospital, and for bed-patients there was always confinement to the wards. The conditions offered much scope for the British Red Cross welfare officers in their efforts to banish boredom and relieve monotony.

A hospital library service was a recognised activity of the British Red Cross service. It covered the supply of books, magazines and illustrated papers in a variety of languages. Regular deliveries and collections were maintained to and from general hospitals, convalescent depots and homes, reception stations, casualty clearing stations, field ambulances and ambulance trains. Isolation blocks were not overlooked. Its range was wide, covering 'comics', picture papers, biographies, travel books, philosophical works and technical manuals. Books on such subjects as bee-keeping, gardening, architecture and agriculture were in demand during the latter part of the war. Biographies if of recent date were asked for, but poetry was little read. Tough thrillers and 'Westerns' were in constant demand.

Many of the hospitals, tented and hutted, were sited in the desert, and monotony, irksome confinement and lack of amenities were always threatening to retard the patients' recovery. The Red Cross stores department was fortunately able to assist in this direction. Numerous wireless sets were delivered and installed; gramophones and records as well as games and playing cards were sent in quantities. A travelling cinema was an ever-welcome visitor to the desert hospitals. For recreation rooms there were carpets, curtains, armchairs, sofas, tables, lamps, writing-tables, clocks. For the wards there were fans, fly swats, mosquito netting and jug covers. Seeds, shrubs, creepers and plants were supplied to any hospital wishing to make a garden or grow its own vegetables.

Hospitals in and near cities were visited by local residents, but with desert hospitals this service was usually impossible as there was always the difficulty of transport. The amount of hospital welfare work undertaken was limited by the shortage of available voluntary workers, but this position was eased by the arrival early in 1943 of parties of Red Cross personnel who were sent out primarily to establish a 'searching' service in hospitals for news about missing men. Almost immediately on their arrival the scope of their activities was considerably extended. They were posted as residents to hospitals for welfare duties. They were required to feel their way for they were a new feature of hospital organisation. Their duties could not be precisely defined and the opportunities open to them depended mainly upon the attitude of the hospital staff. It was not long before they were fully accepted as part of the hospital organisation, as they were found to fill a need. They relieved the nursing sisters of services which the latter, however much they desired, had but little leisure to perform. The medical staff found that their attentions were benefiting the patients, and that entertainments, libraries and outings were more successful when it was someone's duty to organise them.

It is difficult to list all the tasks which fell to them to perform. For individual patients there were many kindly attentions. It might be no more than conversation; just the chance to tell a listener of one's anxieties and thoughts and to get a sympathetic reply. Family troubles, after such conversations, seemed less worrying. Patients in hospital and their families at home, many of them unused to expressing themselves on paper, were potential sufferers from misunderstandings. Letters from home were read and discussed with the welfare officers who, being more accustomed to writing, were frequently able to suggest a suitable reply which would satisfy both sides. There were more pleasant duties for welfare officers. Shopping for bed-patients, especially for presents to be sent home, was one. Others were the exchange of books from the hospital library, concerts, whist drives and gramophone recitals. For up-patients there were entertainments and other functions in rest and recreation rooms, and tours and outings to be arranged.

In 1943 in North Africa the Royal Air Force had established a considerable number of sick quarters attached to outlying stations but their equipment was not lavish. In addition to the usual comforts the Red Cross supplied such articles as oil stoves, blankets for shock cases, dressing pails, plates and cutlery, deck chairs and wireless. Many of the sick quarters were not easily accessible by road transport and safe transit for British Red Cross stores sent to these outlying stations was effected by loading them on ambulance planes returning after bringing the wounded to the base.

After hostilities had ceased in the Western Desert the Commission continued to be directly responsible for British Red Cross services to the

wounded and sick who remained in that area. By May 1943 welfare officers were preparing the El Alamein Convalescent Home for officers and distributing 'comforts' to battle casualties arriving at the docks.

NORMANDY CAMPAIGN, 1944

The earliest British Red Cross arrivals in Normandy experienced what was described as a 'damp' beginning, as they reported during a deluge of rain. They and those who immediately followed them found living conditions primitive at the tented hospitals to which they were posted. Meals were served in the open, water was severely rationed, sleeping cots were below ground level to afford some protection from shellburst. Convoys of wounded arrived at all times. It was usual to be awakened about 2 a.m. for duty in a draughty reception tent serving tea and cigarettes to the wounded lying on stretchers awaiting the medical officer's inspection. There were comforts, books, magazines and notepaper to give out, letters to be written home for those who were themselves unable to write and many other services to be given. Throughout the autumn of 1944 requests for reinforcements of welfare officers were persistent and by January 1945 seventy-six were attached to hospitals and other medical units. Among the latter were casualty clearing stations, mobile field hospitals (R.A.F.) and convalescent depots where canteen services were a regular feature. At Ostend the staff of the relatives' hostel also maintained a canteen at the dockside railway station in what had been the buffet. There the welfare officers served refreshments to the wounded lying on stretchers awaiting transfer to hospital carriers.

DIVERSIONAL THERAPY IN HOSPITALS

Diversional therapy proved so beneficial to patients that after a time the Service authorities co-operated with the British Red Cross on an extended scheme. Many of the patients did not even know how to thread a needle and had to be persuaded in the initial stages, but large numbers reached a high degree of efficiency. The making of string belts was most popular, as was rug making, simple embroidery, and regimental crests. '*Per ardua ad astra*' must have been embroidered many hundreds of times on different articles. More skilled patients worked tapestries. They found this means of passing the time a pleasant change and subsequently in civilian life some took up various forms of leather work professionally, having received initial instruction from a welfare officer.

GUIDE SERVICE

The War Organisation was asked whether it could provide personnel experienced in travel conditions as 'guides' for patients needing care and control during their journeys to and from hospitals. Owing to the crowding of trains, lack of porters, taxis, and refreshment cars, a great strain

was imposed on the patients, especially when they had to change trains. The British Red Cross agreed to supply guides, men and women, who were experienced travellers, to accompany patients either proceeding on leave from Service hospitals or being transferred from one hospital to another by passenger transport. This service was extended to R.A.F. hospitals in December 1943. Many journeys were over long distances and would, without assistance or attention, have been exhausting to the disabled and unfit.

ARRANGEMENTS FOR VISITS OF RELATIVES TO FRANCE

In October 1939 the War Office wrote to the War Organisation saying that the Service Departments were considering the possibility of instituting arrangements to enable relatives or friends to visit dangerously ill members of the Forces in Service hospitals in France. It was arranged that relatives arriving at their port of embarkation would be met by a representative of the British Red Cross who would give any assistance required, including the finding of accommodation and the reservation of their return passage on a boat to England. Over 120 visiting relatives were cared for in this way in France. This service was extended to other theatres of war overseas and to the hospitals at home. British Red Cross liaison officers, having arranged with the hospitals to be notified when relatives had been sent for, met them at the station, and saw that they were suitably accommodated.

RETURN OF PATIENTS FROM OVERSEAS

About the end of 1942 wounded and sick arrived in great numbers from overseas creating further problems for the liaison officers. They were asked to let the families of patients know of their return, to obtain news of relatives for patients, many of whom had lost touch with their homes while overseas, to let relatives know of a patient's condition, and to inform them when patients were returning home on discharge from hospital, many of the latter having had no opportunity of communicating the news to their families.

PRISONERS-OF-WAR

The proposal of the War Organisation to set up a Prisoners-of-War Department was approved by the Service Authorities in October 1939. The Department was housed in St. James's Palace, H.M. the King placing accommodation at the disposal of the War Organisation. In the House of Commons on December 5, 1939, the Secretary of State for War said that the British Red Cross Society and the Order of St. John of Jerusalem had set up a Prisoners-of-War Department. A few days later a statement was issued describing the types of parcels then being planned. They were:

(*a*) the initial parcel to the newly-captured prisoners-of-war.
(*b*) a food parcel to each prisoner three times a fortnight weighing approximately 11 lb.
(*c*) medical comforts.
(*d*) a personal parcel to be sent quarterly, providing a medium whereby relatives might send articles to individual prisoners-of-war in whom they were interested. (To become known later as next-of-kin parcels.)
(*e*) a bread parcel (sent experimentally).

The bread parcel was discontinued after May 1940 and flour and biscuits were substituted. The first parcels were dispatched in October 1939. The Secretary of State for Air asked the Department if it could assist in sending parcels to R.A.F. prisoners in Germany. It being agreed that there was no objection to making arrangements pending the receipt of official confirmation of the general understanding with the War Office, parcels were sent through the Swiss Legation Bag. A few days later parcels of invalid comforts and warm clothing were sent to Geneva by plane for transmission to captured airmen. A second consignment was sent on November 10, and from that date further supplies were despatched regularly.

Associated in some degree with the food parcels service, since it despatched invalid foods, but also operating in the specialised field of medical, surgical, dental and optical supplies and equipment, the Invalid Comforts Section of the Prisoners-of-War Department met the positive needs of wounded and sick prisoners-of-war. By the autumn of 1941 the service had attained such proportions that it was decided to build up an eight-weeks' reserve of invalid food and medical stores in Geneva; to establish a reserve of medical stores in each camp and independent hospital; and to send each camp and independent hospital invalid food and medical stores based upon estimates of weekly requirements, which were:

	Invalid foods	*Medical stores*
Camps with their satellite hospitals per 1,000 men	5 per cent. or 50 units a week	1 unit per month plus 1 unit in reserve
Independent hospitals per 50 beds	33 per cent. of the 50 beds or approx. 17 units per week	1 unit per month plus 1 unit in reserve.

The system was kept continually under review.

The need for adequate dental treatment caused the War Organisation much concern. On receipt of requests from dental officers at camps and hospitals, dental material and equipment were supplied through the Invalid Comforts Section, being despatched in special parcels by air mail and air freight.

Anaesthetics were sent by monthly despatches, and cod liver oil and malt were despatched regularly. A reserve of vaccines was maintained at Geneva for immediate issue to camps in emergencies. Blood transfusion sets were despatched at the request of medical officers.

The War Organisation undertook to supply prisoners with necessities such as tooth brushes, razor blades and socks, and a certain amount of underclothing and blankets.

The service for prisoners blinded in the war was established early in 1941. Under the name of 'Braille Comforts' it was conducted by the War Organisation and St. Dunstan's in close co-operation, the latter body meeting a large part of the cost. To each blinded prisoner as soon as his camp was located, and to his next-of-kin, letters of sympathy and encouragement were sent. A Braille watch was despatched by air mail to the prisoner, who was also supplied with Braille instruction and reading books, Braille writing materials and Braille games. Directions which would enable a sighted prisoner to help in the education of his blinded colleague were also sent. In 1942 the blinded prisoners were all brought together and this increased the effectiveness of the educational and training services. A suitable rehabilitation and training service for the particular needs of these prisoners was also established.

In association with the National Institute for the Deaf, a special comforts service was arranged for the deaf by the Invalid Comforts Section. Mechanical hearing aids with the necessary supplies of batteries were despatched together with text books on the art of lip reading.

The materials for occupational therapy were despatched and appreciation of this service was unquestioned, as it offered some relief from the intense boredom of prison life and routine.

Next-of-kin, other relatives, the general public and the War Organisation were able to make gifts of a range of products for the comfort, pleasure and recreation of prisoners. At the end of November 1941 the 'permit' system for tobacco and cigarettes was established and supplies were then sent free of duty. The aim of the War Organisation was to supply a reasonable weekly ration for each prisoner.

Books, music, packs of cards, games and sports equipment were also despatched on an organised basis by the War Organisation to camps in Germany and Italy. Over 71,000 books had been despatched by December 1941.

An educational system for prisoners was gradually evolved and developed on the following lines. Prisoners wishing to study were provided with the necessary books and materials; educational facilities were organised and examinations were held in the camps so that personnel could obtain maximum benefit from the scheme. After their release they were still able to obtain assistance with their studies.

The services for British prisoners-of-war needed considerable direction and organisation and a Correspondence and Inquiry Section was established, its special care being the files relating to prisoners-of-war. As soon as it was reported to the Department that a man was a prisoner, a file was opened for him. The first action of the section was to let his next-of-kin know how he could be communicated with, what services the War Organisation would render him, and how next-of-kin parcels could be sent. The letter was often the beginning of a personal correspondence which continued over the whole period of the prisoner's captivity. For many next-of-kin a visit to St. James's Palace was more satisfactory and there an Interviewing Section advised relatives and relieved them of deep anxieties.

THE WOUNDED, MISSING AND RELATIVES DEPARTMENT

The Wounded, Missing and Relatives Department of the War Organisation came into being on May 1, 1940. The main services with which the Department was concerned were:

(*a*) To make inquiries through the International Red Cross Committee on behalf of the three Service Departments about men reported missing.
(*b*) To administer for the Service authorities a 'searching' service in hospitals with a view to gathering information from patients about men reported missing.
(*c*) To handle inquiries from next-of-kin and other relatives of men who were reported missing.
(*d*) To handle inquiries from the same sources about the condition and progress of men in hospital.

It acted on behalf of the Admiralty, the War Office and the Air Ministry. The arrangements made with the Air Ministry about missing personnel of the Royal Air Force proceeded smoothly throughout the war. From the end of 1941, by supplying the names of aircrew in addition to the alphabetical list of names, the Air Ministry enabled the Department to send fuller information to the International Red Cross Committee and to have inquiries made regarding prisoners-of-war who might have information to give about the fate of their comrades.

CONVALESCENT HOMES

At the request of the R.A.F. the War Organisation agreed to open and maintain a convalescent home overseas for officers and aircrew in April 1943. The home, comprising a dozen villas, was situated at the pleasant seaside resort of Madrague Plage, some ten miles from Algiers. Eighty-three patients could be accommodated; some came from as far as Gibraltar. Casualties in the R.A.F. being less than anticipated, patients

from the Royal Navy and Army were admitted and one villa was set apart for convalescent nursing sisters from the R.A.F. and for convalescents from the Women's Services. Medical cases formed the largest class and they included a high proportion of sufferers from jaundice, malaria and enteritis. Surgical and orthopaedic cases were attended to by a visiting specialist. A third class was composed of convalescents suffering from 'flying stress'. To the end of August 1944 the number admitted to the home was 1,430. It closed in October 1944. Convalescent homes and depots for the Army to which the R.A.F. were also admitted were formed in Italy and North-West Europe.

Convalescent homes in Great Britain were also maintained by the War Organisation under arrangement made with the Ministry of Health. The properties were placed at its disposal for hospital or convalescent purposes mainly through the goodwill of friends and supporters of the British Red Cross Society and Order of St. John. There was never any need to resort to requisitioning, for offers of properties were always sufficient to provide the required accommodation. Nearly all the residences were normally in private occupation and for that reason they had an atmosphere which no institution can create.

For a number of disabilities, homes were wholly or partly allocated. One was given up to ophthalmic cases. Nine received only orthopaedic cases; in nine others a specified number of beds was set aside for such patients. Two homes were set aside for post-operation hernia cases; and in three more, beds were reserved for them. In 1943 it was requested that a home be wholly allocated to skin cases requiring special convalescent treatment and rehabilitation. It proved so successful that another home was entirely devoted to them.

A resident or visiting physiotherapist was attached to nearly every establishment. Patients needing massage, infra-red ray, paraffin wax baths and ultra-violet ray received the treatment appropriate to their disability. The special rehabilitation centres were equipped with a full range of physiotherapy and remedial equipment. Orthopaedic and peripheral nerve injury and plastic cases showed marked improvement under this treatment.*

CARE OF SICK AND WOUNDED AFTER DISCHARGE FROM HOSPITAL

The War Organisation continued to be concerned with the welfare of disabled and sick Service men and women after their discharge from hospital to home. Provision to meet their needs was made by the Government, supplemented by the services of voluntary societies. It

* A full description of the organisation set up to provide Auxiliary Convalescent Hospitals and Homes and the work they carried out will be found in Emergency Medical Services, Volume I.

was found that many on their return experienced unnecessary hardship. Either they were without special 'comforts' which they needed, or they did not know of the help and guidance available to them. The War Organisation undertook to see that the 'comforts' were provided and that the attention and advice which they needed were arranged. To enable action to be taken the Air Ministry forwarded invaliding lists. Not all required assistance or advice, but by many it was welcomed. Gastric, duodenal and similar cases who required invalid foods were advised how to obtain them or were supplied with them by joint county committees. Such 'comforts' as bed-rests and invalid chairs were provided, transport was arranged for those attending hospital for out-patient treatment, and those confined to their homes were helped by diversional therapy. All that could be done for them was done sympathetically, to make it clear that they were not forgotten.

CHAPTER 7

ACCOMMODATION, HYGIENE, SANITATION AND SPECIAL PROBLEMS

Accommodation

UNITED KINGDOM

PRE-WAR ACCOMMODATION

UNTIL 1935, accommodation at Royal Air Force stations in Great Britain was of permanent brick or stone construction. The expansion of the Royal Air Force between 1935 and the outbreak of war made it necessary to provide additional accommodation at existing units and to build complete new stations in many areas. The type of accommodation used was wooden huts. New stations such as Locking and Yatesbury were built of 'A' type centrally heated huts which had boarded walls lined with fibre board, bitumen felt roofs and wooden floors. Extensions to existing stations were provided by the use of 'B' type huts which were of similar construction, but were heated by slow-combustion stoves.

EXPANSION ON OUTBREAK OF WAR

Although, after the outbreak of war, tentage was sometimes used as a temporary measure during the summer months or when operational emergency necessitated its use, the static nature of the location of the Royal Air Force in Great Britain permitted of a general policy of providing hutted accommodation for all units. The movements of air forces in the country at various stages of the war made it necessary to provide huts which could be taken to pieces and transported, without damage, to other areas for re-erection.

USE OF PORTABLE PRE-FABRICATED BUILDINGS DURING THE WAR

As hostilities progressed, timber became scarce and in the early years of the war accommodation was invariably provided by the erection of the various types of Nissen hut. These huts were constructed in three sizes of curved semi-circular corrugated iron on concrete bases. The smallest size, which measured 16 ft. span by 36 ft. long and was generally used for sleeping accommodation, had ends of timber or brick in which the windows and doors were fitted. Huts of a larger area measuring 24 ft. by 30 ft. span were used for technical buildings and messes; these had windows in their curved sides. The advantage of Nissen hutting was the ease with which the huts could be erected, taken down and transferred without damage to other areas. They had, however, certain

disadvantages. Thermal insulation was unsatisfactory as the huts were constructed of double thickness, unlined, corrugated iron sheeting which, being ungalvanised, required regular inspection to ensure that the huts remained weatherproof. The doors of some of the small sleeping quarter huts fitted badly, causing draughts and allowing pools of water to collect on the floor during wet weather. Heating was by centrally placed slow-combustion stoves, but those sleeping at the ends of the huts gained little benefit from this form of heating in severe weather. Condensation of moisture on the cold iron lining caused damp and added to the discomfort of draught. In many Commands porches were built on at later dates in an effort to overcome some of these difficulties.

The larger types of Nissen huts were more satisfactory in that there were windows in the sides and inside linings of fibre board or other approved material were provided. The result was that natural ventilation was more controlled and it was possible to maintain satisfactory indoor temperatures. In general these huts served a useful purpose and accommodated flying personnel as well as ground crews without appreciable increase in sickness.

Other types of hutting that were used included Laing, Romney, Orlit, Handcraft, Turners Everite, Seco and many others. In addition, the Ministry of Supply provided several types of hutting, some of timber with bitumen felt-covered roofs, others with walls of maycrete or concrete and roofs of wood and bitumen felt.

HEATING ARRANGEMENTS

Central heating was available in permanent barrack accommodation although, at times, the heating was reduced owing to fuel shortages. It was also installed in control towers on airfields, in operations rooms and in sick quarters, which were supplied by an externally fuelled furnace supplemented by electric panel heaters in the case of crash rooms and operating theatres. Hospitals had priority for the installation of central heating and there were ancillary means of heating in special departments.

In temporary hutted accommodation, however, coal and coke stoves were widely used and on small dispersed sites heating was supplied by oil and coke stoves. These means of heating, which were the only ones readily available, were never really satisfactory. They greatly increased the difficulties of keeping accommodation clean and chimney sweeping by contract was an expensive item. Furthermore, the natural tendency of the occupants to congregate around the stoves was thought to contribute to a high incidence of upper respiratory infections.

ABLUTIONS AND BATH ACCOMMODATION

At the outbreak of hostilities permanent stations had ablution and bath accommodation in accordance with the appropriate scales, but with

the rapid expansion of both the Royal Air Force and the W.A.A.F. there was not only some degree of overcrowding of the sleeping accommodation, but the existing ablutions and baths had to serve larger numbers than those for which they had been designed. The acute shortage of labour and materials precluded the installation of additional slipper baths so that the increased demand had to be met in most cases by the provision of shower baths.

On stations built after the commencement of hostilities, where the dispersed type of accommodation was used, the ablution blocks were sometimes very distant from the sleeping accommodation. In bad weather this discouraged personnel from using them and many limited their ablutions to washing their faces and hands and cleaning their teeth. The inconvenient siting of these blocks was also blamed for an increased incidence of upper respiratory infections.

MESSING

The Royal Air Force diet scale was that agreed for the Services with the Ministry of Food; details of the scales in all theatres of war are given in War Office Code No. 1699 published in June 1947. The main difference in dieting in the United Kingdom, however, between the Army and the Royal Air Force was that while the Army in June 1940 gave up the daily messing cash allowance in favour of a fixed scale, the Royal Air Force did not. The reason for this was that after the occupation of France by the enemy the need for Army mobility precluded any arrangement other than a fixed scale. This was not the case with the Royal Air Force, so that throughout the war the benefit of purchasing locally or through N.A.A.F.I. was still enjoyed, with the result that it was possible to obtain a greater variety of non-rationed foodstuffs.

In the early months of 1940 the Air Council introduced Catering Officers in the Administrative and Special Duties Branch for full-time catering duties. Until then an officer was appointed by the Station Commander to supervise each of the several messes on the station. This was in addition to his ordinary duties and the officers had, naturally, no special knowledge of messing. Many civilian specialists from the catering industry were recruited to form the nucleus of this new branch and training was instituted to provide catering officers for all units.

The calorific value of the daily ration scales was as follows:

Home Service	*Calories*
Officers and men	3,300
Women's Services	2,800
Field Service	3,600
British–American	3,900
Prisoners-of-war: workers	3,300
non-workers	2,900

	Calories
British Army of the Rhine	
Field Service—British Troops	4,000
Women's Services	3,500
Battle ration A	3,500
Battle ration B	3,300
Central Mediterranean Forces	
Field Service	3,600
Women's Services	3,000
Middle East	
Field Service	3,700
Women's Services	3,300
Australian Imperial Force	4,200
U.S. Forces	4,500
Battle Ration (U.S. and British) A	3,300
Battle Ration (U.S. and British) B	3,900
Iraq and Persia	
Field Service	4,000
Women's Services	3,100
U.S. Forces	4,000
Battle Ration (British) A	3,400
Battle Ration (British) B	3,400
East Africa	
British Forces	3,500
Women's Services	3,300
West Africa	
Field Service	4,100
South East Asia	
Field Service	4,500
Women's Services	3,700
Gibraltar	
Field Service	3,800
Siege Ration	3,500
Malta	
Field Service	3,600
Defence Ration	3,200
Women's Services	3,000

The Home Service Ration Scale, on which the basic daily ration cash entitlement was based, varied in its constituents during the war, but changes occurred mainly during the first two years, after which little alteration was made. The main items are shown in the table overleaf. (Daily amounts are given in ounces).

Additional food was provided for operational aircrew, Transport Command crews and those at O.T.Us., but not for aircrew under ordinary flying training. The supplementary issues consisted of half a pint of milk daily, 3 eggs per week and 3 oranges or 5½ oz. of fruit juice per week. Meals taken before and after flights included extra amounts

Item	September 1939	October 1940	March 1941	May 1943	November 1945
Meat (bone in)	12	10	6	6	5
Bacon	2	1 4/7	1 4/7	1 4/7	1 1/7
Offal or sausage	—	1 4/7	1 4/7	1 4/7	1 1/7
Bread	16	10	10	10	10
Butter and margarine	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Cheese	1	3/7	3/7	3/7	2/7
Milk (tinned)	—	3	3	3	3
Milk, dried (skim)	—	—	—	2/7	2/7
Jam	1	1 1/2	1 1/2	1	1 1/7
Sugar	1 1/2	2 1/2	2	2	1 6/7
Potatoes	—	12	13	20	18
Vegetables (fresh)	—	5 5/7	5 5/7	5 5/7	5 5/7
Vegetables (dried)	—	4/7	4/7	4/7	4/7
Fish (fresh)	—	—	—	—	1
Fish (tinned)	—	3/7	3/7	3/7	3/7

of nationally rationed commodities such as bacon, tea and sugar. No monetary allowance was given in connexion with these extra items, certificates of over-issues being submitted by units with ration accounts. An 'energy food allowance' as follows was issued for expenditure on chocolate and sweets for consumption during flights:

	s.	d.
2 to 4 hours' duration		6
4 to 8 hours' duration	1	0
8 to 15 hours' duration	1	6
Over 15 hours' duration	2	6

The emergency flying ration was issued at times in lieu of this allowance.

In 1943 the 'universal' messing system was introduced in the United Kingdom. Under this system stations where there were several messes worked to a common diet sheet from a purchasing and distributing point of view. The advantages were equal distribution between all messes of nationally rationed commodities and foodstuffs in short supply, economy in use of M.T. and accounting and reduction of the personal expenditure of junior officers and N.C.Os. The only disadvantage of this system, which was found to work very well during the war, was that it tended to reduce messing to a common level.

The war ration scale in the United Kingdom gave rise to no medical criticism apart from the inevitable lack of variety and no attributable illness or nutritional deficiency was discovered. The ration scale, however, is no true indication of the amount or quality of food which any unit is consuming, and the lack of medical evidence of defective nutrition was certainly not due to the satisfactory nature of food storage and preparation.

The initial overcrowding of stations following mobilisation was never satisfactorily rectified as far as cooking and messing were concerned. This was to some extent unavoidable on busy stations at which ever recurring temporary commitments meant more overcrowding for which extensions of cookhouses were unwarranted. Throughout the war it was unusual to visit a station where the messes and cookhouses were not accommodating and messing an excess of 100 to 300 per cent. over the number for which they were built.

This overcrowding was apparent in food preparation rooms, stores and dining-rooms and an additional factor which militated against high standards of messing was the shortage of cooks. They were always below establishment at large units and there were training difficulties, for cooking cannot be learned quickly. Furthermore it is desirable that cooks should be interested in their work, but war-time conditions made it necessary to detail men irrespective of their interest and train them basically in fourteen days before posting to units.

Cooking facilities varied a great deal. At large permanent pre-war stations steam cooking plant and hot-air ovens were installed. In hutted camps steam cooking was used while baking was done in groups of 75 in. ranges which were coal burning and had the disadvantage of requiring stoking in the kitchens. Cooking facilities were extended at cookhouses by providing 72 in. ranges and Soyer stoves. At aircraft dispersal points in the operational stations petrol stoves, hydro burners and Soyer stoves were provided but feeding here was difficult and many units drew hot meals from the central cookhouse and distributed them in insulated containers. It was in this way that balloon units were fed at first but these and other similarly dispersed units later adopted 'site cooking', being provided with various kinds of stoves including many from the ruins of bombed dwelling-houses.

The dish-washing machines installed were of the 'Deluge' type in which trays of crockery passed through the machine on a conveyor belt, or were placed in it, and were subjected to high-pressure spraying of hot water from above and below followed by a similar rinse of fresh hot water circulating from a different sump from the cleansing detergent water. This type replaced the brush or Enk (turbulent immersion) types, but there were difficulties in operation, as the pressure of steam required to keep the water at correct temperatures for cleansing and rinsing was often insufficient. This was generally due to the inability of the kitchen boiler to supply the additional plant installed to increase the cookhouse facilities. This meant not only faulty disinfection of crockery, but the employment of personnel on wiping and hand drying which should have been unnecessary.

During the war years the Royal Air Force Medical Branch carried out investigations into the adequacy of the diets provided in different theatres

of war.* The investigating teams consisted of a medical officer, a biochemist and an ophthalmologist. The reliance on ophthalmic signs for indication of certain vitamin deficiencies necessitated the ophthalmic specialist. The investigations covered personnel stationed in the United Kingdom, Iceland, West Africa, Middle East, Western Desert, Malta and India. Their findings were of great value and resulted in a better appreciation of the nutritional situation, which in some areas, particularly in West Africa (Gambia), was in need of improvement.

OVERSEAS ACCOMMODATION

In operational theatres of war, where units were in a highly mobile state, accommodation was organised on a full active-service basis, making use of bivouacs or any local permanent or semi-permanent structures which were available. The general arrangements are discussed in some detail in the accounts of the various overseas Commands, but the following description of the problem in West Africa, a non-operational Command, is given as an indication of the difficulties encountered overseas. The Command included Gambia, Sierra Leone, Gold Coast and Nigeria. There were no permanent Royal Air Force stations but there were various large units, which were located mainly in the coastal belt, where the mean maximum daily temperature was 90° F., the mean minimum daily temperature 70° F., the relative humidity mean daily maximum 85 per cent., mean daily minimum 70 per cent., and the annual rainfall, 40–114 in.

In 1941, units were temporarily accommodated in a variety of buildings and in tents. There was much overcrowding and a shortage of mosquito proofing, but the gradual erection of huts provided improvements in living conditions. The choice of accommodation was governed by the availability of building materials and apart from tents the temporary accommodation consisted of 'bush huts' or 'giddahs'. The former were made of crinting (interwoven split bamboo) and mud with interwoven palm frond thatching and the latter of daub and bamboo wattling with conical thatched roofs.

The semi-permanent accommodation consisted chiefly of Nissen and Lagos huts and other wooden huts made from local timber. The Nissen type huts were erected on dwarf walls of concrete block, with ventilators, 3 ft. high, at intervals. These huts withstood the heavy rains and sandstorms admirably, but they were very hot and retained their heat even when provided with false ceilings and lined with 'tentest'. Some improvement was effected by whitewashing the roofs, which reduced the indoor temperature by 1 to 2° F., but as the natural ventilation was insufficient to cool the huts and was further reduced by the necessary mosquito proofing,

* *See* Volume II, Chapter 3. Iceland Section.

the only really efficient means of achieving a degree of comfort was the installation of overhead electric fans. 'Lagos' huts were rectangular buildings of varying size with wooden or concrete walls and corrugated asbestos roofs. They generally had wide verandahs at both sides, the verandahs being walled up to 3 ft. and enclosed beyond that height by the mosquito netting. The concrete block walls were more satisfactory than wood which warped and was subject to damp and infestation by termites and for this reason floors were always made of concrete. The Lagos hut, which incorporated ablutions, was the hut most suited to life in West Africa; the rooms were usually relatively cool and dry and the building was more durable. The use of thatch roofs in Nissen and Lagos type huts was not satisfactory. They attracted and harboured insects, snakes and vermin and were not waterproof during the rains.

Other accommodation included requisitioned civil buildings and American prefabricated huts, which were rectangular wooden buildings on wooden stilts five feet above ground level, with no verandahs or glass windows. As substitutes for the latter there were openings close to the eaves, covered with mosquito proofing, which required varnishing to keep the rain out. The roofs were covered with a tar composition and the floors were of wood. These huts, which were quite unsuitable for prolonged residence, were intended to last only a short time, pending the construction of permanent accommodation.

Hygiene and Sanitation

UNITED KINGDOM

SCHOOL OF HYGIENE

Hygiene instruction was carried out at the Medical Training Depot at Halton as part of the training given to officers and airmen until Medical Training Establishment and Depot was formed and moved to Harrogate in June 1941. From February 1940 until that date instruction was given by a flying officer (medical) assisted by a sergeant and one or two civilian qualified, direct-entry sanitary assistants. After June 1941 the School of Hygiene was situated at Halton as a lodger unit, under the functional control of Medical Training Establishment and Depot. It was finally accommodated in the old Medical Training Depot building and annexe, with the title Royal Air Force School of Hygiene.

The School had two functions; the main one was teaching and the secondary one research and development. Both functions of the School were limited to a certain level, although excellent foundations were laid. The Officer Commanding was an ex-Palestine Government Sanitary Inspector. Close liaison was maintained with the Sanitary Inspectors Association and other professional bodies and from time to time the Staff Officers toured Commands in an advisory capacity.

Initially the only courses held were for newly commissioned medical officers and Part II training of nursing orderlies but the scope of instruction gradually increased until at the end of the war the following courses and demonstrations were being held:

Medical officers on entry.
Medical officers refresher course.
Medical officers tropical hygiene (part of tropical medicine course at Institute of Pathology and Tropical Medicine).
Catering officers.
Hospital cooks.
S.E.A.C. cooks
Sanitary assistants on entry.
Sanitary assistants tropical hygiene.
Sanitary assistants refresher (on return from overseas).
Substitute sanitary assistants (*ab initio* training).
Nursing orderlies water course.
Nursing orderlies. Part I Training.
Nursing orderlies. Part II Training.
Junior N.C.O. disciplinary course, Halton. Field Hygiene.
A.T.C. Halton. Field Hygiene.
Allied personnel (French, Belgian and Polish). Substitute sanitary assistant training.
Model grounds constructed and instruction provided at Officers School of Administration, Stannington, No. 1 P.D.C. West Kirby, R.A.F. Police School, Padgate and Aircrew N.C.Os.' School, Whitley Bay.
Training of 38 A.M.C.Us. and 11 Field Hygiene Units.
Training in Field Hygiene of Airfield Construction Squadrons.

The School was staffed, with one exception, by direct-entry civilian qualified sanitary inspectors. Syllabuses were drawn up and a collection of technical précis made. A drawing office was established and a full set of instructional charts and lantern slides was constructed. Illustrations for the *R.A.F. Handbook of Preventive Medicine* were prepared and a reference library was provided. The technical contents of the syllabus were arranged by Air Ministry (M.A.1 and M.A.4), but the School was under the functional control of Medical Training Establishment and Depot and had considerable local autonomy.

The School carried out trials and investigations of various pieces of equipment during the war. Where necessary instructional manuals were prepared. The equipment concerned included:

150 gallon water trailer.
Portable current steam disinfestor.
Petrol safety stove of box-type.
300 gallon water trailer.
Filter powder for 250 gallon water tender.

Grease trap designs.
200 gallon water tender.
Tangle foot fly traps.
Fyerside heater.
U.S.A. immersion heater.
Dennis sullage tender.
Hydra burner.
German trombone heater.
Powder guns.
Anti-malarial spray power plant.
Collins water sterilisation process.
Bell's ten gallon water steriliser.

APPOINTMENT OF SANITARY ASSISTANTS

In May 1940, the trade of Sanitary Assistant, which had been obsolete since 1935, was revived. It was open to direct enlistment for civilian qualified sanitary inspectors only. Pre-war Service sanitary assistants, either regulars or reservists, were not eligible. Recruiting was carried out through liaison with the Sanitary Inspectors Association, but the number of sanitary inspectors forthcoming was not sufficient to meet requirements. This was due partly to civilian needs and the Ministry of Health's unwillingness to release too many sanitary inspectors, and partly to bad liaison with Service recruiting authorities. This problem would have been simplified if a body, such as the Sanitary Inspectors Association, had drawn up in peace-time a list showing:

(*a*) Sanitary inspectors willing to volunteer for the Services in an emergency.

(*b*) Sanitary inspectors liable to call-up for war service.

On call-up sanitary inspectors were given a four-weeks' course of recruit training and military hygiene at the School of Hygiene, Halton. Before going overseas they attended a two-weeks' course in tropical hygiene and sanitation at the School of Hygiene and the Institute of Pathology and Tropical Medicine, Halton. On return from overseas they attended a refresher course at the School. The shortage of civilian qualified sanitary assistants was overcome by training nursing orderlies as substitute sanitary assistants. The course was of eight weeks' duration and the first was held in May and June 1942.

SUPERVISION OF WORKING CONDITIONS

Just as in civil life it is the duty of the Approved Factory Doctor to supervise the health, welfare and safety conditions of the factory worker, so the Service medical officer had many responsibilities in connexion with the health of R.A.F. personnel employed in numerous trades. The most specialised form of this responsibility in the R.A.F. was the

maintenance of the health and efficiency of flying personnel. In this section, however, it is proposed to discuss briefly only the industrial aspects of the subject. The majority of industrial health problems were centred in Maintenance and Technical Training Commands and medical officers with particular knowledge of industrial health were attached there for duty. The history of these Commands is described in detail in Volume II.

On each station throughout the Service there were certain common problems. Attention had to be given to hours of work, the length and timing of 'breaks' and the heating, lighting and ventilation of workshops and technical sections. As far as possible the provisions of the Factory Act, 1937, were observed, but it was not always possible to adapt these provisions, intended for civilians in peace-time, to a Fighting Service in war-time.

Where the nature of duties involved frequent exposure to inclement weather, as in the case of sentries, M.T. drivers and marine craft personnel, special additional items of clothing were issued, such as leather jerkins for M.T. drivers, oilskins and seaboots for marine craft personnel, and for these last there were increased rations.

One of the most widespread occupational hazards was the 'doping' of aircraft and full precautions were adopted throughout the war years to safeguard personnel. It was ordered that Forms 122 (giving the official precautions) should be displayed prominently in doping-rooms, and steps were taken to ensure that rooms were adequately ventilated. Special meals for dopers were authorised and periodically these workers were medically examined. Doping involved painting with acetate compounds.

The extended use of radio-active materials also necessitated action to reduce the hazard to the health of workers who might inhale or swallow particles of these materials. Plant and machinery of many kinds were installed, which were liable to be a source of danger to the operators unless guards and other safety devices were fitted. Cutting and boxing machinery were special examples of this kind of danger. In battery charging rooms working conditions had to be arranged so as to minimise the risk of injury by acids or by high-voltage current.

Many airmen were continually exposed to oils, greases and chemicals in the course of their work; protective clothing, barrier substances and the medical selection of personnel reduced the chance of chemical side-effects in this connexion. Close co-operation between the medical and technical staffs was found to be necessary at all levels.

The blackout was a great enemy of adequate ventilation and many problems had to be solved in working in underground control rooms. Special care had to be taken of the health of W.A.A.F. personnel working on a watch basis. This problem is discussed in some detail in the account dealing with the W.A.A.F.

SERVICE DRESS AND UNIFORM

During the war a number of changes of dress were introduced in response to new requirements. Research continued at the R.A.F. Institute of Aviation Medicine to improve flying clothing and numerous changes were made in flying suits, flying boots, helmets and oxygen masks. The aircrew battledress suit was first used as a working uniform for flying personnel and was later adopted for all branches.

Protective clothing for personnel in special occupations had to be provided. Examples of this type of clothing were the armoured gloves for personnel engaged in bomb and ammunition storage and handling barbed wire or sheet metal, the rubber gloves and aprons provided for those engaged in handling certain chemicals and the asbestos suits provided later for fire-fighting. As an anti-gas measure all personnel were issued with anti-gas capes, cap covers, respirators and gauntlets. White coats were finally introduced for medical officers although they had been authorised for dental officers many years earlier. W.A.A.F. M.T. drivers and plotters were authorised to wear slacks owing to the nature of their duties and W.A.A.F. overboots were introduced for personnel on dispersed sites. The clogs with wooden soles which were provided for cookhouse personnel when swilling down floors were never popular, as they were clumsy and uncomfortable to wear.

For wear in inclement weather at home stations airmen and airwomen had the choice of wearing groundsheets or greatcoats. Groundsheets were only a partial protection against rain which usually ran off on to the clothes at waist or hip level. The use of the serge greatcoat in wet weather was unpopular with airmen and airwomen. This was because of the many buttons which had to be polished before it could be worn, and because it was heavy when wet and owing to its absorbent nature took a long time to dry. Furthermore, drying facilities were not always easily available. Consequently there were many persons who preferred to risk getting wet rather than use the greatcoat. In this connexion also the use of the forage cap by airmen gave less protection than the peaked Service cap which was formerly used.

WATER SUPPLIES

The actual provision of water supplies from the engineering point of view was the duty of the Works Department. Air Ministry (Department W.1) was responsible for providing water from whatever source it could be obtained in the rural and remote situations in which airfields were frequently placed and for delivering it in a potable condition to the airfield.

Despite its fundamental importance water supply was not commonly taken as a limiting or restricting factor in the selection of an airfield site. The physical features of the terrain and its strategical site were the

overriding considerations. It was accepted that few existing supplies could cater for the additional consumption by the R.A.F. commitment of 100,000 gallons a day which was commonly involved, and it had to be assumed that, if necessary, an alternative source would have to be found and made available. Therefore the provision of water supplies for airfields became an enormous task and involved great expense and much time, effort and material.

Water was obtained from many sources varying from supplies from local authority undertakings to new supplies developed from springs, boreholes (pumped and artesian), streams and rivers, sometimes developed solely for Royal Air Force purposes and sometimes in conjunction with local authorities for joint use. Direct supplies from existing plants by local authorities were the simplest of the undertakings and in addition afforded a double check on the purity of the water supply. In the absence of such a supply a water survey had to be performed, taking into account any available topographical or geological data. In the case of rivers, streams, and springs, data had to be found concerning the volume of flow over seasonal and dry weather variations. Chemical analyses had to be sought and the existence of any source of pollution or nuisance determined, from local knowledge and records. Once the water supply had been laid on, it was the duty of the unit medical officer to satisfy himself that the supply was pure and that it remained protected from contamination, at all stages of delivery and storage.

Routine testing of permanent water supplies was carried out as outlined below:

> Water from Air Ministry wells was submitted quarterly for bacteriological analysis. Chemical analysis was only needed for new wells.
>
> Water from public supply companies was normally examined annually. As public companies are required by law to supply pure water, the routine annual test served to keep a check on the integrity of pipework and the cleanliness of storage tanks on the station. Routine chemical analysis was not needed.
>
> Special analysis of permanent water supplies was needed when outbreaks of enteritis or other disease brought the purity of the water into question, or when special indications existed such as possible damage by enemy action, or when water from a new source was added to the existing supplies.

It was necessary to impress upon the medical and works staffs the need for full co-operation at all times. Sometimes the works staffs would introduce new sources of supply without notifying the medical officer and a number of outbreaks of enteritis was caused in this way. Similar additions to the water supplies were made occasionally for fire-fighting and the contamination of station supplies in this way was a further cause of gastro-enteritis.

The works departments were responsible for chlorinating supplies from boreholes, wells, springs and rivers. In addition filtration had to be effected in a number of cases by rapid gravity or pressure filters. Some supplies needed chemical treatment. About forty-five stations had water supplies from rivers and streams and about two hundred stations had water supplies from boreholes. It is noteworthy that although the borehole is often regarded as a doubtful and problematical source of supply, less than 4 per cent. of failures were experienced. In planning the water supplies of this sort the services and assistance of the Geological Survey were enlisted and proved most valuable.

The development of water supplies from the source involved the routing and laying out of mains, provided as necessary with intervening pumping and boosting to give delivery to the storage facilities on the site. Storage tanks and reservoirs were provided to give storage over peak consumption periods, their sites being selected in conjunction with planning departments, to secure gravity flow from high-level tanks to the various airfield sites, dispersed living sites and other installations. In the reticulation systems it was not always possible to provide galvanised water piping and recourse had to be made to iron piping without this protection. This led later to a rust nuisance which appeared after the water had stood for a time but later cleared on running the water for a short while. 'Iron bacteria' developed in the water supplies of certain stations (Castle Kennedy, Stranraer, and Foulsham, Norfolk) and were never satisfactorily cleared.

It was noted that some medical officers on stations did not seem to have a good grasp of the medical aspects of water supplies. Samples were often sent in for bacteriological testing from sources which were obviously subject to pollution and which could only have received a certificate of potability by 'chance' good reports. Other medical officers on receipt of an adverse report on a station water supply, merely sent in repeated samples in the evident hope that one of them would come back with a satisfactory report after which all could be forgotten. Sometimes there was insufficiently close liaison with the Works representative. At a number of old mansions used as Group Headquarters the water supply in respect of both source and reticulation was something of an enigma. Repeated chemical and bacteriological tests in different sites would finally reveal, perhaps, two supplies, one clean and one unclean, with communications between the two not envisaged in the initial planning.

Where chlorination was required for a water supply a plant was installed, although a hand dosage method, using water sterilising powder, had to be resorted to in some instances. When the chlorinating dose necessary had once been determined, the plant attendant was charged by the Works Directorate with the responsibility of day to day routine testing of the degree of chlorination. Simple testing sets were available

for use by the attendant of each plant (Chlorotex testing set). The Directorate of Works, although accepting the duty of carrying out daily tests by the plant attendants, did not accept the full responsibility for the safety of any water for drinking purposes. A second check by the medical officer of the station had therefore to be made from time to time.

SEWAGE DISPOSAL

Originally both water supply and sewage disposal policy were the responsibility of a special section of the Air Ministry Directorate of Works, called the External Services Section, which also handled the roads and surface drainage policy. The External Services Section dealt in fact with all services external to the buildings. At that time, when airfields were numbered in tens and the airfield proper was a grass field and thus largely an agricultural problem, water supplies were usually delivered from local authorities' mains. The war-time expansion of the Royal Air Force greatly increased the difficulties of providing adequate water supplies and necessitated the formation of a separate section to deal solely with this problem.

In peace-time it had been the policy where possible to discharge sewage into local authority sewage systems, but this method was far from universal and the development of isolated sites in war made it the rare exception. The efficient design of sewage treatment works and the purity and proper disposal of the effluent is of course just as important to the health of a community or district as the purity of its water supply, and it bears a definite relation to the latter.

Designs in sewage plant were developed in upward and horizontal flow settlement tanks with filters, humus tanks and sludge beds and were arranged where possible in units, permitting extension by the addition of similar units. These designs were standardised for any likely capacity and site and for flows of 15,000 to 100,000 gallons per day. Several special designs were prepared for flows of 150,000 gallons per day. The largest special design was prepared for a population of 14,500 and a dry weather flow of 360,000 gallons per day.

The installations designed during the war period approached 400 in number and approximately eighty existing installations were extended to four and six times their original capacity. In districts where the works were likely to be of service in rural development they were sited and arranged in conjunction with local authorities and in liaison with the Ministry of Health. Approximately 25 per cent. of the installations came within this category.

The disposal of effluent amounting to 100,000 gallons per day, in districts where nothing of this nature had previously existed, brought its problems. Notable among these were effluent disposals in water authority surface catchment areas, fissured chalk and limestone subsoils

which provided borehole water supplies, in which naturally few, if any, streams existed for the disposal and dilution of effluent. In the latter case surface irrigation with its attendant dangers was the only ready means of disposal. In many of these cases sand filters were incorporated in the outfall works, while others involved extensive piped outfalls to suitable disposal locations. Disposal problems of this kind were arranged in liaison with the Ministry of Health.

Other problems which arose constantly were shortages of materials and man-power when further urgent construction was required and the necessity for economy in design without impairing efficiency. Added to these were the difficulties of maintaining efficient working when the populations of stations increased enormously above the capacities for which they were designed, or when extensions in progress had not yet become effective. Frequently installations designed for 50,000 gallons per day had to cope temporarily with 100,000 gallons per day. In spite of these difficulties complaints of pollution were few and usually arose from such circumstances of overloading.

At certain low-lying stations an adequate fall was not available to ensure a gravity flow of sewage from the latrines to the sewage treatment plant. Here sewage pumps had to be installed to boost the pressure which enabled the flow to be maintained. At Walney Island near Barrow-in-Furness the boosted sewage mains curved in bridge form over one of the camp roads. At Millom, in the same area, an adequate fall was obtained by raising the camp latrines on brick bases six to ten feet above ground level. Steps had to be provided for the users to ascend to these latrines, from which drainage pipes descended and were supported on brick columns. At such low-lying coastal areas the treated effluent drained into small streams whose current became reversed when high rainfall and high tides were experienced.

In order to ensure that the plants were working efficiently a check was maintained on effluents which were examined as a routine, samples being sent annually to the Royal Air Force Institute of Pathology and Tropical Medicine.

In 1941 the Director of Hygiene compiled, for the information of medical officers, a full description of sewage disposal works and their method of functioning. The duty of the medical officer in relation to sewage works was defined and the standards for satisfactory effluents were given in detail.

LATRINES

On permanent stations with waterborne systems of sewerage the disposal of excreta was a straightforward matter. Expansion of units led to the overloading of sewage plants and in some cases plants which were designed to deal with sewage from a camp of a given strength had to deal

with sewage for one of twice the size. Bad sewage effluents, smell from sewage works and complaints from local catchment boards and agricultural authorities were the result. In some cases petrol and oil from M.T. sections were allowed to enter sewage works with bad results, oil in particular very adversely affecting the working of the percolating filters. Other upsets were caused by blockages due to the disposal of sanitary towels into the latrines. Where sewage farms were working well, a good quality sludge was produced, which was of use as a fertiliser and could be disposed of to local farmers.

In temporary camps or on dispersed sites bucket latrines had to be used and the contents were either emptied by contractors or were emptied by sanitary squads into a manhole opening into the nearest sewage system. It was necessary in such cases to construct a bucket-washing plant at this point, with a hard standing and water point. The buckets after emptying and washing were returned to the point at which they were used. Owing to much carrying and heavy handling by personnel doing an unpopular job, the life of the latrine bucket was very short. Elsan chemical closets were also used, initially with the correct Elsan fluid, but later on, as this became more difficult to obtain, the Elsans in use degenerated into ordinary bucket latrines. Bucket contents were sometimes disposed of by burying them where there was no danger of contamination of water supplies. The crude sewage of a number of coastal stations, such as Calshot, Mount Batten, Pembroke Dock and Felixstowe, was discharged direct into the sea.

Although most of the latrines using a waterborne system were of the conventional type certain older stations had latrines of the water-trough type in which there was a row of latrine seats opening into a long water-trough which was flushed at intervals. This type was not entirely satisfactory owing to smell and lack of fly-proofing. Sometimes the faecal deposits were such that they were not wholly removed by this method of flushing and this type of trough closet was undesirable. Where waterborne systems were not available and where camps of a temporary nature were established, trench latrines and latrines of the borehole type (the latter being more efficient) were sometimes used as an alternative to bucket latrines.

OVERSEAS

HEALTH EDUCATION

The health of troops in overseas Commands depends very largely on the individual efforts of the unit medical officer. To a greater degree than his counterpart in the United Kingdom, he has abundant opportunity for the exercise of preventive and curative measures, particularly the former, which if effective, may result in a great saving of man hours.

Responsibilities of the medical and executive officers. At the beginning of the war most medical officers already in the R.A.F. had had experience

of tropical conditions, and further medical officers with previous tropical experience joined the Medical Branch. Others rejoined from the Reserve. As the R.A.F. expanded to meet new tasks, however, young recently qualified medical officers were entering the Service who had had no chance to acquire practical knowledge of conditions in overseas theatres. Training in tropical medicine, tropical hygiene and in field hygiene had to be arranged and short courses were given at the Institute of Pathology and Tropical Medicine, Halton, and at the London School of Hygiene and Tropical Medicine, Keppel Street; over 300 medical officers passed through the former. The courses lasted for ten days only and although as much instruction as possible, including revision of basic laboratory procedures, was compressed into this very short period, many medical officers arrived overseas with insufficient knowledge of the practical side of their work. Although most of these officers were able, by personal effort, to make good the deficiencies in their knowledge and experience, it appears advisable that medical officers serving overseas in any future campaigns should be given greater opportunities of fitting themselves beforehand for their very important task.

The ability to improvise was found to be a most useful asset, particularly in connexion with the construction of hygiene appliances. Generally speaking, there was little real appreciation among executive officers of the need for efficient field hygiene. Many non-medical officers had little knowledge of the subject, apart from its connotation with latrines and drains, and few were enlightened concerning the wider aspects of the preservation and promotion of the health of troops. It was not until commanders in the field had experienced severe casualties from malaria and dysentery that they would give firm support to sanitary measures, although very considerable saving in man-power could have been effected on several occasions had medical advice been heeded from the outset. In the field of venereal disease control too, they tended to leave the responsibility entirely to the medical officer, but the advice of the medical authorities on all these matters counts for little, unless it is fully backed by the necessary disciplinary measures.

Use of films. A selection of films on the subject of health education was retained at command headquarters and circulated to units from time to time. For various reasons this was not found to be a very efficient way of ensuring that all personnel, particularly those from small units, saw the films. Some of them were 16 mm. and some 35 mm. and some had copies in both sizes, but unless a projector of the right size was available at each unit, all the films could not be shown. There was frequently delay in the circulation of the films which, furthermore, soon became dated or so worn that the sound track was indistinct, while sometimes films were so badly damaged that repeated stops for adjustment had to be made during the showing. At units, the keenness of the staff was a big factor in

determining whether or not a film was properly shown, but even then many personnel on key duties could not always be spared to attend.

The use of mobile film units eliminated certain of these difficulties, especially overseas, where out-of-door showings could be arranged. When the films were shown indoors in huts of the Romney or Iris type, the sound was very muffled during periods of heavy rain.

In general, films were found to be extremely useful, provided that they kept pace with modern trends. Careful selection was necessary to ensure that the interest of the audience would be aroused, for it was found that if the same films were shown too frequently to the same audience, an antipathy to instructional medical films was easily created. There was a special need for R.A.F. films on the subject of the dangers of venereal disease.

WATER SUPPLIES

In active theatres of operations the Royal Air Force was mainly dependent on the Army for water supplies. In certain theatres water supply was a major undertaking involving large numbers of water lorries and trailers, as in the Western Desert in the North African Campaign. Here the water supply for individual persons had to be cut down to minimal essential uses and the success or failure of the water supply system played an important part in the outcome of operations. In other Commands where rivers, wells and streams were available the chief problem was filtration and chlorination of the water, the difficulty being to maintain quality rather than quantity. Boreholes and tube wells were used in India and Burma to supply small units such as mobile field hospitals and where municipal supplies were available these were used. During advances into conquered enemy territory the water supplies were frequently disorganised by bombing and had to be improvised on a field basis until the engineers had done the necessary repairs. Overseas it is rare to find a water supply in tropical or subtropical areas where treatment of the water is not necessary.

The Electrolytically Controlled Dosing Trailer, which was extensively used, received adverse criticism particularly from Iraq and Persia Command. The D.P.M.O. (Hygiene) of this Command stated in 1942 that a survey of E.C.D. Trailers in the Command showed that there was not one which could be considered fully serviceable. The defects were:

Fracture of knee action road springs.
Disintegration of equipment boxes on the sides of the tank due to flimsy construction.
Fracture of gauge glasses which were difficult to replace.
Complexity of the working of the numerous taps, cocks, etc.

The usual fate of E.C.D. Trailers was ultimately to become a water tender in which water sterilising powder was introduced by hand dosage.

For large units permanently stationed in the desert the water supply was a considerable problem. One such unit was Royal Air Force Station, Port Etienne in Mauretania, French Territory on the coast of the western border of the Sahara, where the difficulties of obtaining an adequate water supply were so great that the continued existence of the station on this site was at times precarious. The nearest natural water supply to this unit was a small well at an oasis sixty miles away, where the scanty water supply was invariably contaminated with camel droppings and other excreta. In the initial phases of occupation water was shipped in by tanker from Dakar and later two sea-water distillation plants were set up and operated spasmodically, but this was a laborious and uneconomical process, as blowing sand interfered with the working of the machines, frequently making them unserviceable. The water, which was rather warm on production, was collected by bowser for transportation to tanks around the station. Although distillation should theoretically sterilise the water there were so many points at which contamination could occur anew that the water was chlorinated. The value of the water to the local natives was so great that for a cup of it they would do a day's work.

Among other unusual methods of water supply that used on the Rock of Gibraltar is of interest. Here catchment zones have been created by constructing concrete aprons on the external surface of the rock itself. The water supply on the Rock is further safeguarded by the use of sea-water distillation plants, should the rainfall prove inadequate.

DRESS

Considerable changes in the standard type clothing issued to personnel embarking for overseas service became necessary as war developed in the Far East. Peace-time planning had not envisaged fighting in the areas in which it did actually occur, but the Japanese conquest of Malaya and the Dutch East Indies, bringing with it the need for jungle warfare in which the R.A.F. had perforce to participate, made it imperative to revise the scales of clothing.

One of the principal difficulties was the selection of suitable materials for tropical clothing which would allow ventilation of the skin and at the same time be proof against mosquito bites. At the outbreak of war heavy khaki drill was the standard material for shorts, shirts and tunics, but later a cotton cellular weave material was largely used and the bush jacket was introduced. The woollen or wool mixture stockings which were a universal issue were comfortable, provided that the wearer washed his feet regularly morning and night, powdered them well and wore the light *chapli* type sandal which was also a personal issue. The standard type boots were intolerably hot but wherever slacks were worn in the jungle it was essential that these boots should also be worn with

anklets made of webbing. This type of wear proved very effective in scrub typhus areas.

Wherever possible airmen were encouraged to work stripped to the waist, as it was found that individuals who had gradually acquired a healthy tan were less susceptible to numerous skin diseases and the effects of prickly heat. The removal of shirts, particularly in offices, was often unpopular with the executive authorities and directives on the subject varied in different localities. No policy decision was ever made although considerable suffering might have been alleviated had one been issued.

In tropical areas very particular attention to the wearing of protective clothing was necessary in order to avoid outbreaks of endemic diseases. In malarious regions mosquito boots were worn and standing orders were issued that personnel should change out of shorts into slacks at dusk and should wear long-sleeved shirts or long-sleeved jackets. The former, which buttoned at the neck, offered greater protection.

Considerable difficulty was encountered in devising suitable clothing for flying personnel operating over jungle areas who might have to bale out and attempt to reach friendly territory on foot. An outfit consisting of jungle-green bush jacket and slacks, worn with flying-boots with detachable uppers which could be ripped off, was found to be the best solution, although it was felt that no really satisfactory answer to the problem was ever found.

EFFECTS OF HEAT

Heat effects, consisting of heat exhaustion and heat stroke, were seen in most tropical theatres, but true heat stroke was mainly limited to the Middle East, in such areas as Iraq, Persia and the borders of the Red Sea and the Persian Gulf. Medical officers were trained to distinguish between the two and were taught the appropriate method of handling each type of case. Among the predisposing causes of heat stroke were malaria, over-indulgence in alcohol, and over-exertion before acclimatisation. Heat exhaustion was more liable to occur in those with deficient salt and water intakes. Working during the hottest part of the day, working in fuselages of aircraft parked in the sun and forced marches all contributed their quota to the cases of heat effects.

In the summer of 1942 the heat was somewhat above average in intensity in Persia and Iraq and attention was focused more than usual on the problems of combating heat effects. Large numbers of unseasoned personnel were arriving by sea after a long and overcrowded journey and were required to perform urgent and arduous duties, often in the open. There were a number of cases of heat stroke and heat exhaustion, with some fatalities, and urgent action was imperative, especially in Shaibah, Basra and the Gulf stations. Preventive measures included the adjustment of working hours in order to utilise the cooler part of the day for

working in the open and the education of personnel in the value of salt and copious fluid intake. Heat-stroke centres were established for the early treatment of cases on the dispersed sites. These centres consisted of reed huts with the open side into the prevailing wind. The sides of the hut could be wetted to produce evaporative cooling. *Chattis* and fans were provided and *charpoys* on which patients could be laid, stripped, for treatment. These centres proved most useful since moving acute cases to sick quarters might involve a journey of some distance in an overheated ambulance and this might prejudice their recovery. Later an air-conditioned ambulance was evolved.

CONTROL MEASURES

Swimming Pools. Baths which existed at permanent stations before the war remained in operation, but few new baths were constructed. In the larger baths chlorination plants had been installed and in smaller baths it was customary for the medical officer to supervise hand dosing. Further measures frequently taken by medical officers in hot climates to limit ear and foot infections included compulsory permanganate foot-baths and the provision of ear drops. During water shortages water in the baths was changed at the discretion of the medical officer.

In the operational theatres, bathing was encouraged wherever it was considered safe. In North Africa and the Western Desert and later in Sicily and Italy, in West Africa, Malta and coastal areas in South-East Asia Command, sun and sea bathing was an almost universal pastime. Although there were certain disadvantages such as the risk of mycotic infection and sunburn, jelly fish and sharks, the benefits, both physical and mental, derived from sea bathing, far outweighed them. Bathing in inland waters often had to be forbidden because of the dangers of bacterial contamination, schistosomiasis and Weil's disease.

Fly-proofing of kitchens. The policy of fly-proofing kitchens and all buildings in which food was stored, cooked, prepared or eaten continued as in peace-time, but the increasing numbers of personnel stationed abroad and in the field of operations made it extremely difficult, in the often adverse conditions, to achieve a satisfactory degree of proofing.

Conditions in the home establishment presented little difficulty apart from the problems created by the shortage of supplies of screening gauze, which was found to be the best medium. Overseas this shortage was even more of a problem because screening rapidly became unserviceable through rusting or corrosion and blockage by sand or soot. At permanent stations a considerable degree of fly-proofing was obtained, but in the field much depended upon the circumstances. Bombed buildings, old native dwellings or badly constructed *basha* huts presented considerable difficulty, although much was achieved by means of improvisation with butter muslin.

Probably the most important problem overseas was to ensure that all personnel fully appreciated the menace of the fly to the individual and collective health of the unit. Only when the dangers were fully realised would personnel take care to shut doors, pull curtains and treat the often flimsy anti-fly devices with the respect which they deserved. Side by side with fly-proofing it was necessary to provide fly traps, to eradicate breeding grounds and to ensure that all fly-proofed premises were sprayed at least once daily.

Latrines. Overseas, in permanent stations, much the same types of latrines were used as in the United Kingdom. At the non-permanent stations the bucket type latrine was the most widely used and there were varying methods of disposal of the contents. Where plenty of auxiliary fuel was available, burning was possible. Disposal by shallow trenching was satisfactory where the nature of the soil permitted and in some areas this worked exceptionally well, with no smell, flies or other nuisances, coupled with rapid disintegration of faecal matter. Other units relied on carriage of buckets for a considerable distance down wind before dumping in the bush or desert, with or without some attempt at covering faecal deposits. Some units dumped latrine bucket contents into the sea or into creeks.

Hygiene difficulties with locally enlisted labour and followers. Special provision had to be made for natives of various races where they were employed by R.A.F. units or affiliated to them. Native customs and prejudices had to be observed and religious views respected. The eastern attitude towards hygiene in general and towards what in broad terms may be called the decencies of behaviour in particular, is one which is not readily understood by the average European. Native labour employed by the Services was usually drawn from a class which has no equivalent in the United Kingdom. Their standard of intelligence was usually low and for them poverty was often synonymous with dirt. In many cases they were carriers of numbers of communicable diseases, the most important of which, from the European point of view, were the dysentries and helminth infections; venereal diseases, although common, were less easily transferred and more readily treated. In the interests of the general health of all personnel it became necessary to supervise the toilet habits of these races very closely.

To the average Asiatic urination and defaecation are matters which are attended to with an attitude directed towards convenience rather than propriety and when he finds that the latter is demanded of him, he will make use of any convenient form of cover, the nearer the better. While this satisfied the dictates of decency it did nothing to further the maintenance of hygienic conditions, for faecal deposits, which might remain undetected for considerable periods unless the sanitary and medical personnel were alert, provided the ideal *nidus* for the propagation of fly-borne dysentery.

The problem, although distasteful, was one that demanded definite and positive action by the medical authorities. The native is accustomed only to the Asiatic type latrine, which allows the user to adopt the squatting position during defaecation. If confronted with the pedestal type, he will squat on top of the seat, with obvious unhygienic results. The solution lay in the erection at suitable points, of Asiatic type latrines, which were of simple construction and very easy to fly-proof, being flush with the surface of the ground. If the provision of these latrines was to be of any value it was necessary to erect them in relatively large numbers, for if the native found himself working at any distance from the nearest one he was liable to revert to his normal procedure and foul the site on which he was working.

Having erected these latrines in sufficient numbers, a further problem remained. The native, after defaecation, normally uses water to cleanse himself, viewing with disgust the European's use of toilet paper. This necessitated a water supply in the latrine, a problem easily surmounted in permanent brick structures. To the temporary field Asiatic latrine however, the native brought with him a small tin of water, creating two further problems of disposal. The soiled water was best dealt with by liming the area generously, but the tin presented greater difficulties, as it was often thrown away after use and provided a potential breeding-place for mosquitoes. The solution was to inspect the area frequently for discarded tins.

These and other precautions were essential in view of the fact that a large number of natives were employed in the cookhouses, where they were actively engaged in the preparation of food. Many others acted as personal bearers and in this capacity carried food from the cookhouse to other parts of the camp. It was of the utmost importance that all such personnel should wash their hands regularly before entering the cook-house and everything possible was done to ensure that this became a matter of routine. Although theoretically the regular testing of stools of native employees was the ideal prophylactic measure, it was found in practice to be extremely difficult, in view of the frequent changes of personnel and the fact that despite all precautions, many unauthorised natives managed to find their way into the cookhouse area. The only really effective measure was constant vigilance on the part of the sanitary and medical authorities, followed by prompt action in respect of any delinquents.

Inoculations. All personnel, unless they specifically refused, were immunised against:

Smallpox by vaccination every 5 years at home or 2 years overseas.
Typhoid and Paratyphoid by inoculation annually with phenolised vaccine until February 1943 after which alcoholised vaccine was used.
Tetanus by inoculation with tetanus toxoid annually.

Inoculation against other diseases, namely yellow fever, cholera, plague and typhus fever, was required for those proceeding to or serving in areas where the diseases constituted a significant risk or where quarantine regulations demanded such inoculation. Moreover, outbreaks of smallpox and typhoid from time to time required immediate re-vaccination or re-inoculation.

No great difficulties were encountered either in persuading all but a negligible minority to be immunised or in giving the inoculations at the required time. A number of cases of homologous serum jaundice followed inoculation against yellow fever in 1941–3 (*see* section on yellow fever) and for a time caused some confusion as there was at that time an outbreak of infective hepatitis in the Middle East.*

Delousing. Infestation by lice did not at any time prove serious. The possibility of such infestation and of the occurrence of epidemic typhus was, however, a matter which caused some concern. Migration of refugees and movements of armies and prisoners-of-war occurred on an unprecedented scale in climates and conditions ideal for the development of louse-borne disease. Fortunately these conditions were not found on fronts on which the R.A.F. was engaged until 1943, by which time D.D.T. was beginning to become available. Until then the standard anti-louse powder was 'AL.63' chiefly composed of naphthalene and derris dust, which, although very effective, was not the dramatic substance which D.D.T. proved to be.

A considerable outbreak of typhus occurred in Naples in December 1943—January 1944, which was checked by the use of AL. 63 by Field Hygiene Units of the R.A.M.C. but finally stamped out by an elaborately staffed and equipped U.S. team using D.D.T. powder. Mass powdering of civilians and of such Service personnel as necessarily lived or worked in Naples rapidly prevented infestation and no cases occurred in the R.A.F. A fuller description of this outbreak is found in the section dealing with special problems. Almost universal infestation occurred in the groups of partisans and a delousing station was set up at Bari to deal with them. In 1945 large numbers of repatriated prisoners-of-war passed through R.A.F. stations in the United Kingdom—as many as 4,000 in a day—and for them power-operated powder blowers were used (*see* Prisoners-of-War, Chapter 13).

Laundry facilities. On permanent stations pre-war arrangements continued and articles were laundered by contract. Similar arrangements were made at many new and reasonably static stations overseas and in the Middle and Far East *dhobies* were usually obtainable. In North Africa and Southern Europe it was virtually impossible to make laundry arrangements for mobile formations and most airmen and many officers

* *See* R.A.F. Volume III, Middle East Campaigns.

washed their own clothes. Some made private laundry arrangements with civilians in the neighbourhood while others managed to secure the services of prisoners-of-war employed in the unit. Ironing of clothes was practically impossible but this was not of great importance in units 'in the field' where a smart appearance was not to be expected. The drying of clothing in the winter months and monsoons was the greatest problem and was never completely solved.

In the case of M.F.Hs. the problem was accentuated by the considerable quantities of linen which were used by the surgical section of the establishment. Every effort was made, therefore, when the hospital became static for any length of time, to make full use of any washing facilities, utilising whatever local labour was available. In areas such as the Western Desert, where water conservation was of the utmost importance, and the daily ration per head was limited to one quart, considerable ingenuity was necessary to permit of any laundering and water was frequently filtered for re-use.

Special Problems

DYSENTERY

GENERAL SURVEY OF INCIDENCE

In the following review of dysentery during the war from the hygiene and sanitation viewpoint, treatment has not been discussed and the pathological aspects are not included except for a sub-division into amoebic and bacillary types in the first incidence table. This table (below) shows the incidence of dysentery per thousand of strength in the total Force, in the Force at home and in the Force overseas:

Dysentery in the R.A.F.

Year		Incidence of Dysentery per thousand of strength		
		Total Force	Home	Overseas
1939	A	·09	·05	·40
	B	·50	·02	3·90
1940	A	·09	·01	·78
	B	·86	·07	8·14
1941	A	·18	·03	1·35
	B	2·98	·16	24·18
1942	A	1·20	·05	4·92
	B	7·17	·35	29·40
1943	A	2·94	·13	8·98
	B	8·88	·73	26·35
1944	A	4·66	·36	13·90
	B	9·12	·80	26·96
1945	A	3·55	1·18	8·71
	B	8·73	0·85	25·84

A = Amoebic
B = Bacillary

The majority of cases naturally occurred in overseas theatres and the proportion of amoebic cases to bacillary is indicated. Incidence of amoebic and bacillary dysentery increased in overseas theatres from 1939 to 1944 and then began to fall. In the Force at home dysentery incidence, both amoebic and bacillary, rose from year to year, to all intents and purposes, throughout the war.

The table below shows the incidence of dysentery in certain major overseas Commands. Here clinical, amoebic and bacillary dysentery cases have been combined and the table illustrates the various incidences in different Commands as they were at the onset of war showing how increases occurred in all Commands as hostilities developed. Malta and the Far East had only low incidences at the onset of war, India Command always had a high incidence which became even higher in the war years and the incidence in the Middle East and especially Iraq rose sharply:

Dysentery Incidence in Overseas Commands per Thousand of Strength

Year	Malta	Middle East	India	Iraq	Far East	West Africa
1939 .	1·1	6·0	13·1	2·4	1·6	—
1940 .	11·2	17·8	19·0	6·5	1·9	—
1941 .	21·3	46·4	36·9	7·2	—	—
1942 .	25·8	40·9	71·2	61·1	—	81·4
1943 .	24·1	32·5	63·9	52·1	—	44·65
1944 .	20·1	41·5	89·8	97·0	—	29·11
					ACSEA	
1945 .	5·6	14·9		95·3	64·0	17·51

At the end of the war, A.C.S.E.A. showed a very high incidence. This was consequent on the reoccupation of Malaya, Hong Kong and other zones which had been subjected to Japanese occupation. West Africa was never the scene of land hostilities but nevertheless there was a high incidence of dysentery there in 1942, which is amply explained by the local conditions. As more and more was done in the hygiene and engineering sphere, the incidence of dysentery fell year by year.* It should be noted that originally when Takoradi in West Africa was opened in July 1940 it was administered by Middle East Command. Its sickness incidences were not recorded separately, but were included in Middle East's figures until 1942.

METHODS OF SPREAD AND PREVENTIVE MEASURES

The method of spread of amoebic dysentery is *via* contaminated food, especially if moist, such as fruit and fresh vegetables. Contaminated water also plays a part, and flies and infected food-handlers are a serious

* *See* R.A.F. Volume III, West Africa Command.

menace. Bacillary dysentery is spread in much the same way but contaminated milk and water supplies play a larger part, as do flies and infected carriers. The methods of control of dysentery were based on this knowledge and were those described below:

Personal hygiene of food-handlers. Before being employed in any capacity involving the handling of food or food utensils, personnel were medically examined and stool tests were done and repeated as necessary and practicable to eliminate the carrier state. Food-handlers were briefed and supervised as far as possible in cleanliness of person and clothing and the essential need for washing the hands after defaecation. This was difficult to ensure in the case of white personnel and almost impossible in the case of native food-handlers. A fairly high percentage of natives were dysentery carriers and the carrier state could not be excluded with any certainty by any practicable means.

Cookhouse hygiene. Cleanliness of the cookhouse, cooking utensils and food containers, at all stages of preparation, storage and consumption of food was the aim, but for various reasons this was not always possible. Under field conditions and in tented camps full compliance with all the rules of hygiene was seldom attainable, one of the difficulties being the apparent inability to convince the native food-handler of the importance of thorough sterilisation of all soft-skinned fruit. Food contamination in carriage and storage was not always preventable and water shortages created further difficulties.

Anti-fly measures. These consisted of prevention of fly-breeding, killing of adult flies and fly-proofing of messes and cookhouses. Though entirely practicable for static units, it presented difficulties in the field and its efficacy depended largely on the keenness of individual units.

Supervision of personal hygiene. This was exercised where practicable, but indiscriminate fouling of the ground by natives and at times by airmen resulted in food contamination by flies.

Protection and sterilisation of water supplies. These were efficiently carried out except when water trailers or hand chlorination systems were left in the hands of unreliable personnel. It was not realised in some areas that the normal chlorination processes do not destroy the cysts of *Entamoeba histolytica.* Milk supplies needed careful supervision.

Detection of carriers and early clinical cases in food-handlers, was most important. After an attack of dysentery it was desirable to obtain seven negative stool findings before clearing the patient but this was only possible in static units near hospitals and was virtually impossible in the field.

One danger to which personnel overseas were exposed was that of infection in unauthorised cafés and eating places; furthermore, in purchasing ice cream and cool drinks from the numerous itinerant food vendors, they ran a very great risk. They were constantly warned in routine orders and medical posters against this practice of consuming doubtful items, but many infections must have been contracted in this

way. The carriage of uncovered food on the floors of trucks, exposed to dust and dirt and to the footwear of passengers, was also a frequent occurrence, especially in the case of small isolated units which had to collect their own rations.

In the United Kingdom, dysentery cases occurred sporadically or in epidemics usually of *Sonné* type bacillary dysentery. One source of infection was found to be the Italian collaborators employed on food-handling duties, and instructions were issued prohibiting the employment of these men on such duties, except in cases where they had been given medical clearance.

MALARIA

INCIDENCE IN OVERSEAS THEATRES

Each theatre overseas had its own special problems and local difficulties. The local vectors of malaria and their breeding habits, the local terrain and meteorological aspects had to be studied. Stationary air bases had problems which were quite different from those of large mobile military forces operating in the jungle. The incidence of malaria per thousand of unit strength is quoted below for certain major overseas Commands, for the war years:

Year	*Malta*	*Middle East*	*India*	*Iraq*
1939 . .	2·2	22·7	39·3	50·7
1940 . .	—	60·1	46·0	43·0
1941 . .	3·2	60·4	33·9	38·5
1942 . .	3·0	37·5	118·7	38·6
1943 . .	40·4	47·1	134·4	57·1
1944 . .	55·1	41·2	157·1	83·4
1945 . .	5·6	14·5	40·2 ACSEA	28·0

The high incidences in 1942 and 1943 for India Command are largely explained by the Japanese invasion of Burma and Malaya. The Far East Command incidence for 1939 and 1940 was 9·4 and 27·3 per thousand respectively. The report for Air Command, South-East Asia in 1945 shows an incidence of 40·2 per thousand. This is a relatively low incidence and shows the results achieved by comprehensive anti-malarial measures. The territory occupied by units of A.C.S.E.A. in 1945 was very malarious, for the Command included the following areas:

Arakan Coast
Central and South Burma and Rangoon
Bangkok and Saigon
Agartala and Comilla
Malaya
Sourabaya and Hong Kong

On re-occupation of these areas it was found that most of the anti-malarial engineering projects had been badly neglected under Japanese tenure. It was expedient therefore to place the entire Command on daily

compulsory doses of mepacrine. Later considerable advances in preventive measures became possible as supplies of D.D.T. increased.

The towns and villages in Burma and Siam occupied by military personnel were sprayed with D.D.T. by aircraft of No. 1354 D.D.T. Flight and excellent work was done by anti-malarial control units under conditions of great difficulty. More widespread use of D.D.T. also became practicable in Middle East in 1945, when D.D.T. air spraying was done by aircraft (Baltimores) of No. 1345 Flight. Five aircraft of this Flight were available in Egypt and five were allocated to East Africa. In the latter region air spraying was carried out in the following areas:

Kisumu
Dar-es-Salaam
Port Reitz
Mombasa
Tabora

Canal Zone areas were also sprayed by the Flight and also Kordani (Palestine), at the request of Army units in this area. Courses in anti-malarial methods were held at No. 2 School of Hygiene (Egypt) and courses for medical, hygiene and administrative officers at No. 3 School of Hygiene, Ranchi.

West Africa Command. The incidence of malaria, practically all malignant tertian, in West Africa Command is shown in the following figures:

Year	*Incidence per thousand of strength*
1942	843·50
1943	392·55
1944	212·25
1945	78·19

The difficulties of malaria control in the various units of this Command are illustrated in Plates XLIII and XLIV, which show the siting of certain stations and the nature of the surrounding terrain.

The suppressive used in West Africa was originally quinine bihydrochloride in a dosage of 5 gr. daily, but mepacrine was substituted in 1943. A period of 'overlap' between the two drugs is normally necessary but this was not universally carried out in West Africa, and certain units discontinued the quinine as soon as the mepacrine was started. The concentration of mepacrine in the blood was at first insufficient to suppress malaria and the result was a vastly increased incidence of the disease for the following week or ten days. Aircrew continued to take quinine, as it was thought at that time that mepacrine was predisposing to anoxia or had other adverse effects on flying personnel. Work at the R.A.F. Institute of Aviation Medicine disproved this, however, and in June 1944 aircrew personnel were placed entirely on mepacrine. Where mepacrine was regularly taken, at a dosage of 0·1 of a gramme daily,

malaria was extremely unlikely to occur and it was the responsibility of the executive to ensure that this dosage of mepacrine was, in fact, actually taken by all ranks.

CONTROL MEASURES

The control of malaria, important as it is in peace-time, is much more important in war, for a high proportion of non-effective personnel in a unit or formation can make all the difference between success and failure in an action or a campaign. This was evidenced in Burma and South-East Asia and in the campaigns in the Pacific. In the early days of the Burma campaigns two-thirds of the personnel were absent from their units suffering from malaria, dysentery or skin diseases, the first mentioned claiming the largest number of casualties.

With notable exceptions, unit commanders were slow to realise the great importance of malaria control and tended to leave the problem entirely in the hands of the medical and hygiene personnel who, in spite of all their efforts, could not hope for satisfactory results without executive backing. Only when high incidences of casualties due to malaria had brought the problem forcibly to notice was the full co-operation of the executive authorities given. However, the Medical Branch was not entirely blameless in this respect, as newly joined medical officers in their early months overseas were sometimes slow to appreciate their responsibilities in the preventive field. In the main, however, they quickly grasped the importance of therapeutic and preventive measures in relation to malaria.

Environmental control. Malaria control was an Army responsibility where Army and R.A.F. units were operating in the same area, and R.A.F. units were normally responsible only within the confines of their own stations. In operational theatres where there were no stations as such, areas of responsibility were agreed locally between the two Services. In some areas R.A.F. units were established where there were no local Army units and the R.A.F. had perforce to assume full responsibility for large areas. For this purpose the Anti-malarial Control Units were formed and equipped. They were handicapped by the lack of trained malariologists to command them and by the poor quality of airmen posted to them. Transport was not available as needed, and advisory and administrative backing was not available to the degree enjoyed by Army units of similar function. Fortunately the advice of expert malariologists, entomologists and field engineers was usually obtainable from the Army, from our Allies, particularly the American Forces, or from civilian authorities. The experience of Air Ministry Works Department engineers in relation to malaria control varied considerably; many with previous experience overseas were highly trained and well versed in the work. Where airfields were being urgently

constructed, however, anti-malarial engineering works were usually relegated to a low priority. In non-operational areas environmental control was usually in the hands of a joint organisation, the Area Malaria Board, to which the civil government and the Services allotted the necessary personnel and financial aid if required.

Aerial control. The R.A.F. made a special contribution to environmental control, by the application of larvicides from the air. At first paris green dusting by aircraft was carried out and later D.D.T. was sprayed by aircraft in areas where the breeding grounds were too extensive, too inaccessible, or too heavily mined for effective ground control. D.D.T. was sprayed from aircraft fitted with smoke-screen tanks or specially adapted long-range petrol tanks and this measure met with considerable success in overseas Commands. Following initial experiments in Italy with a Hurricane, a team from the Chemical Defence Experimental Establishment carried out extensive trials in West Africa. The most important point that emerged from war-time experience was that spraying should be possible from normal operational aircraft with the absolute minimum of modification. Special aircraft could not be obtained or reserved for this specific purpose from British sources, neither could extensive modifications be undertaken. The application of larvicidal sprays is essentially similar to the production of smoke-screens, and aircraft which can perform one function can perform the other once the area has been indicated and suitable containers have been fitted and charged. The problem is in fact primarily one for the Armament Officer.

Unit control. By its very nature an area which was selected by the executive and engineering authorities for an aerodrome was likely to be situated in a malarious region. A large flat area of land, suitable for an airfield in the Tropics, will almost certainly be poorly drained and surrounded by water courses, paddy and swamps, this being nearly always so in Malaya and South-East Asia generally. This was also true of Ceylon and West Africa and largely so of tropical flying-boat bases. Artificially formed lakes are often constructed in such areas by 'bunds', to conserve water for the dry season for both domestic and agricultural use.

Once the airfields were sited, malaria control for the station and its immediate environment tended to be regarded far too much as the medical officer's prerogative and far too little as the ultimate responsibility of the commanding officer. Its effectiveness, therefore, depended largely on the enthusiasm and capability of the medical officer and on his success in enlisting the help he needed. In the later years of the war when the executive had at last been convinced of the dangers of malaria and the value of suppressive drugs and protective clothing, malaria control became, as it always should have been, a matter of normal unit discipline.

EQUIPMENT

For unit control in static conditions, it was essential to have accommodation to house anti-malarial equipment and to act as a small headquarters for the anti-malarial workers. Here the equipment was issued to the gangs in the morning and received back after work for checking and servicing. Paris green was mixed here and D.D.T. solutions and pyrethrum solutions made up and malariol issued. Maps and charts were kept also to show the progress of work and to record new breeding-grounds discovered. The stores were often sub-divided into office, storeroom and workshop and had to be secure against unauthorised entry, carefully supervised and locked up at night. Hand-sprayers, knapsack and power sprayers were stored in this building. Many defects were found owing to poor workmanship, cheap material and selection of parts which were liable to corrode in the hot moist conditions of the Tropics. The valves and washers of the knapsack sprayer were the weak points in this apparatus, otherwise it was easy to use and reliable in action. These knapsack sprayers were in great demand and many were constructed locally (see Plate XLV). These, however, did not remain serviceable for any length of time in the hands of mechanically unskilled coolies.

In some areas environmental control had to be undertaken within unit boundaries and here the medical officer found himself in charge of an augmented sanitary squad which in turn controlled a gang of native labourers or prisoners-of-war; with this unskilled force and with such equipment as he could obtain, he often accomplished quite considerable feats of clearing, canalising, oiling and spraying of buildings. A great deal depended on the medical officer's powers of organisation and on the labour force at his disposal. In some cases there were suitable overseers available who could be placed in charge of a gang of coolies and who could be relied on to carry out these duties in a satisfactory manner. The Eurasian overseer, who had a good grasp of the problem and was usually multi-lingual, was a typical example. At other times the supervisory labourers were totally unreliable and this prevented efficient mosquito control. The same can be said of the airmen who were allocated to supervise labour gangs: some were very good and others useless. It was by no means always easy to get rid of the latter in spite of the importance of the work they were supposed to be doing. Furthermore, it was possible for these airmen to be allocated to anti-malarial duties on a part-time basis and to be on call for other duties. This was a most unsatisfactory state of affairs although it applied only to station personnel and not to Anti-malarial Control Units, where the officer in charge had full control of his personnel.

Where a large amount of direct insecticidal spraying had to be done daily in domestic accommodation, the use of power sprayers increased

the efficiency of the spraying and diminished the time, labour and amount of insecticide needed to do the work. Power sprayers were rather late in the day in making their appearance in many theatres, but some were improvised by using modified paint sprayers, or by adapting spray heads for use with air compressors. These were usually heavy and unwieldy, and not sufficiently mobile. The 'Phantomyst' was an advance in this direction and could be started and used by natives with the minimum of training (see Plate XLVI).

Clothing for the protection of coolies' backs from malariol was necessary when the knapsack sprayer was used and for this purpose unserviceable gas capes were worn. Suitable boots or Wellingtons were necessary in thorny jungle, or where snakes were prevalent. Considerable difficulty was encountered in providing adequate transport facilities for station anti-malarial squads, who were often engaged on work at some distance from their stores. Heavy spraying apparatus and drums of D.D.T. were difficult and time-consuming to move by any other method. Nevertheless, the executive staff were often loth to put lorries at the disposal of the squad, usually because of their lack of appreciation of the difficulties involved, though in some theatres motor transport was definitely scarce. Often the only solution was to use sick quarters transport for this unsuitable purpose.

Apart from the active malarial control by anti-malarial personnel steps had to be taken by means of lectures, films, the issue of posters and propaganda in orders and publications to make all personnel aware of the dangers. Punishment for non-compliance with personal precautions would have been most salutary if commanders had resorted to it more often.

Other items of unit malaria control were the following:

Screening of buildings. In non-operational theatres, where permanent and semi-permanent buildings or hutting were occupied, screening was practicable and was undertaken as far as metal gauze was available. In the operational theatres, however, and particularly in the forward areas where men were bivouacking or living under canvas or in requisitioned buildings which were more or less damaged, screening was, of course, impossible. Screening was also a problem for men living in *bashas* of *cadjan* (baked palm fronds) construction, of which examples are shown in Plate XXXV. In these huts the open 'slit-bamboo' construction with open eaves rendered screening difficult. Similarly, in mobile field hospitals using *cadjan* wards, no screening was possible and reliance had to be placed solely on mosquito nets.

Mosquito nets. Nets were generally in adequate supply although temporary local shortages occurred through faulty distribution, as in the initial landings in Sicily when some units were separated from their nets for several days. Experience showed that nets should always be a personal issue, that the nylon 'boot' type is the most suitable for use under

all conditions, that nets should be khaki or green in colour and not white (white nets used by troops in the open are easily seen from the air) and that the square mesh nets made in India of a fluffy cotton interfered so seriously with ventilation as to be intolerable in hot and humid conditions.

In West Africa there was a large issue of 'bell' type nets. These had one point of suspension and the lowermost folds were tucked under the bedding. A ring 'spreader' was intended for use with these nets but was seldom correctly erected. Also, for proper hanging the net had to be hung at the correct height. They were usually hung too low and thus had inadequate spread interfering with ventilation. Furthermore, the calico edge around the bottom was then tucked completely under the bedding and personnel were bitten through the mesh of the net. Hung at the right height the calico edging would have prevented this.

Clothing. Orders were in force requiring the wearing of slacks and long sleeves during the hours of darkness. On the whole these orders were enforced but, inevitably, a change of clothing was not always readily available at dusk and this was an important point in favour of the abolition of shorts as an item of uniform. The orders in relation to changing into slacks and long-sleeved shirts at sundown were often flagrantly disobeyed by senior officers and in such circumstances it was found hard to enforce the orders for airmen. In West Africa Command personnel frequently arrived in shorts and short-sleeved shirts, having been told to draw anti-malarial dress, including mosquito boots, on arrival. By the time the items needed were drawn these personnel had in many cases already been infected with malaria.

Insect repellents. Anti-mosquito cream was unpopular and relatively ineffective and was never widely used. The introduction of liquid repellent (D.M.P.) in 1943 was a considerable step forward but, possibly because of the prejudice against the former cream, it was used only in certain areas and then only by those on duty in the open at night, such as guards and sentries. Sleeping and living accommodation was usually sprayed night and morning with some type of pyrethrum in kerosene from a spray gun. Later when D.D.T. became available residual spraying was undertaken and resulted in increased efficiency and a great saving in labour. The personal issue of the American 'Aerosol bomb' to personnel in transit was a great benefit.

Suppressive drugs. The growing shortage of quinine following the Japanese occupation of most of the world's quinine producing areas resulted in the introduction of mepacrine hydrochloride in 1943. The dosage advised at first was 2 tablets (0·1 gramme each) twice a week. This dosage resulted in sensitisation so that the second dose produced, in anything up to 50 per cent. of those taking it, vomiting, colic, diarrhoea and pyrexia. In North Africa this caused widespread sickness in the Army and the R.A.F. alike. This coincided, in the last days of April 1943, with the culmination of the campaign and produced a prejudice against the drug which was difficult to eradicate. In other theatres one tablet every day was prescribed without any ill effect and with dramatically successful

suppressive results. For a time also, mepacrine was believed to predispose to anoxia and to be, on that account, unsuitable for administration to air-crew, for whom quinine continued to be issued. At the same time rumour attributed to it many harmful effects such as impotence and sterility, and it was only after some time and much propaganda that the drug was accepted.

Discipline. The most important lesson which was ultimately learned about the prevention of malaria was that it was an executive and not a medical problem. When a high incidence of malaria in any unit was at last regarded as the fault of the commander and the recognised precautions were enforced, as was especially well illustrated in Burma, the disease ceased to be the threat to efficiency that it had previously become.

YELLOW FEVER

GENERAL BACKGROUND

Apart from a West African cruise by flying boats there had been no R.A.F. unit in West Africa or other major endemic area of yellow fever before 1941. Yellow fever precautions on a large scale were therefore an innovation for the R.A.F. With the German occupation of Norway and France in 1940, and with the commencement later of the Libyan Campaign, two new situations arose. The first was the extension of U-boat bases on the Atlantic and the intensification of attacks on Allied convoys in the Atlantic. This necessitated more intensive anti-submarine warfare on our part, and more bases for aircraft engaged in convoy escort duties and anti-submarine warfare in the Atlantic. Secondly, a means had to be found for reinforcement of the Army and R.A.F. in North Africa, involving air transport routes *via* endemic yellow fever areas. These routes were used both to transport personnel and material and also to fly out aircraft reinforcements. Aircraft from the U.S.A. flew by way of Natal and West Africa onwards and others were shipped in crates or on deck to Takoradi, assembled there and flown up to North Africa by way of Lagos, Kano, Maiduguri, Fort Lamy, El Fasher and Khartoum to Egypt. Around the Gulf of Guinea were a number of bases for aircraft taking part in the Battle of the Atlantic, and later, in 1943 and 1944, transport aircraft from the United Kingdom flew *via* bases in Gibraltar, Rabat Sale, Agadir, Port Etienne, Dakar, Bathurst, Freetown and Takoradi to Lagos. Both landplanes and flying-boats were involved.

Until the end of 1942 the Vichy French in French Senegal and Mauretania were hostile. When they changed sides in January 1943 the bases in Dakar, Ouakam and later Rusifisque for landplanes and Bel Air for flying-boats, became available for Allied use. Port Etienne in Mauretania also became a base for operational use by landplanes and flying-boats. The squadrons operating from West African bases were

British, but included New Zealanders and Australians, American, French and South African personnel. No case of yellow fever was reported in any of these.

CONTROL MEASURES

Yellow fever control was effected by measures based on the International Sanitary Convention for Aerial Navigation, 1933 and 1944 and on the Interim Reports of the Inter-departmental Committee for Yellow Fever Control. In these reports the endemic area for yellow fever was defined and the definition was revised from time to time as new knowledge became available. Local anti-amaryl committees were set up to discuss and formulate local policy in accordance with overall requirements. Measures adopted for the control of yellow fever included the following:

Inoculation against yellow fever for persons posted to, or in transit through, the endemic area and the carrying of recognised forms of yellow fever inoculation certificates. Inoculation of natives in the neighbourhood of Service installations.

Mosquito control, especially of *Aëdes aegypti* in the localities of airports.

Mosquito proofing of living quarters and use of mosquito nets.

Disinsectisation of aircraft at the airports of exit from the endemic zone, and at airports of arrival in potentially endemic areas.

The prevention of air movement of persons not in possession of valid certificates of inoculation against yellow fever.

Attempts to establish a 400 yards perimeter zone free of buildings occupied by natives.

The quarantine of personnel who had not been inoculated against yellow fever, such quarantine to be effected by enclosure in a mosquito-proofed space as far as possible.

Early detection and correct diagnosis of cases, with notification and isolation in mosquito-proofed wards.

Each of these measures had its own particular difficulties in execution. These are discussed below:

Inoculation policy. The vaccine had to be produced under standardised conditions, assayed, and preserved at a temperature of 4° C. Special thermos flasks were used to transport the vaccine, and Service and civilian centres were set up, at which recognised operators who had been briefed in the technique, administered the vaccine. In 1942 and 1943 a large number of cases of hepatitis followed two or three months after the inoculation. With an improved technique of production of the vaccine such cases no longer occurred. The period for which the inoculation was regarded as effective was initially two years and in 1944 the period was extended to four years. Certification of inoculation was complicated by the fact that the nature of the inoculation revealed the destination or route of travel. Accordingly the certificate was sealed in

PLATE XLIII. Man-made malarial hazard. Water collecting in a borrow pit.

PLATE XLIV. Man-made malarial hazard. Water seepage from a storage tank—a serious malaria risk.

[*facing p.* 392

PLATE XLV. Knapsack sprayer in use.

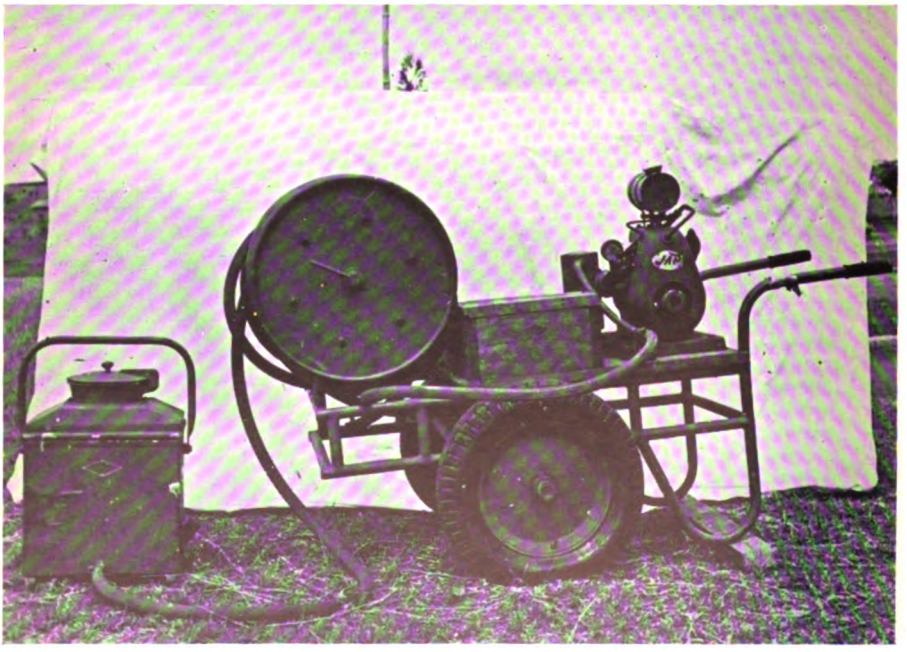


PLATE XLVI. Modified 'Phantomyst' power sprayer.

an envelope and the nature of the vaccine not revealed to the recipient. This plan was later changed and the inoculation recorded as for others. Finally an international form of certificate was introduced and the other methods of recording declared invalid. Before the International Certificate there was much discussion and many cases of international near-friction, owing to the multiplicity of policies as to what constituted a valid inoculation certificate.

Mosquito control in airport environs. Owing to the nature of the terrain in the neighbourhood of most airfields in the yellow fever zone, complete mosquito control was difficult or impossible. *Aëdes* control was the main aim and as this is a mosquito which breeds largely in places where man has settled, the control of *Aëdes* species was theoretically easier. Control of *Aëdes* mosquitoes in the zones of native habitation was difficult owing to the non co-operation of natives and their lack of appreciation of its importance. A system of fines was employed in order to improve matters in some West African areas. 'Anti-amaryl' aerodromes as such were abolished by the 1944 Convention and the concept of the 'sanitary aerodrome' was introduced. These had to have total eradication of mosquitoes in the aerodrome area, with no houses allowed within 400 yards of the aerodrome perimeter. This was impossible to comply with in the case of aerodromes, especially flying-boat bases, which had been developed in close proximity to local townships, such as Half Die airport at Bathurst. It must be remembered that D.D.T. was not available during this period.

Mosquito proofing of accommodation for aircrews, aerodrome staff and passengers was usually practicable, but depended largely on the availability of wire gauze for the necessary screening. The wire gauze supplies were made of soft iron wire which rusted rapidly in a tropical climate, especially where the air was salty. It soon became unserviceable and broke away and needed renewal in about four to six months.

Disinsectisation of aircraft. Regulations were laid down for the policy to be followed in order to rid aircraft of mosquitoes before departure from the last airport of call in a yellow fever endemic area. A hand sprayer with pyrethrum in kerosene was first used and later the insecticide R.399 was employed. When the American Westinghouse Aerosol Bombs were made available a big advance was made. The aerosol enabled a much more evenly dispersed and more penetrating spray to be achieved. Four seconds of spraying per 1,000 cubic feet of space was found to be adequate. Spraying was done after passengers and luggage had been emplaned and all luggage spaces, toilet compartments and crew spaces were treated. Difficulties arose from inadequacy of available staff to deal with a number of aircraft moving off at about the same time and aircrews and passengers were not always as co-operative as they might have been. An entry in the aircraft log was made to record the

disinsectisation. For landplanes it was possible to use a mechanically driven pressure sprayer such as the 'Phantomyst'. Aircraft sometimes took off without prior notification of their movements and spraying was avoided. At other times, owing to operational urgency, aircraft could not wait until the disinsectisation could be done. Aircraft of the French Air Force did not always comply with the requirements.

The prevention of air movement of persons not in possession of yellow fever certificates caused considerable friction and numerous repercussions. A loophole was provided by the authorisation to travel if the Governor of the Colony concerned issued a 'Certificate of Urgency'. These were rarely refused as far as Gambia was concerned.

Early diagnosis, with notification and isolation in mosquito-proofed wards, was carried out in liaison with the civil authorities. In the event of death due to suspected yellow fever, air carriage of liver specimens to reference laboratories was made available.

No case of yellow fever in an inoculated individual was reported.

THE TYPHUS EPIDEMIC IN NAPLES
December 1943–January 1944

In many military campaigns since the days of Alexander the Great one factor which has been greatly responsible for the decimation and ultimate defeat of armies in the field has been typhus fever. It is not surprising, therefore, that the attention of medical authorities has always been focused on the possibility of large-scale epidemics and considerable research has been devoted to the evolution of effective preventive measures. Fortunately, apart from sporadic outbreaks of scrub typhus which occurred in Central Burma, R.A.F. medical officers encountered no major epidemics during the Second World War. However, in order to illustrate the measures that were adopted to combat the disease when it did occur, the following account of an outbreak in Naples is included in some detail.

HISTORY OF THE OUTBREAK

In December 1943 and January 1944 an outbreak of typhus occurred in the Naples area, which, but for the effectively stringent measures adopted by the medical authorities would doubtless have resulted in many cases among Service personnel.

Epidemics of typhus had apparently not occurred in the area for many years, although precise details were not obtainable as the Germans had destroyed all records before they left the city. Accounts given by doctors differed widely but, according to the health authorities, a few cases had occurred yearly in the dock area, having been imported from abroad. It was said that the disease did not spread into the city or become epidemic because of the efficiency of the medical organisation. A small outbreak was believed to have occurred in troops who came from the Russian

front in the winter of 1942–3 and were stationed just north of Naples, but no details were available.

The outbreak in December 1943 is thought to have originated in some Serbian prisoners who were confined in a jail on the outskirts of the city, which according to local report had been bombed by the Allies just before the German withdrawal. The prisoners escaped and went into hiding in the slums and air-raid shelters, where conditions were ideal for the spread of the disease. For two months parts of the city were without water and there was no sewage system. Thousands of Neapolitans, many of them homeless and all terrified of bombing, huddled together for protection, shelter and warmth, emerging only by day to search among the rubble for firewood and scraps of food. Their numbers were later increased by the flow of refugees coming down from the north through the German and Allied lines.

The water supply was restored by the Allies, but thousands remained homeless, living in the ruins of what had been their homes or in shelters with no sanitation, electricity or gas. Food was distributed by AMGOT but, unfortunately, not all of it found its way to those for whom it was intended. A certain amount was sold in the black market, and it was alleged that distribution was insufficiently supervised, so that some of the flour went to the confectioners, in whose shops elaborate cakes were on sale to Allied troops and prosperous Italians.

Naples is a city which even in peace-time impresses the visitor with the size and destitution of its slum population; and it is not surprising that war-time conditions should have brought disease in their wake. On November 13, 1943, the first case of typhus was reported and by mid-January of the following year, 768 cases had been notified. The weekly figures rose from twenty-five in the week ended November 16, 1943, to 269 in the week ended January 4, 1944, but the increased figures were no doubt due in part to improved case finding and notification. The cases were of moderate severity presenting no unusual clinical features. Mortality was about 25 per cent. overall and would have been higher but for the large proportion of children who had, as usual, a relatively mild illness and a very low mortality rate. One interesting point was the number of old people aged between 60 and 75 who were seen with quite mild symptoms. This unusual feature may have been due to the fact that they were alive when epidemics occurred fifty years previously, contracted the disease as children and thus acquired a lasting, if incomplete, immunity.

CONTROL MEASURES

CIVILIAN POPULATION

An American Typhus Commission, working in close touch with AMGOT, assumed complete responsibility for control measures among

the civilian population. The Commission was divided into administrative, epidemiological, case finding, disinfestation and immunising divisions, staffed by American medical officers and nurses, most of whom spoke Italian and had had previous experience of typhus in South America, Spain or elsewhere, sanitary assistants, enlisted men of the medical and sanitary corps and Italian sanitary assistants. An aircraft and almost unlimited transport and equipment were available.

Case finding. Cases or suspected cases were reported to the Commission by Italian doctors, priests, nuns or ordinary citizens. Great assistance was given by the Church, the Cardinal encouraging the reporting of all sickness and the carrying out of all measures recommended by the Commission. Eight teams were employed in case finding, each team consisting of a medical officer, a nurse and, if necessary, an interpreter guide, with their own transport. When a case was reported the team went to the address, examined the patient and made a diagnosis on purely clinical grounds. If a positive diagnosis was made, the patient was conveyed by ambulance to Cotugnia or San Giorgio Hospital and at the same time the disinfestation division was notified.

Disinfestation of contacts. As soon as the case had been confirmed a disinfestation team, comprised of American and/or Italian sanitary personnel, was sent to the address with D.D.T. powder-guns and all the occupants of the house, tenement or shelter were thoroughly powdered. Known contacts were, if possible, also followed up and powdered. Wherever practicable, possible contacts were inoculated. No attempt was made to disinfect (as opposed to disinfestation), probably the one really weak point in the system, but there were certain difficulties. Powdering has the great advantage over disinfestation by heat in that its effects last about a week instead of being merely momentary and that it does not involve leaving the patient naked in the cold for an hour or more while the clothes are treated, but it has the disadvantage that it has no effect on the rickettsiae.

Mass disinfestation. Thirty-one centres were set up in the worst areas of the city, each capable of powdering at least 2,000 persons a day. Some of the centres were in buildings, some were set up at street corners. Powdering, which had the blessing of the Church, was popular and it was common to see groups of people in the street, looking as though a sack of flour had been dropped on them. At night teams toured the air-raid shelters, the ruins and the slums and powdered everyone they encountered.

Immunisation. The immunisation division undertook the task of inoculating all personnel of the essential services such as doctors, nurses, midwives, sanitary assistants, undertakers and police. A flying squad was available to go by air or road at a moment's notice to any place in occupied Italy, where typhus was suspected. The squad was able

to deal with the task of case finding and disinfesting of contacts. A second squad was available for cases reported in the environs of Naples, but outside the city limits.

Propaganda. The pulpit, the radio and the press were used, but it was not easy to reach the people most in need of help. The Cardinal and the priests were influential in bringing people to the powdering stations.

Hospitalisation. Two hospitals were reserved for typhus cases. Cotugnia Isolation Hospital, practically adjoining Capodichino Aerodrome, was bombed and evacuated before the Allies entered the city and was used subsequently as R.A.F. billets. The hospital was reopened without heating of any kind and the patients were looked after by Italian staff responsible to AMGOT. The nurses were uneducated and untrained and quite inadequate to deal with the patients who needed individual attention. A limited number of beds were taken over by a British Typhus Team consisting of two Army officers with six volunteer Q.A.I.M.N.S. nurses and a laboratory assistant. This team used the opportunity to evaluate new chemotherapeutic methods on selected cases with alternate control cases. The other hospital used for typhus cases was the San Giorgio Hospital, near Torre del Greco. Hospitalisation of civilian cases was the concern of AMGOT and the Italian Public Health authorities while the British Typhus Team, which commenced work on January 8, 1944, was concerned only with those cases admitted to the wards adopted by them. Similarly, the responsibility of the Typhus Fever Commission, which took over on January 3, ended once the case in question had been admitted to hospital. The achievements of both these organisations, in the face of serious difficulties, were very considerable.

SERVICE PERSONNEL

Bounds. Naples was placed 'out of bounds' to all Service personnel not on duty and appropriate orders were issued, prohibiting the use of civilian transport and places of amusement and refreshment. These orders were however rendered ineffective to a great extent by the large number of personnel stationed in the city. The pavements of the Via Roma were crowded with sailors, soldiers and airmen looking in the shop windows; Service personnel were seen in cafés and horse-drawn cabs, buying fruit and drinks at roadside booths, strolling arm in arm with the local women and fondling the dirty, ragged children. The anomaly of the situation was well exemplified by extracts from the *Union Jack* for January 1944. On page 1 it was announced that 'Naples district has been placed out of bounds to all troops whose duty does not necessitate their remaining in the city'. On page 4 appeared 'What's on in Naples', which included programmes for civilian cinemas. On the same page appeared the following: '. . . all restaurants will be put out of bounds to all officers and men of the Allied Forces, with the following

exceptions . . .'. The situation was fraught with difficulty. It was quite impossible for the police to take action and the varying degree of compliance with the regulations, as between Services and particularly as between units, gave rise to considerable dissatisfaction. Medical officers did all they could to impress upon all personnel the urgent necessity for strict obedience to all orders, which were issued in their own interests.

Inoculation. Adequate supplies of vaccine were available through the Army A.D.M.S. and the inoculation state of all units was soon practically 100 per cent. Medical officers gave advice regarding 'boosting' doses.

Bathing and laundry facilities. The great majority of personnel were able to get baths, generally warm baths, once a week and soap was in good supply. It was found that in some instances clothes were being sent out to be washed to houses not officially approved by units and it was pointed out that this was dangerous and contrary to regulations. On the whole Service laundry arrangements were fairly good.

F.F.I. (Free from Infection) inspections. The importance of these inspections was emphasised to commanding officers and medical officers.

Anti-louse powder and disinfesting facilities. D.D.T. was not available as the Commission had barely enough for their own requirements, but the Army had 140 tons of AL 63 on the spot. The importance of the use of powder for men whose duties brought them into close contact with civilians, was emphasised. There were some complaints that it was irritating to the skin. The Army was hard pressed to cope with its own disinfestation of blankets and similar articles and on January 10, 1944, the Principal Medical Officer, M.A.A.F. was requested to send No. 1 Field Hygiene Unit to the Naples area from Foggia and attach it to No. 3 Base Area. This step was taken to ensure adequate disinfestation for all R.A.F. units in the area and to secure the immediate services of a sanitary assistant. No. 3 Field Hygiene Unit, not No. 1, duly arrived in Naples.

Propaganda. All ranks were definitely 'typhus minded'. There were exceptions and occasions when excessive consumption of the local wine caused a temporary loss of caution, but on the whole the personnel were curious about a disease which was new to them and were anxious for further information. Units were visited and talks on the subject were given. Samples of lice were made available for demonstration and prominent road signs were displayed in the city. A good handbill was circulated and details of the numbers of cases and deaths among the civilian population were made known.

Arrangements for hospitalisation. Adequate arrangements for the reception and treatment of any Service cases were made at the 92nd Army General Hospital to which all patients were to be admitted.

CIVILIANS EMPLOYED IN UNITS

The following preventive measures were taken:

Anti-louse powdering and F.F.I. inspections. It was arranged that every civilian employed by the R.A.F. in the Naples area should be inspected and have his body and clothing thoroughly powdered once a week. This was far too large a task for the Army to undertake in addition to its own commitments and the Senior Medical Officer at No. 3 Base Area was instructed to use the Field Hygiene Unit for this purpose. Powder-guns were to be used but until they were available in sufficient numbers the powder was to be applied with a pepper pot or similar appliance. The quantity required to powder 1,000 men was 47 lb.

Disinfesting, bathing and laundry. Provided that anti-louse powder was used, these were of little importance.

PROGRESS OF THE EPIDEMIC

The numbers of cases reported among the civilian population for the weeks ended January 11 and January 18, 1944, fell to 220 and 126 respectively, indicating that the outbreak was now under control. Over 1¼ million persons had been 'powdered' by the end of January 1944. Although the failure of the epidemic to increase was undoubtedly due in part to the excellent preventive measures adopted by the Commission, it is probable that the outbreak was an increase of endemic typhus rather than an epidemic of classical typhus. This view is supported by the comparatively mild nature of the disease. Although there were isolated cases among personnel of the other Forces, none occurred in the R.A.F.

VENEREAL DISEASE

SURVEY OF INCIDENCE

The incidence of venereal disease cases per thousand per annum is shown in the following table for the years 1939 to 1945. The trends for a short period before and after the war are therefore included:

Year	Incidence in total force per thousand	Incidence at home per thousand	Incidence overseas per thousand
1939	9·2	5·5	35·3
1940	8·1	6·1	26·8
1941	8·4	6·9	19·5
1942	10·2	7·0	20·4
1943	11·6	7·1	21·3
1944	18·6	10·4	36·3
1945	23·0	18·6	32·4
1921 (for comparison)	36·1	32·3	49·2

With the onset of war the incidence of V.D. at home rose steadily year by year and was more than three times as high at the end of the war as at the beginning. Overseas the incidence was high in 1939; when the war began it dropped rapidly until 1942, and then rose until in 1944 it again began to fall. To assess the full significance of these figures it is necessary to refer to their component sections in the Annual Reports on the health of the R.A.F. for the relevant years. It is of interest to note that 1940 saw the lowest incidence of V.D. in the R.A.F. since its inception. The incidence of V.D. has always been greater in the R.A.F. overseas than at home, owing to the greater temptations to which personnel are exposed and the high incidence of V.D. in the civil population in areas where units overseas are stationed. Climatic effects are probably a contributory factor. Units subject to boredom and lowered morale showed a raised V.D. incidence unless they were isolated from all possible sources of venereal disease. The provision of ready means of recreation and local amenities for hobbies and healthy off-duty pursuits constituted an important method of combating venereal disease, but even units with every facility for games and hobbies often had high V.D. rates. In some units a great deal was done by effective leadership from the officers but in the main the executive branch preferred to regard the whole problem as a medical one and left V.D. control to the medical officers. This was a great mistake; more emphasis should be laid on the part to be played in V.D. control by all officers and N.C.Os.

CONTROL MEASURES

The main measures taken to combat venereal disease were the following:

Early diagnosis and efficient treatment. Personnel were always encouraged to report sick at the earliest possible opportunity if they suspected that they were suffering from V.D. Concealment was an offence under the Air Force Act and personnel were periodically reminded of this; no direct penalties were ever imposed for contracting V.D. as it was considered that such measures would result only in concealment of the disease. With the advances in therapy during the war the duration of treatment in hospital was much reduced. Otherwise, with the increasing incidence of V.D. the bed space allotted to this type of disease would have had to be increased far more than was found necessary.

In 1939 the average duration of hospital treatment for gonorrhoea was 32 days but by 1945 this had been reduced to an average of 7 days. Similarly, for syphilis, the average duration of hospital treatment was reduced from 30 days in 1939 to 18 days in 1945. As the war progressed it was found that owing to movements of personnel who were under treatment for syphilis, it was not easy to ensure that surveillance and tests of cure after full treatment were always carried out. The Central Syphilis Register was therefore introduced whereby central control

was maintained and by a card index system it was possible to survey the progress to full completion of treatment, surveillance and final tests of cure in each case. The Central Syphilis Register was maintained by the R.A.F. Director of Hygiene. When Service cases were finally released or demobilised and had not completed the full process, confidential information, if the patient gave his written consent, was passed to the appropriate local Medical Officer of Health.

Venereal disease propaganda. Medical officers gave lectures, films and film strips were shown and posters were exhibited. Guidance for medical officers on the approach to be adopted in V.D. lectures was given in the relevant medical publications. Some medical officers gave excellent lectures. Others were not very efficient. At units where E.T. rooms were available the whereabouts of the 'Early Treatment' rooms were always stressed during the lectures. R.A.F. women medical officers lectured W.A.A.F. personnel on V.D. and films on V.D. appropriate to airwomen were shown, although the incidence of the disease in W.A.A.F. was always extremely low. The moral aspects of promiscuity were not often mentioned by medical officers when lecturing; whether more could be achieved by a moral approach is debatable. Many thought that by the time personnel are in the R.A.F., they have already adopted whatever code of morals is appropriate to their family and social surroundings and this is unlikely to be changed except for the worse. Efforts by officers of all branches could have provided more guidance to the airmen with whom they were in daily contact, but little was done in this way.

Contact tracing. Attempts were made at home and overseas to establish contact tracing systems. Defence Regulation 33B provided for the compulsory treatment of contacts who could be shown to be sources of V.D. When the contact was a civilian the name was notified under confidential cover to the appropriate health authority. If she was a Servicewoman a tactful approach was made *via* her unit medical officer and was usually successful. In the event of only scanty data being available, due to alcohol or other factors, contact tracing was inefficient. Contact tracing overseas can be a most difficult and even dangerous occupation and when the contact cannot be placed under treatment the tracing is pointless. Even when not wholly effective, however, the tracing of contacts and their treatment plays a valuable part in any large scale scheme for the control of venereal disease.

Early Treatment Rooms and E.T. Outfits. E.T. rooms were sited near the entrance of stations, usually at the rear of the main Guard Room. An ablution pan, a source of water, usually cold, and a supply of E.T. outfits were the main items provided. The E.T. outfits comprised a cotton wool pledget, with soft soap folder inside it, and a tube of calomel cream, with instructions for use on the paper packets containing the articles. Units with no E.T. room, as such, had E.T. packets placed handy for use in the ablution blocks. In cold weather in the United Kingdom one could understand the reluctance of the average airman to use the E.T. room. He usually had to come and go under the eye of the Service Police and the E.T. room was often cold and draughty. Once there

he was supposed to perform an ablution of the genitals and adjacent areas of abdomen and groins. This he was expected to do in cold, sometimes very cold, water and when he had rinsed off the lather he had nothing with which to dry himself before he applied the calomel cream. There was no lock on the door and at any time other airmen could enter and find him engaged on this uncomfortable process. A further deterrent was the frequent absence of the electric light bulb, which was often pilfered. In many cases local initiative overcame some of the above disadvantages, but it is small wonder that the average E.T. room was never very popular; its exact value was never fully assessed. In overseas Commands condoms were a free issue to personnel, but this policy was never adopted in the United Kingdom.

Attitude towards brothels. The official attitude towards brothels was to place them out of bounds on medical and moral grounds. The strict enforcement of this policy in Cairo resulted in a striking reduction in the incidence of venereal disease contracted in that city. Prostitution and soliciting were suppressed where possible.

Towards the end of the war when enemy countries were invaded and occupied, and Allied countries were liberated, higher incidences of V.D. were recorded, especially in Germany and Italy. In the latter country many cases of sulphonamide resistant gonorrhoea were encountered.

Finally, mention must be made of one effect of the advances in the treatment of V.D. Airmen now realise that even if they do become infected with gonorrhoea or syphilis a quick and effective means of cure is available by the use of penicillin preparations. This knowledge must have a strong psychological effect upon their former attitude towards venereal disease and result in lessened co-operation on their part in measures to secure its prevention.

Summary

The foregoing narrative has discussed, in their broadest aspects, the problems and difficulties encountered in the fields of sanitation, hygiene and accommodation during the war years. Many valuable lessons were learned, the chief of which are summarised below:

Executive responsibility. The executive branches seldom appreciated that the function of the medical staff was to a large extent limited to advising the commanding officer, who was ultimately responsible for the health of the personnel on his station and for ensuring that any medical recommendations were acted upon. In this connexion, the personnel detailed for sanitary squad and similar duties were frequently quite unsuitable and the provision of the lowest type of labour for work of the utmost importance to the health of the community demonstrated the lack of co-operation which existed at many units. The liaison between medical and executive staffs should be much closer.

Dispersal of camp sites. Early in the war the dispersal of personnel, buildings and stores became necessary because of the likelihood of enemy air attack. Although there were obvious advantages to this policy it proved unsatisfactory in many ways, the greatest disadvantage being the distances which personnel had to travel between workshops, dining halls and domestic sites. Much minor upper respiratory infection was attributed to personnel covering these distances in bad rainy weather and the subsequent difficulty of drying sodden heavy greatcoats. The cape groundsheets offered only part protection and a general issue of raincoats to airmen and airwomen might have eliminated much minor sickness. The dispersal of ablution facilities in relation to the sleeping accommodation was an added disadvantage, since it discouraged personnel from spending adequate time on elementary personal hygiene. It is considered that in the event of future hostilities, dispersal should be limited to the minimum and that where it is essential, improved facilities should be provided for the personnel involved.

Hutting. Experimental use of miscellaneous types of hutting showed clearly the disadvantages of those which were not easily erected by unskilled labour and which could not be dismantled and re-assembled without irreparable damage. Heating and insulation were in general unsatisfactory and the slow combustion stoves which were widely used, provided little comfort for the inhabitants, many of whom, particularly on small units, had perforce to spend a considerable amount of their leisure in the huts. The installation of really satisfactory heating would eliminate much discomfort.

Water and sewage problems. These problems although not strictly medical had a considerable bearing upon the general health of any camp. Units were often sited where no public utilities existed and when plants were constructed on the camps they were frequently far too small to provide adequately for the increases in strengths. The siting of camps within reach of existing water supplies and more attention at the planning stages to the possibility of expansion would have done much to avoid the overloading which occurred. The best temporary latrine was the borehole type, all others requiring too much care in their construction and maintenance to be really satisfactory.

Clothing. Many changes were necessary in respect of R.A.F. clothing. The participation in jungle warfare, which had not been foreseen, created difficulty. Other problems were encountered when convoys changed their destinations *en route* and personnel kitted out for one extreme of climate arrived in an area for which the clothing was quite unsuitable. It is essential that planning on these matters should be extremely elastic and that adequate supplies of suitable clothing should be readily available to provide for any possible contingency.

Venereal disease. Although much was accomplished, the incidence figures suggest that there would have been a considerable saving of man-hours had a more co-operative and determined drive been made by all authorities. E.T. rooms in particular were unsatisfactory, offering little privacy and only rarely hot water or towels. Propaganda, at its best

possibly the most effective of all counter measures, was often blunted by the use of films which personnel had seen many times and the delivery of poor routine lectures by medical officers. Greater importance should be attached to the provision of well-equipped E.T. rooms and propaganda should be up-to-date and topical. In the latter days of the war there were considerable advances in the treatment of venereal disease first by the sulpha drugs and later by the antibiotics. While the efficacy of these measures cannot be disputed, it is important that personnel should not lose their fear of contracting the disease, by the knowledge that a rapid cure is readily available.

Instruction to personnel prior to overseas service. It was found that the incidence of sickness was very high among personnel newly arrived in tropical areas. Some effort was made to instruct personnel proceeding overseas in the elementary precautions necessary to safeguard their health, but considerably more could be done by means of lectures, films and practical demonstrations to ensure that everyone arriving in tropical areas is aware beforehand of the health hazards likely to be encountered and the measures needed to combat them.

Provision of hygiene appliances and chemicals. The campaign against tropical diseases was as important as that waged with the enemy, but the weapons were inadequate. Shortages of the necessary equipment occurred frequently and much unsuitable material was supplied. Increased supplies and improved design would materially assist the struggle against disease.

Enforcement of hygiene discipline. The application of the rules of hygiene which were laid down varied considerably between stations and between Services; bad feeling was apt to be aroused and medical propaganda ridiculed. The anti-malarial regulations relating to the wearing of protective clothing after dusk were frequently ignored. Hygiene regulations may be excellent in theory, but are useless unless they are rigidly enforced.

The price of sickness. The man who, either wittingly or through ignorance, allows himself to fall ill, is acting in the best interests of the enemy. Not only does his non-effectiveness reduce the strength of our forces, but his sickness requires the attention of a number of personnel, both medical and administrative. The skilled application, at all levels, of the principles of preventive medicine could do much to prevent the loss to the Royal Air Force of valuable man-hours.

CHAPTER 8

MEDICAL EQUIPMENT AND SUPPLIES

General Organisation

THE responsibility for the handling and supply of medical stores for all purposes in the R.A.F., for hospitals, station sick quarters, medical boards, and units in the field, rests to a great extent with the Medical Equipment Depot (M.E.D.). From the technical aspect, the Medical Equipment Depot is administered by Department M.A.3 of the Medical Directorate of the Air Ministry. Here decisions of policy are made, contracts are negotiated, scales of medical equipment are initiated and if necessary modified, and general supervision of medical stores is exercised. Most of the work of assembling the reserves of goods required, allocating items to the various scales, making up, packing and despatching the goods is undertaken by M.E.D.

This account is not intended to take the place either of a manual of stores procedure or of a list of scales; reference, therefore, should be made to the appropriate publications for fuller details. These publications are A.P.1269, Chapter 4 (which gives general details of procedure with notes on first-aid and other equipment, procedure to be adopted in respect of damage, losses, deficiencies, accounting, etc.), and A.P.132 (which at various times during the war gave a more or less up-to-date picture of the scales required for various purposes). These were printed before the war, at a time when it was difficult to visualise what changes war conditions would bring; amendments were therefore frequent, particularly with A.P.132 which listed scales of medical equipment. The somewhat illogical and inconsistent arrangement of this book became more striking as time went on, new scales were added and amendments made. This led, after the war, to a complete revision of the publication, with the object of bringing the various scales of equipment into the appropriate sections. Further reference is made to this book later in this chapter where scales of medical equipment are dealt with in detail.

Briefly the purpose of the M.E.D. is to receive, issue and maintain stocks of medical equipment as directed by the Air Ministry and maintain records of all transactions. Although a scale of equipment for a static hospital had not been approved at the Air Ministry, M.A.3 had provided scales for all types of Royal Air Force units including hospitals in the field. A provisional scale, however, was held by Technical Training Command, with which the responsibility for local administration of hospitals in the United Kingdom mainly rested. This was used as a

basis, subject to amendments in every case, for the equipment required when a new hospital had to be opened.

Generally, the R.A.F. overseas drew its medical stores wherever these were most conveniently obtainable. Thus, in the many combined operations, it was the local Army Stores Depot which formed the chief source of supply. This, however, did not mean that no medical stores were sent to R.A.F. units from the United Kingdom. On the contrary, material peculiar to the R.A.F., or not held by the Army, was sent out direct from the United Kingdom to all parts of the world throughout the war period. Initial equipment accompanying units ordered overseas was despatched from home. Early in the war there was a proposal to establish a large medical stores depot in Malaya to supply the Army and R.A.F. in the Far East. This never materialised.

This account deals first with conditions before the outbreak of war followed by a section on 'Preparations for War' dealing with changes in stores procedure at that time. The organisation of the Medical Stores Depot* at Hartlebury in Worcestershire at the outbreak of war is then described; the following section deals with technical details of the work of the Depot and finally there are some notes on the output of the M.E.D.

PRE-WAR STORES ORGANISATION

The formation of a Medical Stores Depot for the R.A.F. had been under discussion for some time before the Armistice of the War of 1914–18, and from 1918 onwards provisional sites ranging from large empty houses in convenient places on the outskirts of London to empty rooms in the Edgware Road had been inspected. It was clear that whichever site was chosen for the depot a very large quantity of stores would have to be held and the convenient location of transport facilities would be of some importance.

Eventually, in June 1919, a shed at No. 1 Stores Depot at Kidbrooke, on the south-eastern outskirts of London, was chosen and this was opened as the Medical Stores Depot (M.S.D.). The unit to which the depot was attached was beside the railway line and there were excellent facilities for the packing and unpacking of goods. For administration and for all technical medical matters the new unit was placed under the Medical Directorate, Air Ministry (Dept. M.A.3), but for discipline it was administered by No. 1 Stores Depot. It undertook its own accounting and pay.

At first the M.S.D. was employed entirely in receiving medical equipment from R.A.F. stations which were closed down at the end of the War of 1914–18. These stations were both naval and military (R.F.C.) so that the equipment received was very varied. Within two months of the opening date stocks had been classified, deliveries of drugs

* The Medical Equipment Depot was formerly known as the Medical Stores Depot (M.S.D.). *See* 'The Move to Chessington'.

and dressings were being received from contractors and the Depot was engaged in performing the duty for which it was established, namely, making issues of medical equipment to R.A.F. hospitals and sick quarters.

A space of 7,500 sq. ft. was adequate to meet all requirements from 1919 until 1935. Staff consisted at first of a commissioned officer, seconded from the R.A.M.C., under whom 5 civilians worked, a dispenser, 1 clerk, and 3 labourers. By July 1931 the strength had been raised to ten, and the Depot now had 2 dispensers, 2 clerks, 2 storemen, 2 packers and 2 labourers.

The procedure, controlled by Air Ministry (Dept. M.A.3), was relatively simple. Demands for replacement of stocks at M.S.D. were prepared by its Commanding Officer and sent to M.A.3 for approval of supply. These demands were to cover the issue of medical stores to the R.A.F. within the scales laid down in A.P. 132 and referred to later in this account. They were limited to a maximum of three months' supply. Demands from sick quarters and hospitals at home and overseas were sent through the competent medical authority to the Air Ministry for scrutiny, a copy being sent to M.S.D., which was able to state which items could be supplied from stock. This demand was sent by M.S.D. to the Air Ministry, so that whatever could not be supplied from Kidbrooke was ordered from contractors for direct delivery to the medical unit requiring the stores. In the case of demands from overseas, goods were handed over to the Transportation Section of No. 1 M.U. for despatch.

Sometimes medical equipment for an overseas station would be ordered from a contractor by the Air Ministry, the goods being sent to M.S.D. for final examination and checking before shipment. If the equipment was unduly heavy, or of a specialist character—e.g. X-ray apparatus or steam sterilisers, requiring special packing—arrangements for inspection at the contractor's works were made and the equipment was sent from there direct to the port. Bonded stores for overseas were not sent to the M.S.D., but were transferred by the contractor from his bonded warehouse to the port. Postal delivery (registered or insured post) was used with valuable articles and dangerous drugs.

The space and staff seemed to be quite adequate for the demands made on it until, in 1935, the Abyssinian crisis and the subsequent general expansion of the R.A.F. called for a bigger organisation. In 1935 there were no empty sheds available at No. 1 Maintenance Unit at Kidbrooke, and, because of the pressing needs of general expansion referred to above, the M.S.D. had to be content with existing accommodation. Extra racks were installed and every effort was made to deal with approximately twice the amount of stores which had been handled before. Urgent demands in September of that year for several sets of medical mobilisation equipment to be built up for the use of squadrons

and field medical units imposed a considerable strain on the staff and necessitated the engagement of extra workers.

When the emergency for which these men were employed was over they were conveniently retained in order to cope with the increased work resulting from the expansion of the R.A.F. No further increase in staff was required until 1937, when it again became necessary to maintain large reserves of medical mobilisation equipment. A year later there was a still further increase, until the strength was about forty and the value of the stores held on charge had risen considerably as compared with the early days. Further additions to the staff during 1939 resulted in an establishment for two commissioned officers, although one of these posts was seldom filled. By now there was a strong team of civilian personnel, many of them ex-servicemen and some of them ex-R.A.M.C., who were well up to the standard required for the work in hand.

In 1939, the problem of accommodation again became acute owing to the further expansion of the R.A.F. and the need to maintain large stocks of medical mobilisation equipment. By this time a policy of dispersal of equipment had already been in operation for two years, and some non-medical material held by No. 1 Maintenance Unit had been transferred to other sites in the country. This had made available a large shed of approximately double the original storage space which had on previous occasions been occupied by the M.S.D. During the early part of 1939, however, the Director of Medical Services decided that the M.S.D. should be moved away from the London area and a site was chosen at Hartlebury, Worcestershire.

PREPARATIONS FOR WAR

Before describing the changes which occurred after the outbreak of war and in particular the experiences of the Medical Stores Depot at Hartlebury, it is necessary to deal in greater detail with activities during the years 1938 and 1939 and to explain how the peace-time procedure was changed to meet war requirements.

During 1938 and 1939, field and mobilisation equipment was being assembled in large quantities and stored as reserves against the risk of war. The expansion programme of the R.A.F. was being accelerated, and many new stations had to be equipped. In addition, equipment was being prepared for flying training schools and many balloon barrage units had to be equipped to war scale. Emergency reserves of medical stores were issued to all sick quarters and R.A.F. hospitals at home and abroad, and it was realised that much material would be required when the new hospitals and convalescent depots were opened on, or shortly after, mobilisation.*

* The large station sick quarters which became 'R.A.F. Station Hospitals' are referred to here. By 1941 there were 26 of these.

Important among the decisions which had to be made at this time (1939) was whether, and if so how, to change the peace-time procedure. It was clear that the practice of sending demands through the competent medical authority to the Air Ministry would, if continued, occasion considerable delay and would result in the Air Ministry having to do work which could be equally well undertaken at the M.S.D. itself. The Air Ministry was fully occupied attending to technical matters concerning the scales of equipment and would naturally not have the staff required to check the many demands it received through the competent medical authorities (i.e. P.M.Os. of Commands and later S.M.Os. of Groups) from stations and other units.

As mentioned, the peace-time procedure was that a demand (Form 1209) went from the R.A.F. Station through the competent medical authority to the Air Ministry, with a copy to the M.S.D. at Kidbrooke. This copy, with annotations stating what could be supplied from stock, then went to the Air Ministry whence it was again returned to M.S.D. By the time it reached the latter for issue, it was often in a very mutilated condition. Further action at Kidbrooke consisted of transcription in triplicate of the items on the form on to two other invoice forms (Forms 712 and 712A) and these were distributed to various destinations which need not be recorded here.

To avoid the complications of this system it was decided to let each station demand go direct to Kidbrooke. If the requirements were within the scale laid down the goods were to be supplied. Units making demands used a Form 1209 which went straight to M.S.D. instead of going to the Group and/or Command or to the Air Ministry. Under the new procedure the Form 1209 went direct to M.S.D. in quadruplicate. Furthermore, demands for replenishment of stocks at the M.S.D. were sent by the Depot direct to the contractors for 'contract items', namely, the ordinary run of medical and surgical material, but articles not on contract continued to be ordered by the Air Ministry (Dept. M.A.3) as under peace-time procedure.

The practice of allowing no issue from M.S.D. without a covering authority from the Air Ministry was therefore abandoned and all demands for equipment authorised by scale were sent direct to M.S.D and supplied. It should be explained here that from R.A.F. hospitals, which had no rigid scale of medical equipment, demands continued to be submitted to the Air Ministry for scrutiny until early in 1944 when they, also, were sent direct to M.S.D. Items not available from stock, or not on contracts from which deliveries could be expected, were transcribed to new Forms 1209 and forwarded to the Air Ministry for supply arrangements if authorised.

There were thus two cardinal changes in procedure. Unit demands were sent direct to M.S.D. and most stores could be demanded from

contractors direct by the Depot. This delegation of authority to M.S.D. made the Commanding Officer responsible for ensuring that the total quantities of goods allocated to the R.A.F. were demanded from the contractors within a specified date of requirements being notified to M.S.D. and that the amounts so drawn were within the terms of the contract. Before the contract was renewed, or a contract for a new item placed, the Commanding Officer, M.S.D., was called upon to prepare a 'provision list' showing his expected requirements during the period covered by the new contract.

The decision to move the M.S.D. from Kidbrooke to Hartlebury was made in April 1939. The sheds, however, were not ready when the war broke out, though it was possible to use the space allocated on a make-shift basis. Plans had been made to close down Kidbrooke on September 30, 1939, and open at Hartlebury the next day. Racks, of which there were none at the new site, were improvised and these, together with the twenty-seven 'key' men from Kidbrooke who volunteered, were transferred to Worcestershire by road, their families being moved at public expense. Those left behind at Kidbrooke were absorbed by No. 1 Maintenance Unit and only a small staff was left at Kidbrooke for loading the vehicles and closing the medical stores accounts.

It has already been mentioned that large quantities of mobilisation equipment had been built up during the eighteen months before the outbreak of war. Sufficient was therefore available to meet the requirements of the Advanced Air Striking Force and the R.A.F. Component of the Field Force in France. Each unit mobilised for field service was given a field unit serial number, which was printed on all cases containing the unit's mobilisation equipment. With the exception of a red cross, on a white circular background, to indicate medical equipment, no other markings were allowed. The equipment for the first échelon of the A.A.S.F. was assembled at the new M.S.D. at Hartlebury and loaded into the allotted vehicles. Equipment for the second échelon was assembled at Carlisle and equipment and vehicles for the component at Quedgeley. When zero hour arrived the vehicles moved off to their mobilisation stations and thence to the port of embarkation. There were no 'hitches'.

THE MEDICAL STORES DEPOT AT HARTLEBURY

Accommodation. The Medical Stores Depot opened at Hartlebury, Worcestershire, on October 1, 1939, using a site under the control of No. 25 Maintenance Unit. Hartlebury is a village on the main Worcester–Kidderminster road served by the Great Western Railway which connects Worcester with Kidderminster, Stourport (Canal), Stourbridge and Wolverhampton. No. 25 Maintenance Unit lay to the east of the railway and was connected to it by sidings running into two of the sites.

The Maintenance Unit comprised seven dispersed sites extending over a wide area. The M.S.D. was lodged on No. 7 Site which lay to the west of the Droitwich–Kidderminster road about six miles from the latter. The Maintenance Unit sites, with the exception of the Headquarters and No. 1 Site, were a considerable distance from the railway station and workers at the sites had either to provide their own transport or depend on the public bus services from Kidderminster. There was no living accommodation for the staff near the sites and all personnel had to live in the surrounding towns. When heavy falls of snow were common the attendance at work was sometimes as low as 25 per cent., with consequent reduction in the output of the unit.

The buildings used by the M.S.D. were two large sheds, each of 40,000 sq. ft., one small shed of 4,000 sq. ft., and an office for the use of administrative and clerical staff.

Solid concrete walls and concrete roofs, with double metal doors, was the construction for one of the large sheds and the small one. These were blast-proof. The second large shed was built of asbestos sheets on a metal framework and roofed with the same material. The various stores sections in August 1940 are shown below:

Section	I.	Medicine, chemicals and medical materials, vaccine and sera.
Section	II.	Compressed tablets.
Section	III.	Surgical dressings.
Section	IV.	Rubber and waterproof goods.
Section	V.	Surgical appliances, sundries and splints.
Section	VI.	Surgical instruments.
Section	VII.	Aseptic furniture.
Section	VIII.	Field equipment.
Section	IX.	X-ray and photographic appliances and materials.
Section	X.	Dental equipment.
Section	XI.	Laboratory apparatus.
Section	XII.	Electro-medical apparatus.
Section	XIII.	Packing cases, etc.

The sheds were not properly heated until the spring of 1941, and much damage was caused by hard frost breaking containers. Damage to stocks also occurred through flooding of sheds caused by the roofs and drainage being unable to take storm water.

The sub-depots. The sub-depots for the storage of reserve stocks had been planned before the outbreak of war, with the object of taking over the work of the main Depot should this be destroyed or severely damaged by enemy action. The sites chosen were at Quedgeley, near Gloucester, in sheds under the control of No. 7 Maintenance Unit, and at Stafford, administered by No. 16 Maintenance Unit. The first was opened for the

receipt of medical stores in November 1939, and the second in October 1940. One civilian dispenser and three labourers who were replaced in 1941 by women, were considered sufficient for Quedgeley and, No. 16 Maintenance Unit being manned by Service personnel, a sergeant dispenser and three aircrafthands looked after the needs of the sub-depot at Stafford.

At first reserves of dressings and Medical Board equipment were kept at Quedgeley, but after a visit of the Director-General of Medical Services in September 1940, a reserve of most classes of stores was moved there, the sheds being thereby used to full capacity. At the same time the Director accelerated the opening of the Stafford sub-depot and gave instructions that Stafford should also be stocked with all stores. This was duly carried out and by the end of October 1940, both sub-depots held a reserve of stores in many of the sections, representing the medical requirements of 200,000 men for three months.

A further sub-depot was opened at Llantarnam Abbey near Newport, Monmouth, in July 1941. This came under the control of 'E' Maintenance Unit, Newport and housed Red Cross Stores presented to the R.A.F. by the American and British Red Cross Societies. By January 1942, as the Abbey was urgently needed by 'E' Maintenance Unit for the storage of R.A.F. general equipment, the Red Cross stores were moved to a building in Kidderminster belonging to the carpet trade.

The method of accounting at these sub-depots was by tally cards and ledgers, the tally cards being kept by the dispensers in each sub-depot and the ledgers at Hartlebury. Frequent inspections were made by officers from the M.S.D. and 'spot' checks were made of chosen items to ensure that the stocks were properly kept. In 1941, it was the practice for an officer to spend a week at each of the sub-depots so that complete stocktaking could be made. Items likely to deteriorate in storage at the sub-depots were returned to Hartlebury, where they would be issued to units more quickly.

Expansion difficulties. By the autumn of 1941, the space allotted to the various sections at Hartlebury had become very congested, particularly in the Field Equipment and Dental Sections. The requirements of field and mobilisation equipment had naturally become very great, while the overcrowding of the Dental Section was due to the very considerable increase in the size of the Dental Branch. It was considered advisable to maintain larger reserves of stores, and for this purpose authority was given to hire premises as near Hartlebury as possible. Some idea of the enormous increase in the dental equipment may be gathered from the fact that stores to the value of £80,000 were requisitioned and contracted for in the first provisioning period of 1942 as against previous requisitions of approximately £10,000 and £20,000 for each of the two six-monthly provisioning periods in 1941. As a large part of this equipment consisted

of the heavier and bulkier items of dental surgery equipment which could not be racked, the already crowded accommodation was further congested and, as a result, another building used by the carpet trade in Kidderminster was hired.

Further embarrassment to the already congested space at Hartlebury was caused by the decision, in March 1942, to transfer vaccines, sera and other biological material, with minor exceptions, from the R.A.F. Institute of Pathology and Tropical Medicine at Halton to the M.S.D. at Hartlebury. The transfer took place in April 1942, after some necessary constructional alterations had been made. These alterations consisted of a screen across one end of the blast-proof shed and the construction of a cool-room within this area. It was intended that this room should be insulated and refrigerated but this work could not be completed until the middle of 1944.

The transfer of some 200 tons of bulky equipment from the overcrowded Hartlebury storage to the carpet trade building enabled reorganisation to be made and it was possible to transfer Section X (Dental Equipment) to a self-contained bay in No. 1 Shed with its own packing bay. The relief from overcrowding was, however, only temporary for as the tempo of the war increased and its area widened, the quantity of medical and dental equipment grew with each provisioning period. In 1943, a proposal had been put forward by the then Officer Commanding, Medical Stores Depot, for a shed of some 8,000 sq. ft. to be erected on No. 7 Site as additional storage space. The proposal was accepted but the shed was not completed until September 1944. It was taken into use as a combined packing bay for all routine issues, but not for hospitals, mobile field hospitals and other small unit medical pack-ups which continued to be assembled in No. 2 Shed under a different system.

Unfortunately, to meet the ever-increasing Far East commitments, still further demands for space had to be made and, in consequence of civil resettlement plans as the war in Europe neared its climax, the R.A.F. was asked to vacate the carpet trade building. Under considerable pressure No. 25 M.U. agreed to transfer one of a number of newly built 20,000 sq. ft. sheds on its Headquarters site to M.S.D. It was decided to move the whole Dental commitment to the shed at No. 1 Site together with the dental quartermaster and his staff of storemen, packers and labourers. Stock recording, however, continued to be undertaken in M.S.D. offices.

The disadvantages of this detachment were obvious, but they were outweighed by the reorganisation which had to be effected to meet the very large requirement planned for 'Tiger Force' (Far Eastern War Theatre). In spite of this increased commitment for hospitals and mobile field hospitals for the Far East, the advance into Europe so clearly indicated a comparatively early end of hostilities in this theatre that

contraction was already taking place and many units, particularly those of a specialised technical type, were being disbanded. This did not affect medical supplies to any large extent, for the Maintenance Units were already preparing for and, indeed, were receiving, vast quantities of equipment as 'unit returns'. Not only was No. 25 M.U., the parent unit, becoming more and more embarrassed for storage space, but No. 7 M.U., Quedgeley and No. 16 M.U., Stafford, where the M.S.D. had sub-sections, appealed for the return of the storage space which they had loaned.

Some time before, in view of the freedom from air attack, it had been decided to revert to the original plan to use Quedgeley as a store for bulk dressings and other items in good supply but slow in issue and to withdraw the whole of the 'active' equipment dispersed there. The equipment and space at No. 16 M.U. were dealt with similarly at a later date. There was thus little justification for attempting to retain this valuable storage space and, in fact, unknown to M.S.D., No. 7 M.U. had already effected the transfer of the whole of the building of surgical dressings, fortunately mainly of the obsolete and unwanted compressed types, to their satellite at Bibury, a desolate, lonely station which was manned by a few civilians and Jamaican airmen. An inspection made as soon as this move became known at Hartlebury revealed appalling storage conditions, the equipment being inaccessible and unsafe; it was fortunate that the items stored there were not of great value. Attempts to instigate the removal of the remainder of the Quedgeley equipment consisting of drugs, instruments and furniture to Bibury were resisted.

It was apparent, however, that some urgent relief for the Medical Stores Depot, for its parent unit (No. 25 M.U.) and for the other maintenance units holding stores, was essential and representations were made to the Air Ministry late in September 1944 which resulted in a conference presided over by Department M.A.3 of the Air Ministry and attended by representatives from Maintenance Command, and the Officer Commanding No. 25 M.U.

The Officer Commanding, M.S.D., made it quite clear that he was asking for a complete move of the Medical Stores Depot to a separate self-accounting location. In this he was supported by M.A.3 but there was considerable discussion on the desirability, in particular from the technical accounting aspect, of the Medical Stores Depot being taken over by No. 25 M.U., thereby losing its identity except as a sub-site of the Maintenance Unit and being subject to the requirements of the unit in regard to accommodation and staff.

THE MOVE TO CHESSINGTON

It was finally agreed by all concerned that an endeavour should be made to find a separate location for the Medical Stores Depot and the

desiderata put forward by the Officer Commanding and supported by the Air Ministry medical representative were expressed as follows:

> Ample storage space, not less than that at present held (130,000 sq. ft.), more if possible. Rail and road facilities near at hand. Within reasonable distance of the Air Ministry. The limitations and control of supplies by various bodies (Ministry of Supply, Ministry of Aircraft Production, Board of Trade and others) and the many and varied changes rapidly occurring in bulk pack-ups and in individual composite items, such as the various first-aid kits, made personal and speedy liaison between the Stores Depot and the Air Ministry essential.

The Air Ministry representative stated that these points would be borne in mind when the available locations were investigated.

At this time a number of Balloon Command stations were closing down and in the latter half of 1944 it became known that R.A.F. Station, Chessington in Balloon Command was to be vacated. An inspection of the site was made and, although it was realised that much of the storage space would have to be improvised from existing buildings, the general layout, facilities and amenities of the Station in addition to its situation (fourteen miles from London) made it a desirable location for the Medical Stores Depot.

At a conference held at Chessington on February 16, 1945, it was decided that the O.C. Medical Stores Depot would become Officer Commanding, R.A.F. Station, Chessington, and that the station should eventually come within No. 40 Group of Maintenance Command for all domestic administration, but that the functional operation of the unit should remain vested in the Director-General of Medical Services. It was also decided that the title of the unit should be changed and in due course the Medical Stores Depot officially became No. 248 Maintenance Unit (M.E.D.).

Considerable changes and increases in staff and organisation were required by the move as many functions had hitherto been carried out by No. 248 M.U. As an example the important establishment of a Civilian Assistant, a complete Transportation Section, an Orderly Room, Accounts Section and other Service and civil administrative departments were among the many additional responsibilities of the unit.

Perhaps the most important addition to the functions of the Depot arose from the fact that R.A.F. Chessington was equipped with excellent workshop accommodation and machinery. This facilitated the repair and servicing of electrical apparatus and certain surgical stores, which had long been a difficult problem, as it was no longer possible to send unserviceable stores to manufacturers or other contractors with reasonable hope of early repair.

For some time a servicing team had been established at No. 2 Radio School, Yatesbury, to effect repairs to physiotherapy equipment and at

the Central Medical Establishment there had existed, since 1940, a team which toured the country checking, adjusting and effecting minor repairs to X-ray installations and electrocardiographs. The Electro-Medical Research and Repair Section at Yatesbury, as it was called, was commanded by a flight lieutenant in the Radar Branch and the short-wave experimental work in which it was also engaged was controlled, on behalf of the Director-General of Medical Services, by one of the two Consultants in Physical Medicine to the Royal Air Force.

It was therefore decided that the two sections should combine and move to Chessington to become both a static and a travelling servicing repair and research section of the new medical maintenance unit. At this stage (December 1944 to March 1945) storage space, though not ample was adequate and as a result of a week's visit by the Officer Commanding to the School of Tropical Packing and Preservation, a scheme was proposed and readily approved by the Air Ministry for the introduction of a pre-packing and preservation section in the Depot. An improvised section was set up immediately and included electric sterilisers and physiotherapy foot baths for wax-bath preservation, pending the arrival of the correct equipment and a small printing machine for containers and labels. This section also included a baling machine to break the large, 180 lb. bales of dressings and re-bale them into tropically wrapped and waterproofed standard bales of not more than 80–112 lb. in weight.

With these accommodation plans settled and the other available space allocated to the various categories and sections of stores, the move from Hartlebury commenced in March 1945.

It was unfortunate that at this stage the already difficult situation was made more so by the unavoidable decision to evacuate Royal Air Force units from requisitioned accommodation at Blackpool and to move the Medical Rehabilitation Unit to Chessington. Much valuable accommodation was thus lost to the Depot. All available storage space had to be re-allocated and some of the balloon sheds, quite unsuitable and unwanted for storage other than of empty cases, were taken into use. To complicate the position, medical stores from units contracting or closing down were reaching very large proportions so that outside storage became necessary. This storage was mainly canvas-covered tubular framework in a series of small compartments each of about 60 sq. ft. Other storage consisted of Milton racking framework lashed to the side of storage sheds and covered with tarpaulins. Even the air-raid shelters were brought into use to store gas cylinders and certain inflammables. Thus the whole move was delayed and protracted.

At the end of 1945, large stocks were still held at Hartlebury and Headquarters No. 40 Group was pressing for the accommodation held at Quedgeley and Bibury. Large stocks, unchecked and unpacked, were accumulating and the storage of dressings, piled 30 ft. high in one

enormous pyramid, afforded grave fire risk. New furniture was stacked in a high balloon hangar with a partly open roof, which resulted in rapid deterioration through rust.

Staff problems. When the M.S.D. opened at Hartlebury, the authorised war establishment was for two officers and eighty-four civilians. Many of these were recruited locally, and, apart from the clerks and pharmacists, were either carpet trade employees or farm labourers. The majority of them had little idea of stores work and, though some were quite good from the outset, much training was generally required before they could be regarded as reliable. With the exception of the typists and two or three temporary clerks, all the staff were male.

During the years 1940 and 1941, the extra work caused by the war expansion of the R.A.F. at home and abroad required an increase of staff. It is worth noting that during these years the type of employee had undergone a considerable change. Many of the original M.S.D. staff, who were not 'reserved', had been called up for service in the Armed Forces and these were replaced by men over military age. The average age of employees in 1939 was between 30 and 40 years, but by the end of 1941 the average age was as high as 50, and some of the men were more than 60 years old. In the early part of 1941, women were employed for the first time in stores work, and by the end of that year they made up 40 per cent. of the total strength. One of the results of this was that the establishment had to be revised with the allocation of women to the grading of storemen and packers for light work.

Although the establishment allowed for two officers, it was not until April 1940, that a second was posted.

Towards the end of 1941 two or three other officers (quartermasters) were posted supernumerary to the establishment for training and after a short course left for various medical units. A dental clerk orderly with the rank of warrant officer was added to the establishment in January 1942, as by this time the Dental Section had become very large. In August 1943, the dental post was raised to commissioned rank and a warrant officer posted for duty was commissioned as a flying officer. He continued his duties as before except that some of the heavy burden, at least on the technical or functional side of the dental stores work of the Depot, was removed from the Officer Commanding.

No other significant changes in the establishment occurred at Hartlebury but in April 1944, a new Commanding Officer took over the Depot. He was posted from the Air Ministry Medical Directorate and his knowledge of future plans, coupled with about three years of provisioning, contract and buying experience, was a considerable advantage. In the same year the officer strength was completed by the arrival of a newly commissioned flying officer (quartermaster) and a pilot officer commissioned into the A. & S.D. Branch for medical (dispensing)

duties. Yet more assistance was forthcoming when two Polish officers were attached to the Depot for some months to learn R.A.F. medical stores procedure. These officers, who had civilian pharmacist qualifications obtained in their own country and spoke fluent English, were quick to learn and were soon exercising considerable control in various sections of the Depot.

With the additional and adequate officer staff and the extra help of the Polish officers, much closer attention could be given to the functional operations of the Medical Stores Depot. The work of the Officer Commanding had hitherto been so largely concerned with administrative details relating to staff, accommodation, etc. that the technical operations had to be left to subordinates, which in the absence of other officers meant, in effect, the principal foreman.

Except for the withdrawal of the two Polish officers, there were no other important changes in the staff situation until just before the projected move to Chessington when, on the suggestion of Maintenance Command, an equipment officer post was established at the Depot and a flying officer posted as an adviser to the Officer Commanding on the general functioning and administration of the depot or maintenance unit.

The establishment required at Hartlebury and that asked for, and in general agreed to, at Chessington, differed considerably. The transition from a lodger unit occupying only a small part of a great maintenance unit and enjoying all its domestic and technical facilities, to a self-supporting unit meant, of course, the establishment of posts not hitherto necessary.

A large increase in storemen, packers and labourers was asked for and authorised. The increased commitment may be gathered from the following figures:

	Establishment	
	Hartlebury	Chessington
Civil assistant . .	Nil	1
Principal foremen .	1	2
Foremen . .	4	5
Leading storemen .	7	15
Storemen . .	11	32
Leading packers .	2	9
Packers . . .	35	54
	60	118

There was also an increase of labourers but the number fluctuated and was not finally established until the Service personnel, taken over from the former unit and drafted or posted in after the change-over as a temporary measure, had left the unit. These large increases in staff were

not due solely to the expected increase in the volume of the normal work of the Depot nor to the assumption of commitments such as transportation formerly undertaken by No. 25 M.U. When Chessington was first visited, the excellence of certain accommodation, particularly the workshops, had been noted and plans were put forward to instal various methods and machinery for the better treatment, packing and dispatch of stores, especially those intended for overseas.

A task for the Far East involving the build-up of equipment for three general hospitals of 600 beds each, twenty-four mobile field hospitals and a small medical stores depot, which was undertaken in addition to the normal work of the depot, was almost beyond the capacity of the accommodation and facilities at Hartlebury. It proved that much larger premises were essential and had it been necessary to take unit returns, which soon began to pour into Hartlebury from stations closing down, the organisation would have broken down. As it was, these unit returns were directed to Chessington. Experience has proved that plans to deal with unwanted or returned equipment are just as necessary as those concerned with the output, and that they are best envisaged and made, not when the end of war is in sight, but as early as possible after its outbreak. For choice, a separate location should be established, for much of the equipment returned is unfit for re-issue and has only 'produce value', if indeed any value at all. A separate location would provide facilities for the sorting of such equipment and its allocation for re-issue, for repair or for salvage. Furthermore, the sale of surplus unserviceable equipment could proceed without interference with the normal working of the medical equipment unit. There was little increase in the clerical staff of the new Depot.

Finally, it will be remembered that the Depot took over a number of Service personnel and that these were augmented from time to time and from various sources in view of the difficulty of obtaining civilian workers. This meant that a Station Headquarters had to be maintained complete with Adjutant, Orderly Room, P. Staff, Accounts Section and other necessary sections. Suitable officers were posted in and the unit continued successfully to exist as a civilian and Service manned maintenance unit until the arrival of No. 1 Medical Rehabilitation Unit, which took over Station Headquarters and practically all the Service personnel. The Depot was left with two airmen in its small orderly room, some Service dental personnel and one sergeant and an aircraftman to run the cold storage for vaccines and sera, which was transferred from Hartlebury to Chessington. This section was now increased to cover the receipt, issue and storage of all biological products required for the Royal Air Force, thus simplifying this most difficult and highly technical aspect of medical stores work, work formerly so unique in its character that at the beginning of the war and for some time afterwards it

was entirely in the hands of 'specialist' authorities, including the R.A.F. Institute of Pathology, the Government Laboratories, the Medical Research Council, the War Office medical depots and others, making the task of all concerned in obtaining such supplies one of extraordinary difficulty and often causing serious delay.

WORKING TECHNIQUE AT THE MEDICAL STORES DEPOT

The Provisioning Section. Although for some years before the war the R.A.F. had been steadily increasing in size and the need for medical equipment in general had grown, the stocks at Hartlebury from which unit demands were met could still be kept at a satisfactory level by means of purchases made periodically by Air Ministry (Dept. M.A.3).

With the outbreak of war, however, the position was entirely changed. It was now necessary to meet not only the ordinary Station and Hospital expenditure of stores, swollen by the new units which were being opened everywhere, but also the demands for squadron medical equipment and reserve stocks. This meant that a new section was required at the Medical Stores Depot, which must ensure that there should be no shortage anywhere, and that stocks should both be maintained at a sufficiently high level and planned in advance to deal with still further expansion. Thus, soon after the move of the M.S.D. to Hartlebury a 'provisioning section' was formed.

A register of contracts was compiled from existing information, records of outstanding store demands were made and maximum and minimum 'establishments' (i.e., potential requirements) for each item held on charge were worked out and recorded. The maximum establishment was fixed at six months' requirements and the minimum at three months. Later it was found necessary to fix the maximum establishment at twelve months' requirements in respect of some items, especially those required for building up mobilisation equipment.

A 'flagging' system was introduced so that the section knew which stocks were low. Any item which fell below its minimum establishment was marked with a red flag on the stock card. When the provisioning clerk had put in a demand for replenishment the flag was changed to blue. Thus, a red flag denoted low stock and called for immediate demand action; a blue flag recorded that demand action had been taken but that the stock was still low. When the stock was increased by fresh supplies from the contractor, thus bringing the balance in stock above the minimum establishment, the blue flag was withdrawn.

In cases where it was necessary to hold reserves above the maximum establishments, this reserve was added to the establishment. In fixing the requirements it was important that the Commanding Officer, M.S.D. should be acquainted with the future policy regarding expansion or mobilisation. Before the war and for more than a year after its outbreak,

this information could seldom be given, and the C.O. had to work out his own estimate of what the requirements were likely to be. From the end of 1940 onwards, however, the M.S.D. was placed on the distribution list for Air Ministry Confidential Orders and the works programme published in these orders proved a very useful guide to provisioning needs.

Provisioning, in spite of the system adopted, was not always successful because of lack of skilled labour. In the case of dental stores, it was further complicated by the fact that the responsibility for issuing instructions on provision action for new dental units did not rest with the M.S.D., but was in the hands of the Dental Service Branch at Air Ministry. Thus, during the first six months of 1940 no provisioning action for the supply of dental equipment for the new dental surgeries was taken, as no instructions were received from Air Ministry. This happened because the Dental Branch was unable to find out, in advance, what establishment it was to have for dental personnel in the R.A.F. generally.

As a result much valuable time was lost and for about six months there were no receipts of equipment for the new surgeries. Deliveries, furthermore, were very slow for about six months after this. Demands accumulated over this period and the 'lag' in meeting them did not begin to be taken up until the end of 1941. Provisioning action for dental surgeries and mechanical laboratories in existence was undertaken by the Medical Stores Depot at regular six-monthly intervals and here there was little or no delay.

Certain specialised items were required from time to time throughout the war for which it was not considered necessary, in view usually of the small and non-recurring nature of the stores required, to ask for a contract. Such stores could be obtained by the Air Ministry (M.A.3) on a local purchase basis.

Generally speaking there was little change in the provisioning method from the Depot aspect throughout the war, although there was considerable alteration in procedure at Air Ministry level as a result of the centralisation of buying in the Ministry of Supply. Obviously, provisioning had to be completely reviewed and brought into line with Ministry of Supply requirements. There was no longer competition between the Services and the civilian medical authorities in the placing of contracts directly with firms; all requisitions were centralised in the Ministry of Supply and, where more unusual stores were concerned, proportionate allocations of the total quantity requisitioned had to be made. Each Service was constantly required to review its holding and future requirements. Substitutions were urged wherever possible and very often were forced upon the buyer. Many items, particularly chemicals, were controlled, some by special bodies or departments of one of the Ministries (including the Ministry of Aircraft Production).

Procedure for drawing on contracts. At the outbreak of hostilities all ordinary supplies of drugs, dressings and surgical appliances in common use in the Services were obtained by the M.S.D. under contracts placed by the Contracts Department of the War Office. These were known as 'running contracts' and were for unspecified quantities. Thus the requisitioner could obtain as much as he required within his limit of expenditure. Contracts for other items, usually articles peculiar to the R.A.F., were placed by the Air Ministry Contracts Department, the necessary application being made by Air Ministry Medical Directorate (Dept. M.A.3) based on demands from the Medical Stores Depot and other R.A.F. establishments concerned.

A second type of contract customarily used was the 'fixed quantity' contract, which provided for the supply of a regular quantity of stores at stated intervals. As the requisitioner must accept all quantities of goods contracted for, he had to ensure that he did not apply for goods in excess of expected requirements. On the other hand, the quantities applied for must not be below expected needs. If, through unforeseen circumstances, the supply was unable to meet the requirements during the period covered by the contract, supplementary provisioning lists had to be prepared by the M.S.D. and submitted to Air Ministry so that the existing contract could be suitably amended. In general, demands under the running contracts were made by the Air Ministry (Dept. M.A.3) for delivery to Hartlebury or to the unit (usually a hospital) requiring the goods. Under fixed quantity contracts the goods were delivered direct to the M.S.D. The actual negotiation of both types of contract was undertaken in Air Ministry.

Towards the end of 1941, the Ministry of Supply took over all medical contracts and almost the whole of the Army Contracts Department was transferred to the Ministry. This change still left the R.A.F. free to requisition items peculiar to the Service and to nominate the firms who should be invited to tender, in order that, as far as possible, there should be no variation from the R.A.F. specification. This was particularly important for various first-aid outfit containers, where stowage space was often severely restricted and exact in its dimensions.

During the winter of 1940–1, when there were frequent air raids in all parts of the United Kingdom, powers of local purchase were conferred on the C.O., M.S.D. so that, should communication with Air Ministry and with the contractors be upset, he would still be able to carry on. It was not, however, found necessary to make use of these powers, although as stated above, the Air Ministry's local powers were often used to advantage.

Demands from and issues to units. During the first month of the war many stations sent in supplementary demands for medical stores to meet possible emergencies and to provide stores for the treatment of additional personnel who were called up to complete war establishment.

These demands were so heavy that it was impossible for the M.S.D. to deal with them expeditiously and it was customary for the M.S.D. to receive many 'hasteners' from units and from the competent medical authorities stressing the urgency of the requirements.

At that time there was no record kept of the demands and it was not only difficult to locate each one but well-nigh impossible to inform the unit when its demand could be dealt with. To overcome this difficulty a 'demands registry', working on a card-index system, was established at Hartlebury soon after the Depot opened there. This simplified the tracing of the demand from the time it entered the Depot until the goods were despatched. The difference between this system and the normal Royal Air Force Register of Demands was that at M.S.D. each Royal Air Force unit had a card showing particulars of its demands, whereas the normal register of demands operated numerically according to the item concerned.

Demands from station sick quarters within the authorised scale (i.e. Scales A1 and A2 of A.P.132) were sent direct to the Medical Stores Depot and it was generally able to execute them in full. Demands outside the authorised scale, after approval by the competent medical authority, were dealt with by M.S.D. if the articles were available; if not, they were sent to Air Ministry (Dept. M.A.3) for action. Any demands involving an innovation or a change of policy had to be sanctioned by Air Ministry before being dealt with by the Depot.

Demands for stores and equipment required by hospitals were sent *via* the competent medical authority for countersignature and forwarding to the Depot. On arrival at Hartlebury they were not dealt with in the same manner as demands from sick quarters, because much of the drugs and apparatus required in hospitals was not required in sick quarters and was therefore seldom stocked. If the drugs were not proprietary brands and appeared in the lists supplied by the drug manufacturers who had contracted to meet the war demands of the Services, a transcribed copy of the demand for these items was sent from Hartlebury to the drug manufacturer nearest the hospital concerned for supply action direct to it. Proprietary and special drugs, tablets, dressings, medical and surgical appliances and instruments were issued from stocks at Hartlebury if available. Demands which could not be met were, as already stated, passed on to Air Ministry (Dept. M.A.3) for action and issue.

In the early days of the war all medical and dental demands from the Middle East, Iraq and Aden and dental demands from the Far East were sent to the M.S.D. When the Army had established their own medical stores depots in overseas commands, these demands ceased, with the exception of those for articles peculiar to the R.A.F. which were not

usually stocked in Army Depots. Despite this, much of the supply of medical stores during the early part of the war for overseas R.A.F. units was sent from Hartlebury to meet demands rejected by the Army Depots. Later, in 1943, it became obvious that the Army's commitment was such that anything other than the commonest of the 'common-user' items could not be supplied, particularly to our forward units. In addition, as territory was covered either in retreat or advance, much equipment was lost or was moved rapidly from place to place. The Army could not be expected to deal with the various items, particularly the first-aid pack-ups and outfits, which were peculiar to the R.A.F. The problems of identification, storage and replenishment of used components were obviously too great and so, with the sanction of the Air Ministry Medical Directorate, small medical stores depots were set up in overseas territories. The principal depot was in Egypt and there were others in Malta, Aden, Habbaniya and Palestine (the last attached to the General Hospital), further depots being set up on a more or less long-term basis in the various theatres.

These overseas sub-depots were supplied with equipment from England and the Depots in turn recovered all the equipment from local sources plus some captured enemy material, so that replenishments of the commoner items from the United Kingdom were seldom asked for and eventually the overseas medical stores organisation relieved both the Army overseas and the R.A.F. authorities at home to a considerable extent.

Stores despatched from M.S.D. to home stations went by post, road transport and passenger or goods train. Road deliveries were made inside the zones covered by the 'Universal' Maintenance Units, passenger trains were used for the stores urgently required for which quick delivery could not be provided by road transport. Goods trains were used when there was no urgency and when road transport was impracticable.

The normal method of despatch of stores to stations abroad was by ship. The utmost secrecy had to be observed. As mentioned at the end of the section 'Preparations for War', each unit proceeding overseas was given a field serial number, and this number, together with distinctive code port markings and a red cross on a white background, was painted on each case to be shipped. No other markings beyond that of the weight and the case number were allowed to be shown.

When consignments were ready for shipment at the M.S.D. they were handed over to the Transportation Section of No. 25 Maintenance Unit which made all further arrangements. Sometimes more rapid methods of transport than the normal sea route were required. Thus, during the French campaign of 1939–40, when stores were often needed very urgently, they were despatched either by air or by means of the

'Military Forwarding Organisation'. The use of air transport often made stores available to the units within twenty-four hours of despatch from the M.S.D. Packages were limited at first to 50 lb. weight and there were also measurement restrictions. Limitations for stores delivered by the Military Forwarding Organisation were 112 lb., delivery being guaranteed within forty-eight hours of despatch. At various times during the war it was necessary to despatch medical stores urgently by air to the Middle East and to West Africa.

As the airlift increased a considerable quantity of more urgently required stores could be flown overseas, both for the R.A.F. and for the Army, the weight limitation being that of the aircraft making the flight. It was the R.A.F. who obtained the first penicillin for treatment from the M.R.C. and a few hours later it was being used in Sicily to save the life of a soldier suffering from septicaemia.

Early in 1940 it became clear that some change was required in the method of demanding by sick quarters and dental centres. Up to that time demands were submitted at intervals which suited each unit best, i.e. quarterly. But the R.A.F. was expanding rapidly and many new stations were opening. It was evident that if the system of demanding quarterly was allowed to continue a bottle-neck would occur at the M.S.D. and the whole medical supply organisation might break down. To prevent this half-yearly demands were introduced, and these were 'staggered' over the yearly accounting period concerned so that a regular flow of demands to Hartlebury and of stores from it to units was ensured. Hospitals, however, were allowed to continue with their quarterly demands.

A change in the method of accounting was introduced in April 1941. Until then the dual system of accounting had been used, employing tally cards and ledgers. The tally cards were kept in the sheds and the ledgers in the office. To work this system efficiently it is necessary to have periodic checks between the tally cards and the ledgers to ensure that they are in agreement. Owing, however, to the pace at which work proceeded it was impossible to carry out these checks in accordance with the regulations and consequently M.S.D. and all maintenance units were ordered to introduce a single-entry system of accounting. This resulted in the abolition of all shed records and the maintenance of a Form 1640 (stock record sheet) in the main office. The system proved its value by economising in man-power, as one clerk was able to do the work previously undertaken by two. An important point was that the greatest care in recording had to be taken when using this system as errors and omissions were extremely difficult to trace. Another disadvantage of this system was that keen storemen no longer knew the amount of stock that should be on their shelves and therefore interest in correct maintenance was lost.

Problems of working by sections. As already mentioned medical stores were arranged in thirteen sections, the commodities in each section being roughly allied to one another. As the items in the different sections varied in nature, from the point of view of bulk, weight and storage handling, the practical problems involved at the Depot require some mention.

In Section I (medicines, chemicals, medical sundries, vaccines and sera), most substances were received in bulk quantities and before issues could be made they had to be broken down into small denominations. In addition to this dispensing on a large scale had to be carried out. Electrical mixing vats and several sets of distilling apparatus were installed at Hartlebury and with the aid of these and ordinary dispensing facilities many mixtures and preparations required for issue to station sick quarters were compounded. As large quantities of bottles were required for this work, a bottle-washing machine was installed and was generally working at full capacity. In Section II (compressed tablets), there was less need for breaking down, as the tablets were usually received in containers of from 500 to 1,000. Section III (surgical dressings) did not, in the first year of the war, present a difficult problem, as most of the dressings were received in canvas wrappers in bulk quantities. Inside these wrappers smaller quantities were packed separately in paper cartons so that the breaking down process for issue was relatively simple. Trouble did, however, occur later in the war, as the manufacturers' baling of some 180 lb. was too big for airlift and beach handling and was not proof against tropical conditions. A baling machine was therefore installed to break down the bales into tropically preserved, waterproof bales of 80 to 112 lb. bulk.

Sections V (surgical appliances, sundries, splints and optical appliances); VI (surgical instruments); VII (aseptic furniture); IX (X-ray and photographic appliances and materials); and XI (laboratory apparatus) necessitated very careful handling and packing due to the very fragile nature of some of the apparatus, in particular glassware, surgical and ophthalmic instruments such as cystoscopes and ophthalmoscopes and above all X-ray tubes which were susceptible to jarring and in very short supply throughout the war period. Equipment in Section IV (rubber and waterproof goods) was quite easily dealt with. Receipts were usually reckoned in unit denominations, so that when issue had to be made no breaking down was necessary.

In Section VIII (field equipment) a building-up rather than a breaking-down process was generally necessary, as most of the items in this section are composite articles which have to be assembled from their component parts before issue. The components were generally set out on long benches by women who were kept very hard at work assembling equipment in order to keep pace with the demands. The accounting

action required for each transaction was shown on a Form 21, the component parts being detailed on the left side of the form and the complete articles on the right.

In Section X (dental equipment) the items are for the most part small and require great care in handling in order that damage and loss may be prevented. When consignments of dental stores were being assembled in the section before despatch to the packing bay it was usual for all the small items to be collected and stowed in boxes or envelopes, thus reducing the possibility of loss to a minimum. Composite articles of field dental equipment and field dental mechanical equipment were assembled in this section, the procedure being the same as for that of the composite articles mentioned above in describing the working in Section VIII (field equipment).

Equipment under Section XII (electro-medical apparatus) was not stocked at the M.S.D. until 1943. Issues of this equipment were arranged by M.A.3 direct from contractors to units. Section XIII consisted of packing cases, wrappers, bottles, jars and any other containers used for the packing and storage of medical stores. Packing materials were obtained from maintenance units as required.

The Contracts Receipts Section was employed solely on unpacking, checking and passing all incoming stores from contractors into the various sections, whether the stores were obtained under contract arrangements or by Air Ministry local purchase procedure. Each consignment was carefully inspected to see if it corresponded with the specification, was in good condition and fit for service. Damaged articles, or items not in accordance with the specification, were rejected and returned to the contractor for replacement. If they had been damaged in transit notice of claim was served on the carriers and the contractor instructed to proceed with the claim from his end. The Contracts Receipts Section was also responsible for the return of empty containers to contractors, special care being necessary to find out if these containers were charged against the R.A.F. and therefore called for repayment action.

The Unit Receipts Section normally sited at the furthest point of the unit from the Contracts Receipts Section dealt with the return of stores surplus to requirements, with articles for repair and with empty containers from units. Before these articles were passed to the Sections they required conditioning by a specialist officer or technician, i.e. classifying under the headings 'serviceable', 'repairable', 'doubtful', or 'for disposal'; 'doubtful' articles were set aside for further investigation. The unserviceable articles were reduced to 'produce', the amount of produce so obtained being then taken on charge.

Plans were progressing during 1945, just before the end of the war, to publish a priced Vocabulary of Medical and Dental Equipment. A brief note on this new vocabulary is included later.

The other sections introduced at Chessington, the Research and Repair Shop and the Preservation and Packaging Section, have already been described elsewhere in this narrative and do not require further comment, as they were not fully functioning before the end of the war.

OUTPUT OF MEDICAL STORES

It is not possible to give a year by year record in tabulated form of the output of the major pack-ups from 1940 to 1945. Up to 1942, before first-hand knowledge and experience under really active conditions of war became available, the build-up of the various outfits remained practically the same and a table is appended showing the principal medical and dental pack-ups issued in the first two years:

At home	First year	Second year	Totals
Scales A.1	69	133	202
Scales Z.1 for satellite aerodrome	61	49	110
Scales Z.1 for Balloon Barrage Squadrons	7	14	21
Hospitals	15	4	19
Medical Boards	11	6	17
Scales D.1 and D.2	70	139	209
Dental Mechanical Laboratory	6	9	15
Field Dental Equipment	1	25	26
Overseas	**First year**	**Second year**	**Totals**
Scales A.1	8	34	42
Scales Z.1	56	79	135
Scales Z.3	1	Nil	1
Hospitals	Nil	1	1
Scales D.1 and D.2	5	11	16
Dental Mechanical Laboratory	3	Nil	3
Field Dental Equipment	4	7	11
Field Dental Mechanical Laboratory	1	10	11
Scales Z.4b	2	Nil	2
Scales G.1	5	8	13

Information as to the content of the various scales will be found in the section on 'Medical Equipment'.

In 1942 and 1943, however, reports were beginning to be available from medical officers who had actually received and used the equipment. Much of it was modelled on designs produced in the War of 1914–18, some indeed even earlier, and although minor modifications had been introduced during the years between the wars, they were mostly adopted as the result of changes in the Army Scale and being primarily designed for Army medical formations were therefore not necessarily suitable in their make-up and bulk for R.A.F. purposes.

In 1943 and the early part of 1944 there were many very important changes, due not only to the reports of squadron and hospital medical

officers but also to the fact that most, if not all, of the R.A.F. consultants and specialists had visited the various war theatres and had seen for themselves the limitations of the equipment then in use.

It is not possible, therefore, to continue the table of issues beyond 1942, but a list is appended which may give some idea of the very varied pack-ups and outfits which had been devised, built up and issued during the last twelve months of the war. The mobile field hospital, as the M.R.S. was now known, bore little resemblance to its early form; it was in fact, a complete 100- or 200-bedded general hospital with sections, such as the casualty air evacuation unit, advanced surgical team and the special treatment centre, which could be added to or omitted from the general outfit as required and could break off from the main unit to function as a separate section when necessary.

During this period, also, most of the mobile field hospitals, general hospitals and dental units had been established as far as the European, the Middle Eastern and the Indian theatres were concerned and the majority of the issues from the Depot during the period took the form of replacements and replenishments. At the same time, the equipment for the Far East was being built up, some to be issued during the latter half of 1944 but the majority remaining in the Depot to be broken down at the end of the war. This equipment included 300 tons of stores for a Base Medical Stores Depot in the Far East.

In the last twelve months of the war about 300 major medical or dental pack-ups were issued. Among the demands for the larger pack-ups was a consignment for a 300-bedded hospital for the Greeks, although some of the equipment in this instance was supplied from Italy. Numerous other smaller but completely self-contained outfits were supplied to the Americans, the Czechs and other Allied fighting forces.

In connexion with the smaller outfits there is a record of the issue of the first consignment of the 'jungle pack', later known as the survival outfit, which consisted of a small tin box containing not only tubes of essential medical tablets and an outfit for treating snake-bite, but also needles, safety pins and a fishing-line with hook and float. These outfits were urgently needed but no contractor could offer any delivery rate, fully packed and sealed, which would have enabled issues to be made in a reasonable time. The problem was tackled with energy and ingenuity. The Medical Stores Depot issued many hundreds of thousands of the quinine (later, mepacrine), aspirin and other tablets required direct to the supply branch of the Medical Directorate (M.A.3). The snake-bite outfits, without the potassium permanganate, were delivered direct by the contractors and the capsules to contain water sterilisation tablets were also sent direct to M.A.3. Six or eight lady volunteers were obtained through the good offices of the *Nursing Mirror* and packing began in the offices of the Medical Directorate and continued at great

speed. A number of the staff, both Service and civilian, in the Medical Directorate gave up some of their rare leisure to help in this work.

Over 5,000 first-aid outfits for gliders were issued during this period and more than 20,000 of the ordinary aircraft first-aid outfits. This latter item included about 1,000 of the American pattern obtained under lend-lease, to fit into the special stowage of the American aircraft operated by the Royal Air Force.

Another item, built up in the Medical Stores Depot, subject to frequent changes and eventually tropically packed before issue, was Outfit Scale No. C. 6, the first-aid outfit for the rubber dinghies in aircraft. In the last twelve months of the war, 15,000 of these outfits were issued as well as over 200 of the comparatively new outfits for the Airborne Lifeboats of the Air Sea Rescue Service.

As a further test of the resources of the R.A.F. medical supplies the Medical Directorate was asked in 1942 to provide a first-aid outfit for pigeons and at a later date a first-aid kit for R.A.F. police dogs. The latter was largely experimental and was a portable outfit.

Measures were taken to relieve the work-load of the Depot wherever possible. For instance, the Institute of Pathology, as mentioned elsewhere, became responsible for all microscopes and although issues had to be made from the Institute to the Depot for subsequent re-issue to units abroad, units at home could be supplied direct and the problems of upkeep and repair no longer became part of the Depot's responsibility.

Medical gases provided a major relief to the work-load when the 'fetch and carry' system was brought into operation. It commenced in 1941 and by 1944 it was almost universally in use at home. The British Oxygen Company from its various depots had a delivery system to all stations in its depot areas and medical gases were obtained from the vehicles as required. This not only ensured speedy and regular deliveries of full cylinders but enabled the Company to obtain the early return of empties for re-filling. A reserve of medical gases was, of course, maintained at the Medical Equipment Depot principally for overseas pack-ups but even there it was found possible to reduce holdings as facilities for re-filling the converted aircraft cylinders became available in certain localities overseas. The demands for N_2O from overseas commands, however, appear to have exceeded our supplies.

COMMENTARY

The function of a medical stores depot is to receive equipment from manufacturers and to distribute it in the most economical manner to the points at which it is required. It was realised during the early stages of the war that insufficient attention had been paid to the supply problem and that the equipment supplied to medical and dental officers was inadequate for their full professional needs. In addition, much valuable

equipment and time was wasted for a variety of reasons, among them the following:

The lack of skilled staff dealing directly with medical equipment. Insufficient quartermasters, both medical and dental, were available for handling supplies. There was only one quartermaster at the Depot and no immediate provision was made for increasing the staff. Neither were there any quartermasters available for opening the hospitals at Torquay and Littleport. The civilian labour available during the whole of the war consisted, in the main, of personnel who were medically unfit for agricultural work or for entry into one of the three Services, those who were too old or unintelligent to obtain higher paid work in factories and others who were too old for active employment. These people, who were always in the majority, were responsible for bad packing of equipment, bad store-keeping and poor stock recording. In the event of another emergency such as war, it would be advisable to ensure retention of the present supervisory grades and skilled labour. Selected employees should be screened by the Ministry of Labour and better wages should be paid to attract the type of labour which would be needed in expansion. If it became necessary to move the depot or to open large sub-depots, the housing of the staff should be urgently considered when selecting sites.

Lack of knowledge of up-to-date packing methods. Poor packaging, until 1945, was the cause of much equipment arriving at its destination in a broken condition. Very close liaison should be maintained with Central Packaging Boards, to ensure that all new methods of packing are made available for medical equipment.

Insufficient liaison between administrative branches. Provision of stores nearly always lagged and they often missed the appropriate convoy. Closer liaison should be established between those framing medical policy, M.A.3 and R.A.F. Movements and higher priority should be given to the despatch and receipt of medical stores. Action taken in peace-time to overcome these difficulties would secure great economies of production and transport and would result in considerable saving of materials and man-power.

Equipment Scales

Scales of medical, surgical and dental equipment in use in the Royal Air Force bear a close, and sometimes an exact, resemblance to those used by the Army. All individual items are, as mentioned in the Medical Stores account, divided into classified sections which up to 1944 corresponded to the sections of the Army Priced List of Medical Equipment. When the R.A.F. Medical Stores Depot was opened and for many years after, it was convenient to base the various scales of equipment on those in use by the Army, and A.P. 132, the R.A.F. vocabulary of

medical and dental equipment, conformed to the nomenclature and the grouping of equipment used by the Army from which, for many years, all medical equipment was obtained.

The R.A.F. scales of medical and dental equipment were grouped under nine different letter headings, each of which included from one to twenty different scales. The R.A.F. possessed no priced vocabulary of equipment, but use was made of the Army list as far as possible, although reference had to be made to the Air Ministry to ascertain the cost of equipment not common to the Services, when such questions as loss or damage or issues to other Services or authorities were involved.

During the war there was considerable divergence from the scales of medical and dental equipment used by the two Services. Many new items peculiar to the R.A.F. were introduced and the types of composite equipment, though sometimes retaining the same nomenclature, were often completely different in build-up. It became necessary, therefore, to attempt to write an R.A.F. vocabulary. Although the Depot was not intimately connected with this project, much thought and experiment had to be given to it from the practical side, principally because a complete change in the sections of the vocabulary meant that the physical stocks in the Depot also had to be moved. A temporary price vocabulary was introduced before the end of the war and the first scales of the new A.P.132 were also planned.

The main concern during the early war years was the supply of medical mobilisation equipment. In the following account of particular stores and pack-ups, mobilisation equipment is dealt with first, and is followed by notes on first-aid outfits, field equipment and 'other medical equipment'. The purpose is to give a general impression of the type of equipment provided and to show, briefly, the developments which occurred as the war progressed.

MEDICAL MOBILISATION EQUIPMENT ('Z' SCALES)

Scale Z.1. The standard unit medical equipment supplied to squadrons was Scale Z.1. It was introduced into the R.A.F. in 1930, being originally known as 'Medical Mobilisation Equipment for a Squadron'. In the Commands overseas, Principal Medical Officers had devised local scales of their own. The introduction of Scale Z.1 brought all these individual scales into line.

At first the equipment consisted of shell dressings, splints, a sphygmomanometer, a 'medical companion' (this item is part of another scale, Scale F.11), a surgical haversack (Scale F.12) and Nos. 1 and 2 field medical panniers (Scales F.3 and 4). All this equipment, except for the panniers, was packed in a 'mobilisation case', made of heavy timber and reinforced with metal. The case was heavy and cumbersome and did not

lend itself to easy handling. A lighter type of case, with rope handles, was later provided in its place.

The whole equipment was revised in 1933, the field medical panniers being withdrawn and replaced by a regimental pannier (Scale F.1). Certain additions were also made, namely, tannic acid jelly for the treatment of burns to be later replaced by gentian violet jelly and finally by a special burn/sunburn cream; glucose and saline ampoules for the treatment of shock; medical equipment for a motor ambulance (Scale B.1) and water testing cases (Scales F.16 and 17). Still later a field service pattern manometer and an 'Accoson' sphygmomanometer were included, the latter replacing the original instrument introduced in 1930.

In September 1935, during the Abyssinian crisis, instructions were given to issue mobilisation equipment to squadrons proceeding to the Middle East. This was despatched from the M.S.D., then at Kidbrooke, direct to the port of embarkation and accompanied the units to their destinations. At this time no medical stores had been provided to combat chemical warfare and the omission had to be made good as quickly as possible. A list of equipment was drawn up and boxes were rapidly manufactured in the workshops of No. 1 Maintenance Unit. Though they were not ready when the squadrons left for overseas they were despatched soon after and arrived in the Middle East during October of that year. The original boxes were subsequently returned to Kidbrooke and were later used during the war as containers for gas treatment equipment issued to home stations. Later, special gas treatment panniers were manufactured and were included in field equipment as Scale F.2.

In 1936 a further addition was made to Scale Z.1. This was the medical board equipment which might be required by the competent medical authority in a theatre of war. A special travelling case was made for it and it later became known as the medical board pannier (Scale F.10) as issued to headquarters in the field.

One lesson of the Abyssinian crisis concerned the sufficiency of the scale issued to squadrons who were sent to isolated places with little chance of replenishing the expendable items of their medical equipment within three months from the date of issue. In order to make up for this shortage two medical reserve panniers (Scales F.5 and 6), containing a three-months' supply of expendable articles, were prepared and added to the Z.1.

By 1937 the original heavy case for the Z.1 equipment had been replaced by a series of panniers. It was now decided to include a supply of oxygen and a 100 cu. ft. capacity cylinder was put on the scale. This cylinder was very heavy and proved difficult to handle in a mobilisation pack. Before the outbreak of war in 1939 it was withdrawn, and replaced by four 750 l. lightweight cylinders in a special case. In 1938, presumably

in anticipation of the heavy air attacks which the enemy might deliver on a squadron in the field, the number of shell dressings in the Z.1 equipment was increased.

The Z.1 equipment at the outbreak of war in 1939, except for certain modifications, was almost exactly the same as that in use when the war ended. Previous additions and modifications had shown their value in providing a set of equipment which proved its worth many times under war conditions. Naturally there were minor additions to suit individual medical officers' needs as time went on, but the Scale Z.1, almost unaltered, remained the standard issue to all field units approximating to the strength of a squadron. The main faults of the Z.1 were from the supply point of view. When more than one set was issued to one serial number there was no means of identifying complete sets and as the keys for each set were placed in one of the cases in the set, it usually happened that squadron medical officers had to break the locks.

Scale Z.2. This was introduced in 1935 for the use of medical officers in mobilisation pools, or, as they were later called, 'personnel transit centres'. When mobilisation was ordered reservists were instructed to report to one of these centres, established in various parts of the country, for medical examination before being passed into regular service. On completion of this work, the equipment was returned to the Medical Stores Depot. It was packed in boxes specially made in No. 1 Maintenance Unit.

Scale Z.3. In September 1935, when, as mentioned above, squadrons were drafted to the Middle East, it was thought that an Aircraft Depot with a strength of from 1,000 to 3,000 men, would be used for field service. A set of medical equipment for use in the sick quarters of such a unit was therefore drawn up and added to medical mobilisation equipment scales. War experience up to the end of 1942 showed that there was no call for this scale, since in fact, an Aircraft Depot gets a large quantity of Z.1 type of equipment less aircraft outfits (Scale C.1) and less motor ambulance medical equipment (Scale B.1).

Scale Z.4. The first two mobile field medical units in the field were Nos. 1 and 2 Medical Receiving Stations, both of which were sent to France with the Royal Air Force in 1939. The equipment for these units was based on experience gained by two similar units which were sent to the Middle East in 1935 during the Abyssinian crisis and from two subsequent exercises in the United Kingdom. After the final exercise a scale was drawn up based on part of a R.A.M.C. field ambulance section, but before embarking for the Continent in 1939, the commanding officers of these units, feeling a little doubtful about the adequacy of the equipment, were permitted to proceed to M.S.D. and were issued with further supplies. Later in the Middle East, where five of these M.R.Ss. operated very efficiently, the name of the unit was changed to

Mobile Field Hospital. Examination of captured enemy equipment suggested methods of improving the scale and resulted in the provision of better X-ray equipment and mobile laboratories for these units. Later the Air Ministry added to the scales, which ultimately afforded everything required by surgical and medical specialists in the field. The latest pack provides panniers sufficient to set up small-scale laboratories and special surgical equipment to enable surgical teams to be entirely self-sufficient and mobile.

FIRST-AID OUTFITS AND FIELD EQUIPMENT

FIRST-AID OUTFITS

Before the war the variety of first-aid outfits authorised for use in the R.A.F. was very small. After September 1939, however, many new outfits were introduced to meet special war needs and some of the peacetime outfits were modified to suit war conditions. As mentioned in the introduction to this section, scales for first-aid outfits come mainly under Scale C of A.P.132. In addition to these scales (C.1 to C.9) there is one item of Scale B (B.1) which is provided for motor ambulances and, originally, ambulance motor-boats.

Before giving short notes on all first-aid outfits some introductory remarks must be made on the development of the most important and widely used outfit—that for aircraft. Its history begins in 1917, when a few experimental metal boxes were made up. These contained dressings, adhesive plaster and bandages on rollers. There were various other items, including a slab of chocolate. It was proposed to fix this box in a convenient position in the aircraft, but this proved impracticable, and a small first-aid satchel then in use in the R.F.C. was adopted instead. At first the satchel contained very little beyond dressings. Soon it was considered advisable to make additions, with the result that the satchel increased correspondingly in size. Early in its life the satchel was made to include various types of medicinal tablets such as might be required when forced descents had to be made in overseas areas where medical attention was not available.

Until 1941 the contents of this satchel (Scale C.1) underwent few important changes, except that at one time, owing to frequent 'losses', an effort was made to exclude all Class A items, for example scissors. In 1935 a notable improvement was made by the addition of the tubonic morphia-containing ampoule. In 1936 the satchel was made a general issue for all aircraft, instead of being confined, as had been the case until then, to machines in use overseas.

During 1941 many of the contents of the satchel were omitted and some new items added. These changes were the result of the war experience of pilots and of medical officers working on operational

stations. The first war-time alteration to the outfit comprised the introduction of tourniquets and the re-introduction of scissors of a strong type then known as 'stretcher-bearer's scissors'.

A list of first-aid outfits in use in the R.A.F. follows, with short comments on each:

Aircraft Outfit (*Scale C.*1). This is the satchel referred to above, and is used for all aircraft on normal duties. Its contents as issued at home differ slightly from those used overseas, the latter carrying quinine, aspirin and other medicinal tablets. The issue is to aircraft carrying up to three aircrew, one extra satchel being provided for every additional three aircrew or less.

Aircraft Outfit (*Scale C.*2). This outfit was originally contained in a small wicker pannier and was issued for use in aircraft on long-distance flights in the Tropics and Sub-tropics and for armoured cars. The pannier was later replaced by a fitted metal chest. It is intended to cover the requirements of a crew of four to eight. The contents are considerably in excess of those of Scale C.1.

Aircraft Outfit (*Scale C.*3). This is intended for troop-carrying aircraft in the event of an emergency landing, the contents being enclosed in a light metal box with fabric cover. Both this and the Scale C.2 outfit contain a copy of A.P.1486 (*First-aid treatment for detached personnel in the Tropics and Sub-tropics*).

Air Ambulance Outfit. This was a first-aid outfit specially designed for certain aircraft which were fitted up for exclusive use as air ambulances. A few only of these special outfits were issued. The outfit was contained in a light fitted metal box and contained material specially chosen for treatment of cases of collapse or severe pain. The air ambulances had an oxygen supply and the medical equipment therefore contained the apparatus for administering oxygen.

What later became known as the 'air ambulance outfit' was made up in pannier form to provide a suitable outfit to be carried on freighter aircraft used for evacuating casualties. In 1944, however, two specially designed panniers were brought into use and, as many of the items contained therein were 'barrack' items, the provisioning became the responsibility of the D.G.E. although issues, after the panniers had been completed by the addition of the medical stores, continued to be made by the Medical Stores Depot.

Dinghy First-aid Outfits. There are two types, a small one (formerly Scale C.5 but later C.21) in a tin box, intended for dinghies carrying a crew of not more than three and a large type (Scale C.6 but later C.22), also in a tin box, for dinghies carrying crews of from four to eight (e.g. the Lindholme Dinghy).

Air Sea Rescue Outfits. Two types were issued, the outfit for navigational buoys (Scale C.7 later C.28) in a tin-lined wooden box and a

rather larger outfit for A/S/R Floats (Scale C.8) also contained in a wooden box (Plate LIX). This latter outfit became obsolete in 1943.

Ambulance Outfits. There are two types, one for heavy Albion and the other for light Morris Oxford road ambulances. The contents are the same (Scale B.1) and are divided up into two boxes, wood for the Albion and light tin for the Morris Oxford.

Workshops Box (*Scale C.4*). This was supplied to conform with the Factories and Workshops Act and has been in use in the R.A.F. since 1924. The box was of wood.

A.R.P. Outfits. There were two of these, one for A.R.P. Posts (Scale C.10) and the other for A.R.P. Rescue Parties (Scale C.11). Both were haversacks and the contents did not differ greatly. They were replaced in 1943 by the General Service Haversack. Though the outfits were in use in March, 1942, they were not allotted their scale number until later.

Balloon Unit Outfits. At the beginning of the war there were two of these. One was the first-aid outfit for balloon winch vehicles, contained in a haversack. The other, in a box, was carried in the unit medical officer's light van when visiting balloon sites. During 1943 the first of these outfits, which was never given a 'Scale' in A.P.132, was replaced by the 'Outfit, First-aid, G.S. Haversack' (Scale C.14 later C.31) as used by the Army, with the object of reducing in number and standardising the many first-aid outfits which had been developed since the outbreak of war. The unit medical officer's outfit became Scale C.15 but was withdrawn in 1944 when the balloon units were disbanded.

First-Aid Outfit for Glider Aircraft (*Scale C.12*). This was an important outfit, not unlike the first-aid outfit for aircraft but containing more dressings and morphia ampoules. It was introduced in 1943 but supplies were not in regular issue until 1944.

Aircrew Outfits. Marks IV and V (*Scale C.16 and C.17*). These were originally known as 'personal packs' and this title is almost self-explanatory. Their development arose largely from requests made by pilots and aircrew, through flying personnel medical officers, for a first-aid outfit which could be carried on the person. Obviously a first-aid outfit in its aircraft stowage was of little use to a pilot who had to bale out. The development of this personal pack is not the concern of this particular narrative but it did provide, for all those concerned in its planning and production, many interesting problems. The essential idea was to provide an outfit small enough to be carried by a pilot either in a pocket of his uniform or flying suit or in the 'Mae West' and to be really useful in an emergency. It contained small dressings, the morphia ampoule-syringe, a tube of first-aid burn medicament and a pair of oiled silk gloves sprinkled with 'Albucid' powder which the airman could put on if his hands were burnt. The tube of burn ointment provided its own

problem. Originally it was gentian violet jelly and, in the first packs issued, great trouble was experienced from the inflation, leaking and sometimes bursting of the tubes at great heights. The jelly was later replaced by a cream, designed to give relief against both burn and exposure, containing a sulphonamide base. The fabric case of this outfit was, from its inception, waterproof, later it was also fireproofed. Later developments included an 'easy-tear' device and a 'breathing patch'. The latter prevented inflation of the pack at high altitudes and damage to contents.

First-aid Outfits for Airborne Lifeboats. These were designed in 1943 and produced in 1944. They were evolved from an outfit made for the Lindholme dinghy which preceded the airborne lifeboats. Two types of lifeboat outfit were issued, a home pattern (Scale C.24) and a tropical kit (Scale C.25). Both were contained in fitted tin-lined wooden boxes and the main difference between the home and tropical kits was the addition of quinine tablets and burn/sunburn cream to the latter.

Miscellaneous First-aid Outfits. Before March 1942, there was a first-aid haversack issued for the Armadillo A.F.Vs., used for aerodrome defence before the formation of the R.A.F. Regiment. This outfit became obsolete and was replaced by the 'Outfit, First-Aid, G.S. Haversack' mentioned above. The Scale C.2 outfit has already been referred to. This is put up in a heavy wooden box for use on armoured cars in the Tropics and Sub-tropics. One other first-aid outfit, in a tin box, in use in March 1942, was that for a fire-tender. This became Scale C.12 and was later superseded by an outfit for all fire-fighting vehicles, including launches (Scale C.37).

A small outfit was designed in 1943 for the R.A.F. pigeon lofts. It was a simple wooden chest containing boric powder, iodine, castor oil for the pigeons' eyes, scissors, forceps and small dressings.

FIELD MEDICAL EQUIPMENT

Only four of the eighteen types of field medical equipment (the F Scale) used in the R.A.F. are peculiar to that Service. These are the gas treatment pannier (Scale F.2), the reserve medical panniers (Scale F.5 and F.6) and the medical board pannier (Scale F.10). This fact should be borne in mind when considering the examples of field medical equipment, notes on which are given below.

Regimental and Reserve Medical Panniers, Nos. 1 and 2. These are Scales F.1, F.5, and F.6 respectively. Their principal contents are drugs and dressings with a few instruments. The panniers are issued to squadrons and other units and also form part of the squadron medical equipment (Scale Z.1). They are used by parties of about 300 men who are accompanied by a medical officer.

Field Surgical and Fracture Panniers. These are Scales F.7 and F.8 (for the field surgical panniers Nos. 1 and 2) and Scale F.9 (for the field

fracture pannier or box). They accompany each other and are issued to the larger field medical units such as M.F.Hs. in which surgeons are usually employed. The fracture pannier became obsolete after the introduction of Cramer's splinting which is carried in Modified Scales F.7 and F.8.

Gas Treatment Pannier. This is Scale F.2. It is issued to units of squadron size for the use of the medical officers only. Oxygen cylinders were, at one time, issued separately but were later combined to form a complete portable oxygen outfit.

Cholera Outfit. This is Scale F.18. It was first built up about 1922 and was modified ten years later. It was not issued at any time during the war. There was only one outfit of this scale in the Middle East, one in Aden, one in Iraq and two in reserve at the M.S.D. Hartlebury.

Water Testing Outfits. These are Scales F.16 and F.17 and are intended for testing water for sterility and inorganic poisons respectively.

Other 'F' Scale Equipment. The only remaining items of field medical equipment for consideration here are the surgical haversack (Scale F.12); the medical companion (Scale F.11); the medical board pannier (F.10) mentioned as accompanying the squadron (Scale Z.1) medical equipment; the field medical panniers, Nos. 1 and 2 (Scales F.3 and F.4); the surgeon's instrument roll (Scale F.13); the dental instruments in pouch (Scale F.14); and the tablet tin (Scale F.15). The last three items are no longer listed with the field equipment but are now to be found in the scales of composite items. They are, however, included in field equipment as required.

Oxygen for squadron and other small medical pack-ups was carried in a wooden box divided to hold four 750 l. oxygen cylinders, but for special purposes (air evacuation or air sea rescue) a portable outfit was devised which held only one cylinder complete with pressure gauge, flowmeter and oro-nasal oxygen masks. This outfit was later modified after researches into other types of apparatus had produced a more readily portable form.

OTHER MEDICAL EQUIPMENT

SCALES A, D, G, AND M

There remains for mention, to be conveniently grouped under headings or sections now obsolete, certain equipment, including composite items. These are the 'A' scales originally designed to cover the needs of a station medical officer, from the drugs, dressings and instruments for his sick quarters to the first-aid outfit for his fire-fighting vehicle. Some of the equipment such as certain first-aid haversacks has been included above but a brief mention of the more important composite items will be made. The 'E' scale for Civil Flying Schools consisted of only a few special items for the medical examination of pilots of the schools.

'G' scales were designed for R.A.F. troop transports and are briefly referred to below; the two 'D' scales were for dental surgeries and there were four outfits in the 'M' section of equipment which was designed to cover the introduction of any equipment of a composite nature which could not conveniently be classified under any other heading.

The drugs section of 'A' scale, the equipment for a station sick quarters, underwent considerable changes. Part 2 of Scale A.1 originally consisted only of stock mixtures. In 1943, in accordance with the newly introduced National War Formulary for civil hospitals, a R.A.F. War Formulary was introduced which reduced the numbers of mixtures available, simplified their ingredients and often increased their concentration. At a later date many of the liquids were deleted and 'dry' medicaments substituted.

The 'A' scales also contained a midwifery bag (Scale A.6) but, with the evacuation of married families from most R.A.F. stations of squadron capacity, the item was withdrawn from the scale and none was issued until the occupation of the island of Lampedusa. A medical officer was among the first of the occupying force and within a few hours of his landing an urgent signal was received for the despatch of a midwifery bag. It reached Lampedusa within twenty-four hours.

The small outfit contained in Scale E.1 (for Civil Flying Schools) was naturally not issued during the war.

The dental scales (Scales D.1 and D.2 originally) underwent considerable changes. Scale D.1 included the complete range of instruments and materials required for each dental officer and Scale D.2 was an addition where dental anaesthetic equipment was necessary and authorised.

During the course of the war eighteen dental caravans were fitted up for use at home and abroad and scales were introduced for dental mechanical laboratories, both static and mobile. A further introduction in 1943 was the portable maxillo-facial surgical outfit issued to selected dental surgeons and, at a later date, included in the equipment of many of the mobile field hospitals.

Scale G.1 (medical equipment for R.A.F. transports) is of some historical interest. In 1922 the R.A.F. refitted, equipped and staffed a troopship, and this was used for several years. Medical equipment was based on the Army scale and was prepared and supplied by the M.S.D. It was found, as might be expected, that no R.A.F. medical officer was ever satisfied with the scale and at the end of each voyage new additions were suggested. Some of these were accepted, so that the R.A.F. scale grew on lines very different from that of the Army. Eventually, about 1935, it was decided that what suited the Army, who had far more experience of trooping, was adequate for the R.A.F., and the scale was again brought into line with the original Army scale.

The only exception was that articles specially required by the R.A.F., for example stop-watches, haemocytometers and certain ointments and drugs, were included.

During the war all trooping became an Army responsibility, so that the R.A.F. Scale G.1 became obsolete. The reversion to the Army Scale was in some ways an advantage in that it had been customary in peacetime for all the R.A.F. scales of equipment to be removed from the troopship when the Army was taking it over. This procedure resulted in much unnecessary effort and waste of time.

However, the R.A.F. did, during the course of the war, assume responsibility for certain troopships for a considerable period. Although the equipment as supplied by the Army was generally sufficient, certain items of R.A.F. equipment were issued to troopships temporarily controlled by the R.A.F. Chief among these were a general hospital type of anaesthetic table, an improved operating table and an orthopaedic table.

Brief reference must also be made to the 'M' scales of equipment. There were five items in this 'M' section and their tables are self-explanatory. They no longer exist as parts of a separate scale but are now included in the appropriate sections of the R.A.F. priced vocabulary (A.P.3130).

*Scale M.*1. Case, Instruments, Eye, for hospitals, issued to all general hospitals and many of the mobile field hospitals.

*Scale M.*2. Case, Instruments, Eye, for large sick quarters. Issued to the larger station sick quarters, to specially authorised formations and to some of the mobile field hospitals.

*Scale M.*3. Case, Instruments, Eye, Excision—issued only to specially authorised field units or small units not holding Scales M.1 or M.2.

*Scale M.*4. Case, Instruments, Post-mortem—issued to all hospitals, certain other authorised medical units and, after 1944, to all mobile field hospitals.

*Scale M.*5. Case, Urinometer—issued only in certain field equipment pack-ups. Was not provisioned or issued during the war.

CHAPTER 9

MEDICAL ARRANGEMENTS FOR THE WOMEN'S AUXILIARY AIR FORCE

GENERAL ORGANISATION

THE Women's Auxiliary Air Force was formed by Royal Warrant on June 28, 1939. Separate companies of the Auxiliary Territorial Service (Army)* had been formed in 1938 to work with the Royal Air Force and in March 1939, by which date about seventy-eight officers had been enrolled, the administration of these companies was taken over from the War Office by the Air Ministry, although essentially they still remained Army personnel.

It rapidly became apparent, however, owing to the widely differing requirements of the Army and the R.A.F. that a completely separate service was needed and in consequence, the Women's Auxiliary Air Force was brought into being. The object of the new Service, laid down in A.M.O. A.550/39, was 'to effect where desirable the substitution of women for Air Force personnel in certain appointments and trades throughout the R.A.F.' Officer ranks equivalent to those in the Royal Air Force were defined as Air Chief Commandant, Air Commandant, Group Officer, Wing Officer, Squadron Officer, Flight Officer, Section Officer and Assistant Section Officer.

By the outbreak of war 233 officers and about 1,800 volunteers had been enrolled. Recruiting was voluntary and airwomen and officers could resign at will, which procedure continued until 1941 when, under the Defence (Women's Forces) Regulations, the W.A.A.F. became part of the Armed Forces of the Crown and henceforward discharge could only be obtained for medical, compassionate or disciplinary reasons. From this time onward an increasing number of women were conscripted into the Service in addition to those who volunteered.

RECRUITING

From 1938 until the outbreak of war recruitment of women was carried out on a Territorial basis at Territorial Company Headquarters. Officers were selected by the A.T.S. County Commandant and the N.C.Os. and volunteers by the Company Commander of each company. About 7,000 airwomen had been enrolled by October 1939, and in April

* There were 48 of these, each with an establishment of 6 officers, 11 non-commissioned officers and 50 volunteers. The officers were known as company commanders, deputy commanders and company assistants.

1940 recruiting was handed over to the R.A.F. Inspector of Recruiting in view of the possibility of rapid expansion. Recruits were thenceforth enrolled at the centre in London and at eight provincial centres which opened up as the need arose. At that time the ultimate establishment envisaged was 20,000, which was a very modest estimate of the part that women were destined to play in the war-time activities of the R.A.F.*

In May 1941, recruiting was taken over by the Ministry of Labour and after 1943 the number of recruits coming into the W.A.A.F. was governed by the allocation made by the Ministry of Labour having regard to the needs of industry and the other Services.

Medical Examination on Entry. From 1938 until October 1939, prospective recruits were medically examined by the Medical Officer at the Territorial Depot at which they enrolled or alternatively were accepted on production of a certificate of fitness signed by their civilian doctor. When the recruiting office opened in London however, the women were examined by R.A.F. medical officers who, from April 1940 onwards, were usually women. Some of the provincial centres had a Service medical officer on the spot to examine the prospective recruits, while others had to send them to the W.A.A.F. Depot at West Drayton for this examination. From May 1941, all recruits were medically examined at the Ministry of Labour centres at which they enrolled.

ACCOMMODATION

The introduction of women into the Armed Forces created inevitable problems of accommodation and much effort was expended in the attempt to provide suitable living quarters for the W.A.A.F. These varied within wide limits, the most common being:

(*a*) Nissen or Laing type huts forming one wing or part of a wing of the R.A.F. station or a dispersed W.A.A.F. site.
(*b*) Requisitioned houses or other premises converted into hostels.
(*c*) R.A.F. married quarters on permanent stations.
(*d*) Billets with or without subsistence.

In (*a*), (*b*) and (*c*) a floor space of 38 sq. ft. per airwoman was laid down as a minimum, a reduction, due to shortage of labour and materials, from the originally planned 45 sq. ft. which did not lead to any trouble from the health point of view. Beds were staggered (i.e. alternate heads and feet of the beds were placed to the wall) in order to minimise cross infections of the droplet type. This arrangement was more popular than the use of double-tiered bunks which airwomen did not like and which were therefore not employed if their use could be avoided. The accommodation provided in hostels, married quarters and private billets was

* In 1943 the W.A.A.F. reached a peak figure of 180,000.

generally preferred because of the greater privacy it afforded and the better opportunities for complete relaxation when off duty.

Ablution blocks were usually sited about 25–50 yds. from the sleeping sites and either water-flushed or 'Elsan' night latrines were attached to each hut. A tendency developed as time passed to increase the proportion of showers to slipper baths, but these were not popular with airwomen despite various attempts to make them so. Faulty design was probably one reason for this unpopularity, for shower cubicles for the most part led straight off the main corridor of the ablution hut and it was therefore necessary to undress before bathing either in this usually draughty corridor or standing in the trough of the showers which was wet. Had the cubicles been designed round a central dressing space, the whole process might have been more comfortable.

WORKING CONDITIONS

An Air Council letter of October 3, 1942, laid down minimum hours of work for Service personnel, i.e. sixty hours per week for men and forty-eight per week for women, except where both were working side by side when shorter hours would have been impracticable.

In October 1940, the Director of Hygiene had stressed the need for regular hours of work and sleep and pointed out that the irregular hours of work, off-duty times, meals and rest periods which obtained in certain trades such as cooks, telephonists, teleprinter operators, radio operators, plotters and M.T. drivers were injurious to their well-being and could lead to decreased efficiency, if not to breakdown.

The Director of Hygiene also considered that it was of the utmost importance that personnel should do the same watch period daily for at least a fortnight in order to establish a proper sleep rhythm by day. He advocated not more than eight hours work per day or forty-eight hours per week with one free day off per week and forty-eight hours per month except during occasional periods of extreme emergency. He suggested that personnel working at places particularly subject to air raids should be sent to quieter zones every few months for a rest. He also stressed the need for the organisation of proper hot food and drinks for personnel engaged on night duty.

In the early days these were difficult problems owing to shortage of personnel and pressure of work, but in 1943 steps were taken to implement the Director of Hygiene's recommendations.

In the autumn of 1943, Air Ministry Order A.1014/43 enforced regular watch keeping hours. This order was at first unpopular with numbers of the W.A.A.F., who had grown accustomed, under the earlier three-watch system which obtained at many stations, to snatching the minimum amount of sleep on coming off duty and then going to the cinema, dancing, or otherwise amusing themselves before returning

direct to work. Those women, however, who applied the rule intelligently, admitted, after giving it a fair trial, that they felt less tired under the new system and would not like to return to the old.

Careful consideration was given to the problem of providing adequate food for airwomen on night watches. Where possible, e.g. at Tangmere and Biggin Hill, a cooked meal was served in the middle of the night and at stations where this was impracticable, every effort was made to substitute light, attractively served snacks. It was found that the packets of sandwiches which had been provided at many units were unpalatable.

MEDICAL ARRANGEMENTS

MEDICAL INSPECTION ROOMS

At R.A.F. stations where the W.A.A.F. population was large, a separate W.A.A.F. Medical Inspection Room was usually set aside for their use. When their numbers were small, however, they had to share existing facilities with R.A.F. personnel. In such cases arrangements were made either to partition off part of the M.I. Room for exclusive W.A.A.F. use or for the airwomen to use it at different times of the day from the airmen.

Sick parades were held in the Medical Inspection Room at a time arranged by the station commander and personnel were seen by the unit medical officer, male or female. Women too ill to attend the parade were visited in their quarters. A woman medical officer was usually posted to stations at which large numbers of W.A.A.F. were serving.

SICK QUARTERS

Special W.A.A.F. sick quarters were provided on almost all stations for in-patient cases and were situated in airmen's married quarters, in requisitioned buildings or in huts. In January 1942, when it was found that the sickness incidence among W.A.A.F. personnel was twice as high as that prevailing in the R.A.F., the provision of beds, originally on a basis of 1 per cent. of strength, was increased to 2 per cent. with a minimum of four beds in any one sick quarters. The first large W.A.A.F. sick quarters was formed at the W.A.A.F. Depot at West Drayton, to which a P.M.R.A.F.N.S. sister was posted, while others were opened at Stanmore and Hednesford and at all stations at which W.A.A.F. were serving. All the early W.A.A.F. sick quarters were in buildings separate from those occupied by the R.A.F., but later, due to shortage of labour, materials and medical personnel, W.A.A.F. and R.A.F. had frequently to share the same sick quarters accommodation although of course occupying entirely separate and self-contained wings. This arrangement, which worked well, effected a considerable saving in staff, heating and general maintenance.

Larger sick quarters had their own kitchens and kitchen staff and meals were prepared on the premises. This was a much more satisfactory arrangement than that obtaining in the smaller establishments where food was usually brought over from the nearest cookhouse, sometimes as much as three miles away. In these circumstances, food was carried in hay-boxes or in hot-water trays and was reheated if necessary on arrival at the sick quarters, and apart from the difficulty of reheating food without spoiling it, it was practically impossible to provide the lighter meals which would appeal to women with fickle appetites, who were not likely to be tempted by the diet provided by a cookhouse for the hale and hearty.

HOSPITAL FACILITIES

The same hospital facilities were provided for the W.A.A.F. as for the R.A.F. They were admitted to R.A.F. hospitals, to the hospitals of the other two Services or to E.M.S. hospitals in accordance with local conditions. Uxbridge was the first R.A.F. hospital to provide W.A.A.F. accommodation and the others followed suit as the need arose. Out-patient and in-patient treatment was provided for W.A.A.F. at all R.A.F. hospitals, where specialist opinions could be obtained on all types of sickness and where facilities existed for X-ray, massage, electro-therapy and other forms of special investigation and treatment.

Nursing in R.A.F. hospitals was in the hands of the P.M.R.A.F.N.S. assisted by the V.A.D. and by W.A.A.F. sick quarters attendants (later nursing orderlies). Sick airwomen were visited in hospital by W.A.A.F. officers whose responsibility it was to notify the patient's relatives of her removal to hospital.

From 1940 to 1942 70 per cent. of all W.A.A.F. requiring hospital treatment were accommodated in Service hospitals and the remaining 30 per cent. in E.M.S. hospitals. For the R.A.F. the figures were 67 per cent. in Service and 33 per cent. in civilian hospitals. In addition use was made of the facilities offered by certain of the British Red Cross Society auxiliary hospitals, whereby W.A.A.F. cases were sent to nominated B.R.C.S. hospitals as soon as they had reached the stage at which active treatment was no longer necessary. They remained there until they were fit to be sent on sick leave or return to duty. While at these hospitals full use was made of their rehabilitation facilities but the R.A.F. hospital sending the patient still exercised general supervision over her and was responsible for the final disposal of the case.

Hospitalisation for special diseases. Originally arrangements were made for any W.A.A.F. personnel found to be suffering from venereal disease to be treated at the Lock Hospital, London, but this was found to be unsatisfactory because of the undesirability of women in uniform visiting a place at which they were treated side by side with patients who were often of doubtful character.

By January 1941, twenty beds had been made available in a separate wing of the Infectious Diseases Block of R.A.F. Hospital, St. Athan, in which women patients could be treated under the care of a woman medical officer. In February 1942, the treatment of W.A.A.F. patients suffering from venereal disease was transferred to the R.A.F. General Hospital at Evesham, where there was a ward for syphilis cases and another for gonorrhoea as well as an observation ward and the usual medical and surgical wards. It had been decided to treat V.D. in a general hospital in order to avoid undesirable notoriety becoming attached to any particular hospital and to maintain as far as possible secrecy as to the medical disability of the individual being treated. (Here the patients were in the care of a woman medical officer who had had extensive civilian experience of this type of work.) A very small number of cases were treated annually in civilian clinics, in 1943, 6 out of the total of 327 cases being so treated. In addition, 5 cases were treated in Army hospitals in 1943 and 6 in 1944. Continuation centres for the follow-up treatment of W.A.A.F. personnel were located at Cosford, St. Athan, Blackpool and Ely as well as at Evesham.

Cases of hysteria and other forms of psychoneurosis occurring among W.A.A.F. personnel were referred to the nearest R.A.F. N.Y.D.N. centre and were treated by the Service neuropsychiatrist in the ordinary way.

Cases of psychosis presented a more difficult problem, since before the passing of the Defence (Women's Forces) Regulations in 1941 W.A.A.F. personnel were not subject to the Air Force Act and it was not possible to detain a psychotic patient in hospital against her will. Such cases therefore had to be dealt with under the procedure that applies to civilians.

Unfortunately, even after the passing of these regulations the Air Ministry Order (A.466/41) which applied the Air Force Act with modifications and adaptations to the W.A.A.F. did not apply the detailed regulations relating to the disposal of insane personnel and the position with regard to psychotic members of the W.A.A.F. was not made any easier. In January 1942, A.M.O. A.42/42 clarified the position and W.A.A.F. personnel could henceforward be dealt with in precisely the same way as the R.A.F.

In 1941 the following instructions were issued to all Principal Medical Officers:

> W.A.A.F. personnel developing a psychosis will be brought before a medical board and invalided out of the Service forthwith.
>
> If harmless, they will be handed over to the care of their relatives. The nature of the case will be explained to the relatives who should state in writing that they are willing to accept responsibility.

If a patient is likely to be dangerous to herself or to others, or if her relatives will not accept responsibility for her, admission to a civil mental hospital under certificate should be arranged.

The unit medical officer should endeavour as far as possible to dispose of a case direct from the unit by co-operation with the local relieving officer or superintendent of the nearest civil mental hospital.

In dangerous cases, or where the diagnosis has not been clearly established patients may be admitted to R.A.F. Hospital, Rauceby, for observation or to await disposal but the retention in hospital should be as short as possible.

If it is found necessary to certify a case while under observation in R.A.F. Hospital, Rauceby, the A.O.C. of No. 20 Group shall act as the final authority signing the reception order.

W.A.A.F. psychotic patients should not be admitted to Military Mental Hospitals.

In cases of difficulty the unit medical officer should get into touch with the nearest N.Y.D.N. centre for advice regarding the disposal of patients.

These arrangements continued in force with minor modifications until October 20, 1941, when, by arrangement between the Board of Control, the Army and the R.A.F. 100 beds were made available at the St. Andrew's Military Hospital, Northampton, for the reception of cases of psychosis or suspected psychosis occurring in A.T.S. officers and other ranks, W.A.A.F. officers and airwomen and members of the Army and Air Force Nursing Services.

From this time all cases of psychosis among W.A.A.F. officers and airwomen and women medical and dental officers serving with the R.A.F. were admitted to this hospital. On discharge a very few of these cases were returned to their units but the great majority were invalided from the Service after a medical board. These last were either returned to the care of their relatives or admitted to a civil institution.

The invaliding rate for psychosis in the W.A.A.F. varied between 0·23 and 1·30 per thousand per annum during the war years.

Convalescent facilities and Rehabilitation. In April 1940, a suggestion to provide convalescent depots for the W.A.A.F. was rejected, as it was known at that time that the majority of airwomen preferred to spend their convalescence at home. As the war progressed, however, difficulties began to arise when it was found that home convalescence was not altogether satisfactory or always possible. Parents were often both employed on war work, homes had been bombed and many recently married women had no house to go to. So, in 1941 the first W.A.A.F. convalescent depot was opened at Thurloe House, Torquay, with thirty beds. A second was opened later at Dungavel with about sixty beds and was transferred in January 1945, to new premises at Studley Priory near Oxford. Thurloe House was closed in 1942 as it had never been very

satisfactory and with two centres in operation neither place was ever full. W.A.A.F officers requiring convalescent facilities were at one time admitted to the R.A.F. officers' hospital at Torquay and when that hospital moved to Blackpool they continued to enjoy the same privilege. In addition, beds were provided for them at the W.A.A.F. convalescent depot.

Fuller rehabilitation facilities for W.A.A.F. orthopaedic cases were provided by an arrangement whereby beds were made available at the B.R.C.S. hospital at Brockhampton Manor, near Cheltenham. W.A.A.F. physical training instructors were established at this hospital and treatment was supervised by the orthopaedic specialist from R.A.F. Hospital, Innsworth.

WOMEN MEDICAL OFFICERS

It was the plan to expand the W.A.A.F. which led in December 1939, to the decision to appoint women medical officers to commissions in the R.A.F. The terms and conditions of their employment have been fully discussed in another chapter and it is enough to say here that while they were used primarily for the medical care of the W.A.A.F., they were available for any posting at the discretion of the D.G.M.S. The only posts which were established for women medical officers were the ten squadron leader posts at Commands and at Nos. 60 and 26 Groups, where they acted as advisers to the P.M.Os. or S.M.Os. on W.A.A.F. matters within the Command or Group, and the wing commander post of Woman Medical Liaison Officer at Air Ministry. In all other postings women acted in direct substitution for male medical officers. Filling such general posts on January 1, 1945, were 5 women squadron leaders, including a radiologist and a venereal disease specialist, 68 flight lieutenants and 19 flying officers. The majority served at units which had a large W.A.A.F. population and the rest at hospitals or headquarters. One of the particular duties of all women medical officers was to instruct the airwomen on such subjects as personal hygiene, sex hygiene and venereal disease. They also supervised monthly F.F.I. inspections of W.A.A.F. on their stations; and the women medical officers at Command headquarters toured stations in their Commands at intervals varying between three months and a year according to the size of the Command, endeavouring to carry out a 100 per cent. inspection. W.A.A.F. personnel were distributed among various R.A.F. units in strengths ranging from about a score to 5,000. At most stations, W.A.A.F. formed only a fraction of the total strength so that the male medical officers looked after their medical needs in the same way as the civilian medical practitioner looks after women patients in civil life. Women medical officers were posted to as many units as possible, where the W.A.A.F. population justified their substitution for male medical

officers, and at very large depots one W.M.O. was posted to every 1,000 airwomen.

W.A.A.F. OVERSEAS

Until 1943 no airwomen were employed outside the United Kingdom although W.A.A.F. officers in the Code and Cypher Branch had been sent to Canada, America and the Middle East as early as 1941. This failure to utilise W.A.A.F. personnel in overseas theatres of war was due to divided administrative opinion on the suitability of such service for British women.

MIDDLE EAST

In December 1941, a meeting of the Substitution Committee was held to discuss the question of the substitution of W.A.A.F. officers and other ranks in the Middle East Command. Their conclusions were that, subject to certain restrictions as to location and living and working conditions this would be possible, but that executive action must not be taken until the A.O.C.-in-C. Middle East and the Air Member for Personnel had been consulted and had expressed their agreement. A.M.P. did not agree, however, and in addition to stating that no further W.A.A.F. personnel were to be sent to Middle East Command, he ruled that those already there were to be withdrawn. His decision was made on operational grounds.

This decision held good until December 1942, when a shortage arose in the Middle East of R.A.F. personnel with certain special qualifications. This shortage was general throughout the Service and it was decided that W.A.A.F. personnel with these special qualifications might be posted to the Middle East to fill the vacancies.

In 1943 the local recruiting of women into the W.A.A.F. was introduced in the Middle East and it was hoped that this would meet the demand for W.A.A.F. personnel for duty in that theatre. But the scheme did not prove a success and it soon became obvious that the required numbers (two thousand or more) would never be obtained by this means. Meanwhile Middle East Command continued to press for airwomen in order to release R.A.F. personnel who were tour expired or needed for service elsewhere and finally, in November 1943, the W.A.A.F. Substitution Committee agreed to recommend the posting of United Kingdom W.A.A.F. personnel to the Command, provided that the C.-in-C. was satisfied with local arrangements for their accommodation, and that substitution was in accordance with the Committee's existing recommendations. These included the following provisos:

Airwomen sent overseas should be volunteers.
The minimum age limit for overseas service should be 20.
The tour of duty should be two years only.

> Married women with children in the United Kingdom should not be sent at all.

In January 1944, the Secretary of State for Air agreed to the posting of airwomen volunteers to Middle East subject to certain safeguards.

Before this decision all W.A.A.F. personnel proceeding overseas were medically boarded, but in view of the large numbers to be dealt with this was felt to be unnecessary and it was agreed that in future the W.A.A.F. would be handled in exactly the same way as R.A.F. personnel, i.e. they were to be examined by the unit medical officer who could refer doubtful or difficult cases to a medical board for decision.

Kirkham was selected as the most suitable Personnel Despatch Centre for airwomen proceeding overseas and a wing of that station was made available for them. W.A.A.F. officers and permanent staff took up their duties there in the spring of 1944 to await the first draft.

Medical arrangements at the Personnel Despatch Centre were of the first importance and it was decided to post a woman medical officer for these duties. In addition to the inoculation and vaccination which would be necessary, it was felt to be extremely important that care should be taken to avoid the posting overseas of airwomen in an early stage of pregnancy. In order to minimise this risk all airwomen were fully medically examined at the Personnel Despatch Centre by the woman medical officer, a precaution which proved to be necessary, for there were few of the larger drafts from which at least one woman had not to be withdrawn on these grounds. In addition various other conditions of health which made it inadvisable for the airwoman to proceed overseas without further medical examination or treatment were sometimes discovered at this examination. While at the Personnel Despatch Centre draftees were given lectures on the care of their health in the Tropics.

Soon after the arrival of the first drafts of airwomen in the Middle East several were found to be suffering from pulmonary tuberculosis and it was decided that all draftees at the Personnel Despatch Centre should undergo mass radiography. This reduced one cause of invaliding from overseas.

In the Middle East airwomen were employed at many H.Qs. and on stations in Egypt, Palestine and even Kenya, always in fairly large numbers and always under the supervision of W.A.A.F. officers. Most trades were represented, the main exceptions being the trade of M.T. driver and the various domestic trades. The former trade was considered unsuitable for women owing to the risk of a breakdown in native areas, where a woman might be at a disadvantage, while the latter were unnecessary owing to the abundance of very cheap local labour.

W.A.A.F. accommodation varied in type and standard from the 'Houseboat Arabia' and requisitioned hotels to married quarters, huts and tents, but all these were on the whole more comfortable than their

corresponding equivalents in the United Kingdom. Moreover all cleaning and sweeping was done by local labour, and this made for easier living conditions. For these reasons, in spite of the climate and the fact that they were in a foreign country, most airwomen preferred service overseas to that at home.

W.A.A.F. sick quarters staffed by W.A.A.F. nursing orderlies were established on all stations where W.A.A.F. personnel were employed. Hospital beds were provided for them in both the R.A.F. hospitals in Middle East and in addition they were admitted to the hospitals of the other two Services. Convalescence was catered for by the W.A.A.F. Convalescent Depot at Alexandria and by the various leave camps, hostels or Y.W.C.A. establishments which were to be found throughout the Middle East and which were cheap, comfortable and very well run.

From visiting stations it was found in practice that the W.A.A.F. sickness rate was less than had been expected, being usually of the order of 1·8 per thousand compared with 1·0 for the R.A.F. The chief causes of sickness were gastro-enteritis ('gyppy tummy') and insect bites which had become septic.

W.A.A.F. who became pregnant in the Middle East were returned to the United Kingdom by sea up to the fourth month and by air up to the sixth month. In the event of the condition not being discovered until after the sixth month the confinement had to take place in an Army families hospital and the airwoman and child returned to the United Kingdom when they were fit to travel.

The locally enrolled recruits, usually termed Palestinians, although in fact many of them were European refugees, presented an interesting study. As has been said earlier the scheme for recruiting these women did not prove to be a success either in the numbers or the type of recruit it produced. In the eighteen months that the scheme was in operation less than 900 women in all were recruited and the rate of discharge was high. Some of these women worked well but on the whole they tended to be neurotic and difficult; their lives for the last few years had been in many cases unhappy and often their chief reason for joining the W.A.A.F. was to find a haven of refuge. Patriotism and interest in the war took a very low place in the outlook of such persons and they were not amenable to discipline according to English standards.

An interesting point is that their sickness rate was much higher for all complaints, except perhaps gastro-enteritis, than that of the newly arrived United Kingdom personnel, who had not yet become acclimatised to the country.

INDIA

The question of sending members of the W.A.A.F. to India was first raised in the summer of 1943. At that time the Air Member for Personnel

ruled against it but a few months later the matter was reconsidered and a special mission headed by the Air Chief Commandant, W.A.A.F., in person, visited India for the purpose of making first-hand investigations. This mission decided that, subject to certain conditions and restrictions, suitable airwomen could be usefully and safely employed in India and the question was therefore raised once more at a meeting of the W.A.A.F. Substitution Committee held in July 1944.

The Committee agreed that airwomen might be sent to India provided that they were volunteers, fitted for such overseas service and only served in stations suitable to accommodate them. Bombay, Delhi and Karachi in India and Colombo and Kandy in Ceylon were the places specified. They were to be despatched by sea through the Personnel Despatch Centre at Kirkham in the same way as W.A.A.F. proceeding to the Middle East and they were to travel only during the peace-time drafting season, October to January. Their tour of duty overseas was not to exceed two years in length. It was agreed that in all, 1,500 officers and airwomen should go, this being the number requested by Air Command, South-East Asia. In fact rather less than 1,000 were finally sent but these were drawn from a wide range of employments, principally Clerk G.D., Code and Cypher, Signals and Intelligence.

The first draft landed in November 1944, and proceeded directly to Delhi while the others arrived during the following three months and went to Karachi and Bombay. At these stations they replaced men at Command and Base Headquarters who were thus released for more active duties in the forward areas. Careful preparations had been made for the reception of the W.A.A.F. and they settled in without difficulty.

For the most part they were accommodated in permanent brick buildings such as requisitioned hostels, in which all the normal amenities of civilised living might be found, including electric light and fans, running water and water-borne sanitation. Messing arrangements and standards were also good while recreational facilities were exceptional. Precautions had to be taken, indeed, to ensure that airwomen, most of whom were unused to the rigours of a tropical climate, did not exhaust themselves by the over-acceptance of the lavish hospitality and entertainment which was showered upon them from all sides.

During 1945, the health of the W.A.A.F. in India was maintained, on the whole, at a high level. This was the fruit of careful advance planning on the part of executive and medical authorities, who had made certain that airwomen should enjoy the best of living conditions possible in the circumstances, and that at all stations at which they were to serve there were adequate Service hospital facilities existing in the neighbourhood for their proper treatment if they became sick. One senior and three junior R.A.F. women medical officers had been sent to India specially to undertake the day-to-day medical care of the W.A.A.F., for which

purpose they were posted, one to each of the main W.A.A.F. areas. Ordinary station medical facilities existed, of course, in addition to these special arrangements.

Statistics of disease incidence do not give a true picture of the situation because of the small numbers involved, but it is still interesting to note that only one case of venereal disease among the W.A.A.F. was recorded during the year, in contrast to some two thousand-odd cases occurring among R.A.F. personnel. Figures otherwise for W.A.A.F. and R.A.F. were more or less comparable, although in the group of skin diseases the former showed a case incidence more than half as great again as the latter. There were no cases of pulmonary tuberculosis among the W.A.A.F. in India in 1945.

EUROPE

The first British women to land on the Continent after the re-entry into Western Europe were the three W.A.A.F. nursing orderlies who flew to Normandy on air ambulance duties to evacuate wounded on D-day plus 7. Thereafter W.A.A.F. were regularly employed in this way and assisted in the evacuation of thousands of wounded. As soon as conditions permitted, contingents of W.A.A.F. officers and airwomen were posted to France and later to Belgium and Germany. On V.E. day approximately 1,500 W.A.A.F. officers and airwomen were serving on the Continent.

Wherever possible, personnel were housed in permanent buildings and living and messing arrangements were generally satisfactory, although initial difficulty was experienced at some units in providing adequate facilities for baths, both as regards the actual number of baths available and the amount of fuel available for heating them. The majority of ablutions, moreover, had showers and not baths, but the latter were installed wherever possible. With the co-operation of the R.A.M.C., adequate medical facilities were made available where the R.A.F. were temporarily unable to provide them. Pregnant airwomen were evacuated to the United Kingdom by air. Lectures on hygiene and venereal disease and medical inspections were carried out wherever possible by women doctors made available by the Army medical authorities.

The Annual Health Report for 1945 indicates an incidence of sickness among W.A.A.F. on the continent of Europe approximately 25 per cent. higher than that among airmen, viz. 454·24 per thousand per annum for W.A.A.F. and 361·15 per thousand per annum for R.A.F. As, however, this higher rate was also found among personnel serving in the United Kingdom, it is considered that the figures indicate a normally greater tendency to minor complaints rather than an increased liability to serious infection.

The incidence of communicable disease was lower than that among airmen and venereal disease among W.A.A.F. showed a very low incidence (1·1 per 1,000 per annum).

W.A.A.F. TRADES

Whereas in early 1939 the W.A.A.F. companies were composed of cooks, clerks and drivers only, by 1945 members of the W.A.A.F. were employed in over sixty different trades. This extension of duties proceeded steadily from the outbreak of the war onwards.

In September 1940 the Standing Committee to consider the substitution of airwomen for airmen in R.A.F. trades was formed at the Air Ministry. Its scope was wide and there was no limit to the extent of its examination or re-examination of all substitution questions. The Director-General of Medical Services was represented upon it, either by the Director of Hygiene or his deputy who could advise on all medical aspects of substitution questions.

During the war years the committee examined and made recommendations on the substitution of W.A.A.F. for R.A.F. in innumerable trades, and advised not only on the suitability or otherwise of the trades in question for women, but on such questions as the rate of substitution —one woman for one man, or three women for two men—or special limitations which should be put upon the employment of women in certain trades, i.e. the lifting of heavy loads, driving and cranking of heavy engines, working on exposed sites, or the employment of women overseas and many other relevant matters. That these findings and recommendations were good from the medical point of view was borne out by the fact that the W.A.A.F. in any particular trade never exhibited a high incidence of sickness which could be attributed to the adverse effect of that trade on the health of the airwomen employed in it.

The aim of this medical narrative has been to confine reference to the general organisation of the W.A.A.F. to matters bearing on the medical arrangements made for their welfare, and a discussion of the work upon which they were engaged would not normally come within its province. It is proposed, however, to consider briefly the trades of nursing orderly and balloon operator. The former is considered essential in any medical review, as without the assistance of women the nursing and general staffing of R.A.F. hospitals, sick quarters and medical inspection rooms would have been impossible in the rapidly expanding War of 1939–45. The latter trade presents an excellent example of the successful introduction of women into employment for which they would not normally be considered suitable.

NURSING ORDERLIES

On September 1, 1939, the trade of medical orderly as distinct from nursing orderly was introduced in the W.A.A.F. and peace-time

companies were amended to include five medical orderlies per company. The trade was devised and introduced by the W.A.A.F. Directorate and it was intended that its members should be used for nursing airwomen sick in billets, hostels or W.A.A.F. sick quarters. The personnel were recruited from suitable women over 35 years of age who held the Red Cross certificate or who had had some previous nursing experience.

The previous experience in some cases was decidedly meagre, and as the airwomen were selected and allocated at the W.A.A.F. depots without any assessment of their skill and posted to stations without any further training, it is not surprising that difficulties were soon encountered. It is probably not unfair to say that in those days, any women who did not show particular aptitude for any of the other trades open at the time, were mustered as medical orderlies. The lower age limit of 35 was particularly unfortunate, as it ruled out all those young girls who had done perhaps a year or two of hospital training and who would have been very good material, and included a good many who, ostensibly suitable, were unfortunately quite unteachable. Early in 1940 complaints began to reach the Medical Training Establishment and Depot concerning the unsuitability and inefficiency of these airwomen, who had been renamed sick quarters attendants, and it was decided to assess and train them all.

In August 1940 the trade group M was formed to include sick quarters attendants, who were transferred from group V with corresponding increases in pay. At the same time the first course of training was opened at M.T.E. and D. at Halton, the establishment of which was amended to include two women medical officers, one to take over the training of the W.A.A.F. and the other to assist. The original course was of a fortnight's duration and numbered twenty trainees. The unsuitability of many of those mustered in the trade was shown by the results of the first course, when only twelve passed. The lower age limit was now reduced to 23 with the exception of personnel with previous experience who were accepted at the age of 18. The assessment of suitability for the trade was at first carried out at M.T.E. and D. and later by the W.M.O. at the W.A.A.F. Depot in charge of training.

The training was in two parts, a four-weeks' Part I course at M.T.E. and D. followed by Part II training which was for four weeks, or longer if necessary, and was taken at a large sick quarters or at a hospital. On successful completion of this, and on the authority of the commanding officer or senior medical officer of the sick quarters, trainees were re-mustered as nursing orderlies A.C.W.2 and posted for duty. Before becoming A.C.W.1 airwomen were examined by the Travelling Trade Test Board and after three months as A.C.W.1 they could be considered for reclassification to L.A.C.W. or for promotion to N.C.O. rank to fill establishment vacancies. Both parts of the training

course were later extended to five weeks and after the abolition of the Central Trade Test Board in January 1944, successful trainees were boarded at the hospital to which they were attached.

In August 1941 it was decided by the W.A.A.F. Substitution Committee, in accordance with the view of the Director-General of Medical Services, that airwomen should replace men up to 50 per cent. in general and station hospitals and large sick quarters. The question of substitution on stations was to be reviewed at a later date in the light of experience. The trade of sick quarters attendant was abolished and that of nursing orderly substituted for it. This decision was first implemented in September 1941, when Part I W.A.A.F. trainees were posted to the hospitals at Morecambe, Weeton, Hereford and Yatesbury and R.A.F. nursing orderlies were withdrawn.

The growth of the trade, which closed in October 1944, may be seen from the following figures:

October 1, 1939	99
January 1, 1940	220
,, 1, 1941	540
,, 1, 1942	2,500
,, 1, 1943	3,336
,, 1, 1944	3,538
October 1, 1944	4,246

The general consensus of opinion concerning the introduction of the W.A.A.F. into the trade of nursing orderly was that while they were frequently better than their male counterparts for hospital work, they were not always so suitable for station duties.

Burns Orderlies. From 1942 onwards a few W.A.A.F. nursing orderlies were specially trained at Ely, Cosford, East Grinstead, Rauceby or Halton in the treatment and care of patients suffering from burns. The training period was variable and the trainees were trade tested by the surgeon in charge of the burns centre. If successful, they were posted for work in burns centres, but the work was arduous and harrowing and the D.G.M.S. advocated that they should be given a rest from this type of work after twelve months.

Rehabilitation Orderlies. Three or four W.A.A.F. nursing orderlies were trained as rehabilitation orderlies at Loughborough or Hoylake. This type of nursing had come into considerable prominence during the war years, and had become a special feature of many R.A.F. hospitals at which multiple injuries following aircraft accidents were treated.

Air Ambulance Orderlies. In March 1942, it was decided to train W.A.A.F. nursing orderlies for duties with air ambulances. Volunteers were called for and there was no dearth of applications. By June 1943,

214 nursing orderlies had been trained at Hendon and were employed on duties in the United Kingdom only, travelling with and caring for sick and injured personnel in transit by air to hospital.* They were particularly useful in connexion with the conveyance of patients between the Scottish Islands and the mainland.

In March 1944, the Air Council approved their employment on duties connected with the forthcoming operations on the Continent, taking the view that although the work would entail hardship and danger, the psychological effect on the wounded would be of great value. Again there was no lack of volunteers. Personnel were included in the crews of Transport Command aircraft operating a freight shuttle service to the battle area. On the return journeys wounded were emplaned and the W.A.A.F. nursing orderlies attended to them during the flight. They were posted to stations selected to act as holding sections for the wounded pending their transportation to suitable hospitals and when not engaged on flying duties the orderlies worked in the sick quarters of these stations.

On D-day plus 7 three W.A.A.F. nursing orderlies flew as members of the crews of the Dakotas which went over to bring back the first batch of wounded and the work continued whenever the weather was favourable. Forty trips were regarded as an operational tour after which the orderlies were given different duties and replaced in the air by others.

In November 1944, a new course was started. Trainees went first to Leicester East where they did ten hours in the air to gain flying experience. It was found that between 10 and 15 per cent. of the volunteers had to be removed from flying duties because of air sickness. Having successfully completed their flying time trainees proceeded to R.A.F. Hospital, Wroughton, where they spent five days in the wards learning the problems connected with blood transfusion and maxillo-facial injuries. They then proceeded to one of the casualty air evacuation centres at Blakehill, Down Ampney or Broadwell where they spent the remainder of their four weeks. Having completed the course, they returned to their stations fit for flying duties, and were called upon as required.

W.A.A.F. BALLOON OPERATORS

The substitution of airwomen for airmen as balloon operators, resulting in the employment of large numbers of women on duties of a strenuous and exposed nature, created medical problems which are considered worthy of special mention. Four thousand were established on balloon sites or were under training in February 1942, and at the

* *See* Air Evacuation of Casualties, Chapter 10.

peak period of their employment W.A.A.F. personnel were manning and handling 1,029 balloons.

When the substitution of W.A.A.F. for R.A.F. in this trade was first discussed, doubts were raised as to whether or not women could undertake the strenuous work entailed without adversely affecting their health. It was considered probable that muscular strain, rupture or displacement or interference with the function of the generative organs would occur. Consequently an initial standard was laid down as follows:

Height . . .	62 in. minimum.
Physical condition .	Candidates to be fit Grade 1, robust in all respects, capable of lifting weights, minimum 40 lb.
Vision and hearing .	Not less than Standard II.
Menstruation . .	No abnormality.

The height standard was subsequently lowered to 60 in. as the result of experience; and it was further ruled that no women who had been pregnant should be selected, in order to avoid gynaecological examinations to ascertain whether the pelvic organs were sound.

Observations were made on groups of trainees at centres and also on trained personnel at a selected number of sites, and monthly records on pulse responses to exercise and blood-pressure readings were kept. It was found that neurosis and nervous breakdown were no more frequent among the balloon operator personnel than among airwomen of other trades generally, and that the incidence of menstrual irregularities was no higher than among women in civil life.

Records were kept to compare the incidence of disease to which balloon operators might be thought particularly liable owing to the nature of their employment, such as respiratory, rheumatic, digestive and pelvic troubles and accidents, with the incidence of these diseases among airwomen in other trades. It was found that, in spite of the loading against the balloon operators, the incidence of sickness among them, over a long period, was no greater than among airwomen in other employment. In fact, the general physical condition of the airwomen balloon operators showed a decided improvement.

Accidents of a minor nature were more frequent among them than among W.A.A.F. of other trades, which was not unexpected in view of the nature of their work. It is interesting to note, however, that during the course of training of over 16,000 airwomen, there were only three serious accidents. The majority of accidents were due to carelessness such as tripping over wires, loose bricks and other objects, resulting in bruises, sprains and occasional fractures. Minor burns were comparatively frequent and were almost all attributable to lack of experience in handling cooking and other stoves.

SPECIAL MEDICAL PROBLEMS

The advice of the Royal Air Force Medical Branch was sought on all the numerous problems which arose as a result of large-scale conscription of women. It was consulted, for example, concerning the provision of suitable clothing, particularly shoes, the care of the feet being one of the most pressing problems among the newly recruited.* Another was louse infestation of the head.

Pediculosis capitis. In the W.A.A.F. pediculosis capitis was by far the greatest of all parasitic problems. In March 1942, it was stated in a memorandum issued by the D.G.M.S. that the incidence of head lice infestation among new entrants to the Service was 25 per cent., representing the incidence of infestation in the civil community for the age groups from which the W.A.A.F. was recruited. The incidence among airwomen on posting to stations after leaving the depots was about 1·7 per cent., an indication of the results of action taken to eradicate the condition by means of disinfestation and intensive propaganda. W.A.A.F. (G) officers were instructed to do everything in their power to aid in the detection and treatment of cases of infestation among the airwomen in their charge. Personnel were encouraged to wear their hair short and to realise that infestation could be prevented by strict individual attention to personal hygiene, including daily combing and brushing of the hair. The following instructions were issued:

> Head inspections are to be held fortnightly and a record kept of each airwoman inspected. The inspections are to be carried out by W.A.A.F. administrative N.C.Os. assisted by W.A.A.F. nursing orderlies and the airwomen themselves. A W.A.A.F. (G) officer should be present at, and take an active interest in, each inspection.
>
> Treatment of infested heads is to be as prescribed by the medical officer but, wherever possible, airwomen affected should assist the nursing orderlies or the administrative N.C.O. in its application to themselves or to each other.
>
> All airwomen should wash their hair weekly. If possible, soft water should be used and arrangements should be made to collect rain water for this purpose.
>
> It is essential that airwomen should realise that the brushing of their hair regularly night and morning improves it. W.A.A.F. N.C.Os. should see that this brushing is carried out.
>
> Airwomen required to change their beds for any reason should take their blankets with them. Blankets and bedding are not to be issued to airwomen posted to units unless they have been previously disinfested and bedding issued to an airwoman is to be retained by her throughout her appointment to the unit, during which time she is to be held responsible for its clean condition.

**See* R.A.F. Volume II, Chapter 9.

In addition, arrangements were made for the setting up of hairdressing facilities. A course of instruction for W.A.A.F. Service hairdressers was held at Bridgnorth; the instruction included a demonstration and talk by a medical officer on louse infestation of the head.

MEDICAL CONDITIONS OF SOCIAL IMPORTANCE

Before proceeding to a detailed examination of the health of the W.A.A.F. during the war period, it is perhaps appropriate to consider in some detail two special medical conditions which had great administrative significance. The first of these, venereal disease, was an age-old Service problem in dealing with which the medical authorities had the advantage of extensive previous experience in the R.A.F. The second, however, was pregnancy and this created difficulties quite new to Service medical administration.

Venereal Disease. The study of the problem of venereal disease in the W.A.A.F. is of particular interest, as it is probable that the War of 1939–45 provided the first opportunity for a detailed survey of its incidence in a large body of women whose living conditions, hours and conditions of work, age, educational standards and general conduct were all known. Among this group there were none who were idle or unoccupied and none who could be said to have been 'driven on to the streets' by financial necessity. In short, the group consisted of a large number of healthy, well-fed and well-clothed women, mainly in the younger age-groups, who had adequate recreational facilities and busy working hours, and it formed an ideal medium for the investigation of those factors predisposing women to the type of moral laxity which forms the usual background to the contraction of venereal disease. The conditions of war under which the W.A.A.F. served, of course, constituted an abnormal factor of great significance whose effect had to be carefully assessed when considering the problem.

A careful study of the subject from a psychiatric angle to ascertain whether there were any predisposing factors such as family background or education, yielded inconclusive results and showed only that a large proportion of the patients had a low standard of intelligence. It was found in an analysis of V.D. rates by trades, that the highest rates occurred in the trades of A.C.H., waitress, batwoman, sparking-plug tester and fabric worker, whereas trades such as radio operator, special duties clerk and teleprinter operator had a very low incidence.

In the early days of the war most cases were treated in civilian clinics and little more than the number of cases is known. From 1942 onwards, however, very detailed records were kept, and from these records Tables IV to VIII in Appendix B have been compiled.

Table IV shows a progressive rise in the incidence of venereal disease in the W.A.A.F. which reached a peak in 1942 and then gradually fell.

It is hard to account for this fluctuation but the low incidence of 1940 may have been due to missed cases, while a small proportion of the decrease after 1942 may be accounted for by the gradually decreasing intake of the younger age groups among whom the rate was highest. It is unlikely that many cases were missed after this date by which time good liaison between the Services and improved methods of tracing and treating contacts were well established, but it is possible that the cumulative effect of lectures and anti-venereal disease propaganda was by then beginning to produce results. If this is so, it would help to explain the fall in the total number of cases.

While the high incidence in 1945 shown in Table VI tends to discount the theory of decrease in ratio to decreased intake, it must be remembered that it was in 1945 that demobilisation commenced. Senior and responsible women left posts in which they had exercised considerable control over those in their care. Junior officers and airwomen were posted to other establishments to fill posts vacated by senior women, and were consequently exposed to temptation from which they had hitherto been protected.

Another important reason for the apparent variation in the yearly rates was the amount of undetected pre-Service infection. In 1942 it was found that 1·4 per thousand of the intake of new personnel had V.D. before entry. In 1943 this rate was 1·8 and in 1944 it was 1·4. These rates do not include those who were rejected as unfit on account of V.D. and do not indicate that the V.D. rate in the Service was higher than that of the civilian population. In fact, the indications were that civilian and Service rates were about the same, i.e. about 1·5 per thousand.

Table V gives the Command incidence rates of venereal disease among W.A.A.F. It shows that the rates for Fighter Command remained consistently low, while those for Bomber Command are fairly high throughout. This probably reflects the similarly differing rates which prevailed among the aircrew of these two Commands.

Again, the decrease in the venereal disease rates for Technical Training Command corresponds with the decrease in the intake of recruits, since the majority of cases in this Command were due to pre-Service infection. Frequent gross changes in strengths and stations render the figures for Maintenance and Transport Commands completely unreliable.

Sources of Infection. As a result of the improved methods of tracing and treating contacts, no less than 19·8 per cent. of the cases which received treatment in 1942 came to light because they had been reported either as suspected sources of infection or as women possibly infected by their husbands. (*See* Table VII.) In 1943, this figure increased to 28·3 per cent. and in 1944 it was 44·0 per cent. In fairness it should here be pointed out, however, that a high proportion of these cases had not been

wilfully concealed by the women, who in most instances were not aware that they had contracted the disease. Non-specific vaginitis and leucorrhoea are very common in otherwise healthy women, so that a gonorrhoeal vaginal discharge might well have been mistaken for an exacerbation of a condition previously experienced. In addition, the soreness which frequently accompanies non-venereal conditions may often disguise the discomfort of a chancre.

Table VIII indicates that the Royal Air Force, not unnaturally in view of their close everyday association with the W.A.A.F., were responsible for approximately one-third of the cases, although their responsibility fell slightly each year. It is noticeable that the responsibility of civilians falls markedly over the same period while that of the Allied and Dominion Forces rose almost in the same ratio. The latter increase may well be explained by the increase in the number of overseas personnel serving in Great Britain, far removed from their home environment and family ties.

Pregnancy. No medical history of the W.A.A.F. would be complete without reference to a subject which, although in the Services only in a small degree a medical problem, is certainly one of great medical interest. Since pregnancy is not considered compatible with the efficient carrying out of Service duties, personnel in whom this condition was diagnosed were customarily released from the W.A.A.F., the discharge of airwomen being on compassionate grounds and the problem, if any, of their satisfactory subsequent disposal being shouldered by the W.A.A.F. branch responsible for administrative and welfare matters. The responsibility of the medical branch in the matter was confined to the diagnosis of the condition and its certification.

The first official regulations relating to discharge of women personnel on account of pregnancy were contained in Air Ministry Confidential Order No. 12 of 1943, which was later converted into an open order as Air Ministry Order A.118/44. Under this, an airwoman was discharged or an officer required to relinquish her commission if she became pregnant, the effective date of release to be the end of the third month of pregnancy in normal circumstances or earlier if advisable for any special reason. A supporting certificate signed by a civilian medical practitioner or by a Service medical officer was required in all cases and where the examination was carried out by the latter, the written consent of the woman had first to be obtained. This was necessary because, in those cases not notified by the woman herself in which there were reasonable grounds to suspect pregnancy, she could be required to consult a Service medical officer. If she then refused examination, she had to sign a certificate as follows: 'It having been fully explained to me that there are considered reasonable grounds for believing that I am pregnant, I hereby refuse to give my consent to being medically examined to determine the

presence or absence of the condition of pregnancy although I am aware that this refusal may mean:

* (*a*) the relinquishment of my commission,

* (*b*) my discharge from the W.A.A.F.

* delete as appropriate.'

A woman was allowed to leave her unit before her last day of service if, pending approval of her discharge from the W.A.A.F., she was considered unfit for duty. Leave of up to fourteen days could be granted for this purpose, privilege leave being supplemented if necessary by compassionate leave, but not sick leave. A pregnant woman undergoing treatment for a medical disability at the time when she would otherwise be discharged, remained in the Service until the treatment of her medical disability was completed. If this disability was one which necessitated invaliding from the Service, she could then be dealt with under the ordinary regulations as though she were not pregnant.

Any member of the W.A.A.F. who miscarried after a pregnancy of less than twenty-eight weeks was treated as a gynaecological case, and, on completion of her treatment, her medical fitness for retention in the Service was assessed on purely medical grounds. Cases of unmarried officers found medically fit for retention were referred to the Air Ministry since the Air Council normally required such women to resign their commission. Airwomen in a similar position were discharged if it was considered that to keep them in the Service, even if posted to another station, would be likely to harm the moral standards of other members of the W.A.A.F. Rank and duties were taken into account, bearing in mind that a high moral standard was required of warrant officers and senior N.C.Os., particularly those primarily concerned with the administration of airwomen. After being discharged for pregnancy, officers and airwomen were ineligible for further service in the W.A.A.F., until six months after confinement.

Naturally enough, there was often a marked tendency, particularly among the unmarried, to try to conceal their condition as long as possible. As early as 1940 the Director of W.A.A.F. sent to all W.A.A.F. officers in charge of sections a directive stressing the need to encourage airwomen to disclose their condition at an early date, and pointing out that the Church of England Moral Welfare Council had offered to help any woman who needed assistance before, during or after her confinement. No communication was made to the airwoman's family unless she herself desired it, although in her own interests an effort was always made to persuade her to let her parents know of her condition. In spite of fears to the contrary, it was found that parents almost always adopted a reasonable attitude.

Nevertheless many airwomen persisted in the concealment of their condition and a number of babies were born on stations, although

W.A.A.F. and medical officers were always on the alert to detect possible pregnancy. There were several factors, however, which made such detection less easy than might be imagined. Posting occurred fairly frequently and it was often some time before the W.A.A.F. officer became fully acquainted with the particular airwoman. While it was easy to notice the changing figure of a girl who was well known, it was by no means so simple in the case of an airwoman who was stout and clumsy when first seen.

The monthly 'Free From Infection' examination was one means by which a number of cases were detected, but it was by no means infallible. Except in the few cases where there was a woman medical officer on the station, the examinations were carried out by W.A.A.F. nursing orderlies who were not necessarily competent to diagnose early pregnancy. Furthermore, it was by no means impossible for a determined woman to avoid the examination altogether.

The problem of pregnancy overseas presented additional difficulties. It was not always possible to provide transport back to the United Kingdom at short notice, so that if a pregnancy was belatedly notified, the airwoman might have to be confined abroad and bear her child in a foreign country. In the case of illegitimate children this frequently led to problems of nationality, especially in Egypt where the law denies Egyptian nationality to a child born in the country unless its father is an Egyptian citizen. Since English law lays down that an illegitimate child born to a British mother outside the United Kingdom must take the nationality of the state in which it is born and cannot acquire British nationality, notwithstanding the subsequent marriage of its parents, until it is old enough to take the British oath of allegiance, some illegitimate children born to members of the W.A.A.F. in Egypt were virtually stateless.

In an effort to reduce the number of cases of concealment, a D.W.A.A.F. Confidential Memorandum dated November 9, 1944, stated '. . . it may be necessary to review the policy whereby unwilling airwomen are not returned to their homes. Every effort has been made to avoid action of this nature and no difficulty is experienced where the pregnancy is notified in good time. It will be obvious, however, that suitable welfare arrangements cannot continue to be made if no effort is made by the airwoman herself to comply with the regulations of the Service.'

Until the passing of the Defence (Women's Forces) Regulations airwomen could be discharged without a reason being given. This led to some difficulties in the cases of unmarried girls whose parents were unwilling or unable to have them at home and care for them during their confinement and afterwards. The Service took the attitude that, while there was no legal responsibility towards these airwomen, there

was a moral obligation to ensure that they were cared for, and W.A.A.F. officers, helped by various charitable institutions and societies all over the country, did a great deal to ensure that help was available for them, if required, after discharge. So much was achieved in this direction that in time it became obvious that news of the help given to airwomen discharged on pregnancy grounds was becoming known outside and an appreciable number of girls joined the Service fully aware that they were pregnant. Some of them openly admitted that they had joined because of the help they knew would be available when their condition became known.

Various religious and charitable organisations gave invaluable help in finding hostels, places for confinement and suitable employment after convalescence. In some cases they arranged for the adoption of the baby where such a course seemed the best solution. Gradually however, resources of this nature became seriously strained and in 1943 agreement was reached with the Ministry of Health whereby a limited number of girls could be accepted into hostels, which up to that time had been used to accommodate pregnant women from evacuation areas.

This accommodation was intended to assist airwomen who for various reasons could not return home and for whom it was found impossible to make satisfactory arrangements with the local voluntary welfare societies. The facilities were not normally extended to those airwomen who either wilfully concealed their condition or refused to allow their parents to be informed.

Statistics of W.A.A.F. Pregnancy. Figures of the incidence of pregnancy among W.A.A.F. personnel are given in Tables IX and X in Appendix B. Table X shows numbers of pregnancies expressed as rates per thousand per annum with the ratio of single to married cases. It will be seen that the rates for both married and single rose yearly and there was only a slight rise in the ratio of unmarried to married women who became pregnant. According to the report of the Markham Committee, in 1942, the live birth rate among civilian women in age groups comparable with the W.A.A.F. was 21·8 per thousand, that is, significantly higher than the prevailing pregnancy rate in the Service, and since an additional number of civilian pregnancies did not result in live births, the true difference must have been still greater.

The rate for the 18 year-olds fluctuated considerably without any apparent reason. In 1944, the first year in which it was possible to analyse the over-21 age groups, there was no significant variation between the ages of 22 and 30 and the drop thereafter was no greater than might be explained by the lessened fecundity of women over 30. The highest age for unmarried pregnancy in 1944 was 42, at which age there were two cases.

Examining the cases by trades, it is found that the trades with the highest incidence were those which did not require a high standard of intelligence or education. The highest rates were found among the trades of A.C.H., waitress, cook and mess steward.

Finally, in order to get a true picture of the situation as far as married and unmarried pregnancies are concerned, the following points must be remembered:

All women married on discharge were shown as married pregnancies, however late in that condition the marriage took place.

Of those unmarried on discharge a proportion would get married before the birth of the child and thus appear in civilian figures as married pregnancies.

A certain number of married women were pregnant by men other than their husbands.

The figures do not include abortions or miscarriages.

The only available figures for W.A.A.F. officers show that in 1944 the rate was approximately 6·9 per thousand.

HEALTH OF THE W.A.A.F.

It is not proposed in this chapter to consider in detail the statistics of sickness among W.A.A.F. personnel since the Statistical Volume of this History will contain a full analysis of these figures. Reference to that volume will show, however, that the health of the W.A.A.F. was maintained at a satisfactorily high level throughout the whole war period, morbidity incidence varying little from 1940 onwards. Figures for 1939, which only cover a fraction of the year and relate to extremely small numbers of personnel, may be discounted as not comparable. At no time during the war was the W.A.A.F. subject to major epidemics.

It is noticeable (*vide* Table I, Appendix B) that for each year until 1942 the incidence of sickness in the W.A.A.F. was almost double that in the R.A.F. whether or not '48-hour cases' are included in the figures.

The reason for this higher rate of sickness among women is obscure, for it was not due to the incidence of diseases peculiar to women, which were responsible for only 5 per cent. of the total sickness each year. It has been suggested that it may have been due to the greater encouragement which was undoubtedly given to women to report sick and to the more sympathetic treatment which they received, but this is obviously unlikely in the case of major sickness while the ratio of major to minor sickness was approximately the same for women as for men.

A more probable cause, however, lies in the fact that during the first two years of its existence, while it was still a volunteer organisation, a fairly high proportion of recruits entering the W.A.A.F. were drawn from the middle and upper middle classes—social strata in which, as children, they had tended to be sheltered from many of the commoner

ailments and had therefore had less opportunity to develop a natural immunity to them. Moreover their background and upbringing had taught them to be very conscious of ill-health and to seek immediate medical advice even at its minor manifestations. The conscription of women, started late in 1941, into the W.A.A.F. brought to it very large numbers whose material experience of life had been harder but more practical. More familiar with physical discomfort and its occasional medical consequences, these recruits were much less concerned by it and regarded such things as colds, coughs and minor skin disorders as part of the general pattern of everyday life to be endured without surprise or complaint.

A lower incidence in 1942 was common to practically all diseases with the exceptions of skin diseases and the nervous and mental disease group. The reason for the higher incidence of skin diseases was an epidemic of scabies which coincided with a similar epidemic throughout the country. An increased incidence of diseases in the nervous and mental group was probably due to the increase in cases of maladjustment to Service life in women who before the passing of the Defence (Women's Forces) Regulations in 1941, would have left the Service when they found they did not like it.

INFECTIOUS DISEASES

Infectious diseases accounted for the largest proportion of the total sickness. Diseases of the alimentary system came next. Points of interest are as follows:

Mumps. There was a steady increase in the incidence of this disease in the W.A.A.F. up to 1942 but this was also the case in the R.A.F. and the country as a whole during these years. The rate fell appreciably in 1943.

Tuberculosis. The marked increase in the tuberculosis figures for the year 1942 was due to the earlier diagnosis of the disease consequent on the introduction in May of that year of mass radiography* of recruits on entry. If cases detected by mass radiography are deducted the incidence of clinical tuberculosis for 1942 is approximately the same as that for 1941. The increase in 1943 was due to an increase of non-respiratory tuberculosis from 0·45 to 0·77 per thousand per annum. The incidence of pulmonary tuberculosis actually decreased from 2·36 to 2·19 per thousand.

Measles. The incidence was high in 1940 and in 1942 was below the normal. The incidence for 1943 was about in accordance with the normal rate.

Pneumonia. This showed a steady increase until 1942 with a slight decrease in 1943. The greatest number of cases occurred in December and in the first quarter of each year.

See Special Services (Chapter 6).

Chicken-pox. This showed a satisfactorily low figure throughout.

Scarlet fever. The highest figures for scarlet fever were recorded in 1943, coinciding with an increase in the country generally.

Diphtheria. The incidence remained constant and fairly high. The greatest number of cases occurred in the first six months of each year which is not the recognised season for this disease.

Cerebro-spinal Fever. There were no epidemics of cerebro-spinal fever and a very low rate was evenly spread over the year.

Catarrhal jaundice. This increased in 1942 and again in 1943, consistently with its increase in the country as a whole.

Venereal Disease. This has already been discussed at length.

It is of interest to record that with the exception of venereal disease, where the incidence was very much lower, and of pneumonia and catarrhal jaundice where it was slightly lower, all the other infectious diseases show a considerably higher rate among the W.A.A.F. than among the R.A.F. The possible reasons for this have already been discussed.

SICKNESS BY COMMANDS

If the Command sickness rates are analysed it is found that, as would be expected, the variation was not very great and most deviations from the average can be fairly easily explained. There was one Command, however, Bomber Command, which was an exception to this statement. Bomber Command had an annual sickness rate which was appreciably below the average for the W.A.A.F. as a whole. It is very difficult to find a reason for this since many bomber stations were in bleak cold areas on the east coast; they tended to be widely dispersed, and in many instances during the period of rapid expansion they had to be occupied before the full amenities could be arranged and life was rigorous in the extreme. It is possible, however, that in a very active operational command, airwomen found themselves too busy to be ill.

Balloon Command surprisingly enough, had the next best health record. This was probably due to the high standard of physical fitness* required of airwomen mustering to the trade of balloon operator. Personnel in this trade made up a large proportion of the W.A.A.F. in the Command.

Fighter, Coastal and Flying Training Commands approximated to the average throughout.

Technical Training Command had a higher incidence of minor sickness, but this might be expected as the number of cases of mild vaccinia, inoculation sickness and blistered feet was naturally high in this Command, which included all recruits in their first few weeks of

* *See* R.A.F. Volume II. Chapter 5.

Service life. This high incidence of minor sickness fell to below average from April 1943 onwards when the number of recruits declined.

Maintenance Command showed an above average incidence of minor sickness in 1942 and 1943. The W.A.A.F. in this Command were working in close contact with civilian employees who, being less carefully medically supervised, were a potential source of infection to Service personnel.

INVALIDING RATES

The invaliding rates for the years 1939–45 are given in Table II of Appendix B, and it will be seen that they doubled from 1941 to 1942. There were probably two factors to account for this. The first was that from the latter half of 1941 the medical examination of recruits on entry was carried out by Ministry of Labour boards, whereas before that date the R.A.F. had done its own medical examinations on entry and had set a higher standard of acceptance. The second factor was that, after the passing of the Defence (Women's Forces) Regulations in 1941, airwomen could only obtain their release from the Service on medical or strong compassionate grounds, which had almost certainly a bearing on the increased invaliding rate. The woman who, being unable or unwilling to adapt herself to Service life, had hitherto been able to resign from the Service, had now to find a medical reason—generally a psychoneurosis or psychopathic personality—in order to escape. This is borne out by the fact that nervous and mental diseases accounted for approximately half of the total invalidings annually. Of this group neuropsychopathic disorders were responsible for the larger number (between 70 per cent. and 80 per cent.) while organic disease and psychoses together accounted for the rest. Table III.

DEATH RATES

General death rates among W.A.A.F. personnel are given in Table XI. The highest proportion of deaths each year was due to accidents, mainly road accidents. Next highest was tuberculosis.

APPENDIX A

PLATES

The plates opposite have been chosen from a large number illustrating the activities of the Women's Auxiliary Air Force at work and in training.

PLATE XLVII. Nursing orderlies rendering first aid at an aircraft crash.

PLATE XLVIII. Air ambulance orderly administering oxygen to a patient during flight.

facing p. 470

PLATE XLIX. Mixed classes at physical training.

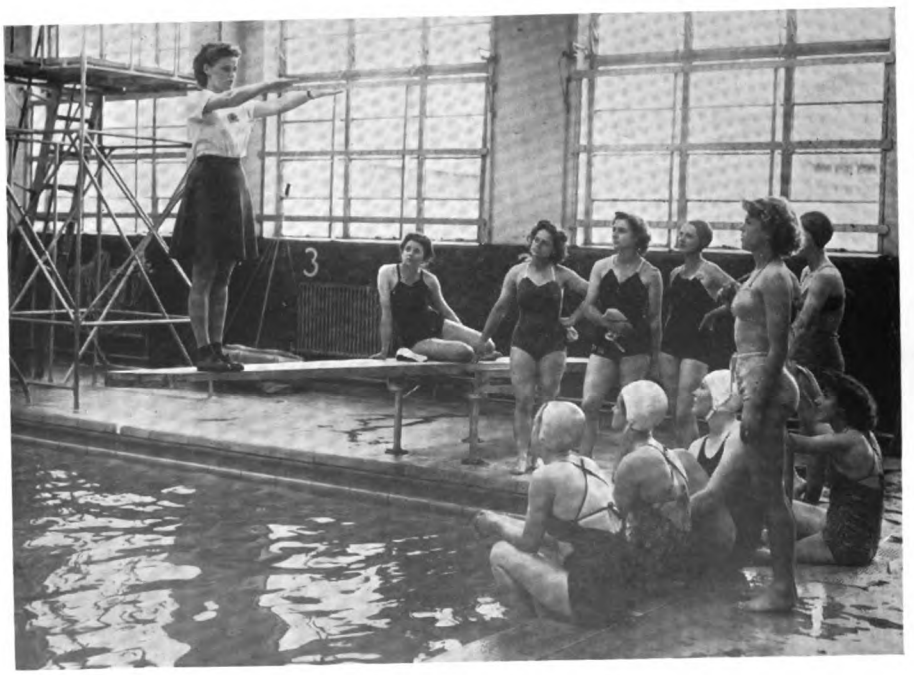


PLATE L. Swimming instruction in indoor baths.

APPENDIX B

W.A.A.F. STATISTICAL TABLES

TABLE I

Total Disability Rate among W.A.A.F. and R.A.F. (expressed as Ratio per 1,000 per annum)

	W.A.A.F.		R.A.F.	
	Including 48-hour Cases	Excluding 48-hour Cases	Including 48-hour Cases	Excluding 48-hour Cases
1939 .	1,187	396	686	357
1940 .	1,512	786	798	435
1941 .	1,075	580	636	382
1942 .	916	572	660	430
1943 .	833	604	729	498
1944 .	725	538	764	551
1945 .	692	534	613	426

TABLE II

W.A.A.F. Invaliding Rates per 1,000 per annum

Disease	1939	1940	1941	1942	1943	1944	1945
Acute infections, effects of	Nil	0·31	0·10	0·41	0·24	0·13	0·20
Tuberculosis, all types	Nil	1·22	1·06	3·18	2·96	2·30	2·04
Venereal disease .	Nil	0·08	0·04	Nil	Nil	Nil	Nil
Septic conditions .	Nil	Nil	Nil	0·08	0·03	0·04	0·02
Alimentary system .	0·24	0·23	0·44	0·77	0·62	0·68	0·48
Circulatory system .	0·12	0·69	0·75	1·18	0·81	0·71	0·57
Blood, blood-forming organs, spleen and reticulo-endothelial system . . .	*	0·15	0·04	0·14	0·10	0·11	0·07
Respiratory system .	Nil	0·69	0·37	0·67	0·89	1·19	1·02
Allergy . . .	Nil	0·08	0·29	0·50	0·20	0·34	0·37
Urinary system . .	Nil	Nil	0·31	0·40	0·29	0·34	0·30
Locomotor system .	0·24	0·76	0·37	1·24	1·27	1·46	1·65
Nervous system and mental diseases, all types . . .	1·08	3·74	5·58	11·84	11·03	11·20	10·56
Eye	*	Nil	0·04	0·27	0·15	0·15	0·13
Ear, nose and throat .	Nil	0·31	0·29	0·78	0·50	0·42	0·61
Skin . . .	Nil	0·23	0·04	0·16	0·29	0·42	0·34
Endocrine . .	Nil	0·38	0·27	0·31	0·28	0·34	0·35
Metabolism . .	*	0·15	0·08	0·09	0·12	0·07	0·05
Cysts and tumours .	Nil	0·53	0·15	0·14	0·07	0·17	0·13
Diseases peculiar to women . . .	0·36	0·53	0·66	0·99	0·86	1·03	0·85
Indefinite and general	0·49	0·69	0·39	0·27	0·27	0·35	0·39
Injuries . . .	Nil	Nil	0·12	0·11	0·16	0·08	0·02
Totals . . .	2·53	10·77	11·39	23·53	21·14	21·53	20·15

* Number of cases too few to be recorded.

TABLE III

Analysis of Invaliding for Nervous and Mental Disorders showing rate per annum and percentage for each type of nervous disorder within this group of diseases

Disease Group	1941		1942		1943		1944		1945	
	Rate per 1,000	Percentage of total	Rate per 1,000	Percentage of total	Rate per 1,000	Percentage of total	Rate per 1,000	Percentage of total	Rate per 1,000	Percentage of total
Psychoneuroses (anxiety states, depressions, hysteria, etc.) . .	3·00	53·8	6·20	52·4	6·70	60·7	5·31	47·4	5·44	51·5
Psychopathic personalities (behaviour disorders, temperamental and emotional instability, etc.) . .	0·64	11·5	1·95	16·5	2·30	20·9	4·10	36·6	3·67	34·8
Psychoses	0·85	15·2	1·30	11·0	0·54	4·9	0·39	3·5	0·44	4·2
Mental defectives . . .	0·17	3·0	0·56	4·7	0·43	3·9	0·32	2·9	0·13	1·2
Indefinite aetiology (enuresis, migraine, vertigo, etc.) . .	0·21	3·8	0·44	3·7	0·28	2·5	0·34	3·0	0·26	2·5
Organic diseases . . .	0·15	2·7	0·30	2·5	0·20	1·8	0·29	2·6	0·30	2·8
Epilepsy	0·56	10·0	1·09	9·2	0·58	5·3	0·45	4·0	0·32	3·0

TABLE IV

Annual Rates of Venereal Disease

Year	Average strength	Cases	Rates per 1,000 per annum
1939 .	2,300	1	0·40
1940 .	13,085	15	1·15
1941 .	48,182	137	2·84
1942 .	127,781	496	3·88
1943 .	178,689	424	2·37
1944 .	173,066	355	2·05
1945 .	142,045	299	2·11

TABLE V

Rates of Venereal Disease by Commands

Commands	1942	1943	1944
Bomber . . .	3·1	2·0	1·8
Fighter . . .	2·4	1·4	0·7
Coastal . . .	2·8	1·7	1·7
Flying Training .	3·9	2·1	2·0
Technical Training .	2·9	1·7	1·7
Balloon . . .	2·2	1·7	0·8
Maintenance . .	3·9	2·2	1·5
Army Co-operation .	0·7	—	—
Transport . .	2·1	3·9	5·1

TABLE VI

Relative Rates of Syphilis and Gonorrhoea

Year	Gonorrhoea	Rate	Syphilis	Rate	Gonorrhoea and syphilis	Rate
1940 .	14	1·07	1	0·08	—	—
1941 .	107	2·21	21	0·44	9	0·19
1942 .	367	2·87	129	1·01	*	*
1943 .	249	1·39	152	0·84	23	0·13
1944 .	218	1·26	127	0·73	10	0·06
1945 .	171	1·20	118	0·83	10	0·07

* Details not available for the year 1942—numbers included in separate figures for gonorrhoea and syphilis.

TABLE VII

Source of Venereal Infection

	1942	1943	1944
	per cent.	per cent.	per cent.
Revealed by consort .	47	74	72
Marital . . .	14	19	20
Extra marital . .	10	1	4
Information refused or not available .	27	2	3
Congenital . .	2	4	1

TABLE VIII

Consorts

	1942	1943	1944
	per cent.	per cent.	per cent.
Royal Air Force .	43	40	34
Army . . .	21	26	18
Royal Navy . .	6	10	8
Civilians . .	23	13	7
Allies, Dominions, etc.	7	11	33

TABLE IX

W.A.A.F. Pregnancy Rates

Year	Strength	No. of Cases	Incidence per 1,000 of strength	No. of Cases invalided	No. of deaths
1940 .	13,085	49	3·74	–	–
1941 .	48,182	239	4·96	1	–
1942 .	127,781	1,112	8·70	4	–
1943 .	178,689	1,902	10·65	–	1
1944 .	173,066	2,605	15·05	4	1
1945 .	142,045	1,884	13·26	3	1

TABLE X

Ratio of Unmarried to Married Pregnancies

Year	Rates per thousand per annum			Ratio of single to married
	Married	Single	Totals	
1942 .	327·4	15·4	46·2	1 : 21·2
1943 .	432·0	20·7	67·7	1 : 20·9
1944 .	485·5	25·0	89·7	1 : 19·5

TABLE XI

W.A.A.F. Death Rates

Year	Number due to injuries	Number due to disease	Total deaths	Rate per 1,000 per annum
1939 .	1	2	3	1·3
1940 .	7	1	8	0·6
1941 .	14	20	34	0·7
1942 .	40	79	119	0·9
1943 .	53	76	129	0·7
1944 .	75	63	138	0·8
1945 .	40	64	104	0·7

CHAPTER 10

AIR EVACUATION OF CASUALTIES

THE air transport of sick and wounded away from the battle fronts grew up from nothing to become the principal method of casualty evacuation by the close of the war against Japan. In 1939, arrangements for moving patients by air were practically non-existent; by 1945, over 400,000 sick men had been carried by the British Air Forces, and over one million by the Americans. This development was forced on the Service administration by the exigencies of geography. Experience of the difficulties of moving casualties across hundreds of miles of the roadless Western Desert of North Africa, and the immense problems of transport in the mountainous jungle-covered country of the Indo-Burmese frontier, led inevitably to the use of aircraft, which alone could ignore all natural obstacles, whether mountain ranges rising to ten thousand feet or the bad weather of the monsoon, by simply flying quickly round or over any obstruction on the journey home.

Some idea of what this meant to wounded men in South-East Asia can be gathered by comparing evacuation in 1943 with that in 1945. To reach advanced base hospitals in Eastern Bengal from North-West Burma meant a journey by a combination of mule, sampan, river steamer, and road transport to railhead, lasting three weeks in all. A man who set out on this journey with a wound or a single illness might easily contract malaria and dysentery on the way, and inevitably, if he arrived at all, reached hospital in an appalling condition. By contrast, in 1945, the journey back, by air all the way, took approximately three hours. The speed of this transit meant that a wounded man could be in the hands of the surgical specialist and receiving the good treatment of a static hospital in less than half a day. Lives were saved and limbs were saved because the patients arrived in good condition, their disabilities fresh. Early treatment, and better treatment than a mobile hospital could offer, meant a shorter hospital stay and a quicker return to duty.

In all about 200,000 men were flown out of Burma, mostly by the R.A.F., at an average of about 600 men a day, whatever the weather. Air evacuation by every conceivable type of aircraft—transports, light aircraft, gliders, float planes—became so efficient that in the end it was the sole means of transport, and the land routes were closed down with few exceptions.

Although casualty air evacuation was born of geographical necessity, it found a function also in areas where ground communications are normally good and straightforward. In the liberation of North-West

Europe in 1944, air transport proved invaluable for removing the sick and wounded from regions where there had been no time to start proper hospital services. Something like 77,000 men were flown to Britain, representing 60 per cent. of all British casualties in the campaign; while 42,000 patients were brought back from the forward fighting zones to base hospitals on the Continent.

Evacuation in this theatre of war demonstrated to the full its value in maintaining the morale of fighting troops. The knowledge that in a mere matter of hours they could be carried hundreds of miles from the fighting to a hospital in England, close to their families and tended by English nurses, was very heartening to men who ran the constant risk of injury and lived under field conditions. In fact, part of the Army's pressure in 1941 for the provision of air ambulances in the Western Desert had come from knowledge of the healthy effect on morale which the existence of such aircraft would have.

There was another military benefit brought by air evacuation. It was an important method of conserving men and resources. Instead of dispersing specialists in a multitude of mobile hospitals and special units in the field, each little self-contained group dragging its bare minimum of robust equipment with it from one temporary site to another, physicians and surgeons could be collected together in a few well-equipped and static base hospitals, and an army of drivers, and cooks and maintenance men, freed for other duties. The wounded flew back to the specialist, instead of the specialist struggling forward to the fighting; only a few specialists remained forward to supervise their preparation for evacuation. A further consequence of this was that the majority of medical stores were no longer required in the front line and its adjacent zones, and the vehicles which would have carried them up took munitions of war instead. Since motor ambulances and hospital trains no longer competed for the available road and rail space, the ground lines of communication thus became free for the fighting troops and their equipment.

The air evacuation of casualties therefore has a justification in tactics as well as in humanity. But it took time for this to be recognised. Men thought in terms of air ambulances as luxuries which could provide a last chance of life for the exceptional case, and were only slowly won over to thinking of the wounded simply as a form of air freight. And when they were won over, there were many problems to be solved. Some were questions of organisation; the wounded are a very special form of air freight, they require a special handling routine and special facilities. Others were a matter of the kinds of illness or disability which would stand an air journey, and the sort of nursing they should have in transit.

This account deals in turn with the early history of the air ambulance, with the evolution of air evacuation after 1939, with the results of

experience in North Africa and Sicily, and the fruits of the experience in the two terminal campaigns of the war, in Normandy and Burma. A final section discusses the relevant clinical features.

EARLY HISTORY

The use of air ambulances followed quickly on the development of heavier-than-air flying machines. In 1913, the French Société de Medicine Militaire held a discussion on them and in 1915 a patient was successfully evacuated by air in Albania. This was followed in 1918 by the establishment of air ambulance services in Morocco and the Levant, for which twenty and sixteen special machines respectively were supplied. Over the period 1921 to 1928, nearly 4,000 cases were carried in Morocco, with only two fatal accidents, both at take-off; while Levant had experience of nearly 1,400 more cases. Each aircraft carried two stretchers, one above the other, inside the fuselage and the patients were loaded through a lateral port-hole.

The first British record of a wounded man travelling by air is dated 1917, in the Sinai Desert. A trooper of the Imperial Camel Corps had his ankle shattered by a Bedouin bullet during an attack on Bir-el-Hassana, and at first preparations were made to send him to railhead in a cacolet on a camel. However, his medical officer persuaded the pilot of a D.H.4 biplane to carry him as a sitting casualty in the observer's seat of the aircraft and on February 19, with his ankle in a box splint, he was flown to Kilo 143. The journey by air took 45 minutes, instead of the usual 2½ to 3 days.

Shortly afterwards, a D.H.9 was modified to carry one stretcher and an attendant, and this was used by 'Z' Force in Somaliland in 1919, patients being carried back to base at Berbera in a two-hour journey which would have taken at least five days on land. Development was, however, slow. Aircraft were few in numbers, awkward in design, and unreliable; accidents were frequent. It needed a real emergency to call air transport into use. Thus in 1923, Vickers Vimy transport aircraft were used to carry 200 British troops, victims of a dysentery epidemic, out of Kurdistan to hospital at Baghdad and for a time an air ambulance bearing the Red Cross was established in Iraq. During the Quetta earthquake of 1935, fifteen doctors and eleven nurses and 13,000 lb. of medical stores and tinned food were flown into the devastated area, and 136 patients (including three stretcher cases) were evacuated to Karachi, Lahore and Risalpur. For special occasions of this kind it became usual throughout India, Iraq and the Middle East to call upon air transport. At first all kinds of aircraft were used, and sometimes the patient was encased in a Neil-Robertson stretcher and strapped outside on the fuselage with his shoulders in the gun ring, an uncomfortable position. Later, the introduction of the Universal stretcher

sheet and changes in aircraft design with the production of troop carriers meant that patients could travel in less discomfort, and makeshift methods could be abandoned.

Between 1919 and 1938 the R.A.F. carried something like 2,800 casualties of one kind and another, mostly in Iraq and Palestine. Wherever communications were poor and distances great, the air ambulance had a valuable rôle. Development of ambulance aircraft services was not confined to the military, but began wherever civilian communities were thinly scattered over wild country. Thus the 'Noorduyn Norseman' with a cruising speed of 120 m.p.h. and a range of 800 miles, and capable of landing on wheels, floats, or skis, was used in the North-West of Canada to bring mining machinery, food and even cattle to isolated outposts, and to remove accident cases and difficult pregnancies to hospital. Queensland and the northern territory of Australia were served by the 'flying doctor' who could be summoned by pedal wireless. The U.S.S.R. began the organisation of an air ambulance service. Air ambulances served the Western Isles of Scotland. The R.A.F. stationed two specially fitted Victorias at Halton, near London, in 1925, ready to bring in patients to the Service hospital there from a radius of a hundred miles round. But in contrast to the other services described, this one appears to have been little used, and it was discontinued at the end of 1926. It appeared that air evacuation had little value in a country where surface communications were already very good.

In spite of this, some interest in air ambulance work still survived and the Air Ministry in May 1933 gave official approval to a British Red Cross scheme to form civilian air ambulance detachments. Pilots and machines were to be provided by flying clubs, and there were schemes for earmarking the machines exclusively for this work in war-time. The plan, in which, however, the R.A.F. had no responsibility, seems never to have developed beyond the initial proposals. In fact, the records of this period suggest that people were mentally restricted by the 'lessons' of the static War of 1914–18, and envisaged a new war as one in which there would still be a clear division between the fighting men and the civilians carrying on business as usual—including the hobby of flying—and in which the strategic scene would change leisurely, ponderously.

It was otherwise in Germany. The Spanish Civil War of 1936–8 was a proving ground of much that was new in equipment and tactics, and the Germans did not hesitate to fly patients of the Condor legion 1,500 miles from Spain to Berlin, though the journey took ten hours and meant altitudes of 18,000 ft. to cross the Alps. This mass evacuation included cases of pulmonary tuberculosis, severe heart disease and gun-shot wounds with anæmia, and all were carried without ill effect in spite

of the extreme cold, oxygen being given at all heights over 10,000 ft. This experience formed the basis for German air evacuation in 1939, when the Polish campaign opened, and in the first four weeks of the war, they evacuated 2,500 patients by air with only four deaths in transit. The journeys were short and made at low altitude and the aircraft used were converted airliners and air ambulances, which took medical personnel and stores (bandages, splints) to the Front, and brought patients back.

Air evacuation formed part of the enemy's conception of the 'Blitzkrieg', which was so fluid and so mobile that medical units had no time to move forward to catch up with the wounded behind the ever-changing 'front line', and therefore required casualties to come back to them. Later, they realised the value for morale, both civilian and military, of flying wounded direct from the Russian front to their home towns. As long as the Germans retained air supremacy over the Continent, for them air evacuation remained a routine procedure.

AIR EVACUATION POLICY, 1939–42

In contrast to Germany, Britain started the war with no policy on air evacuation. It is true that from time to time after 1933 the matter had been raised. In January 1937, for instance, the Commander-in-Chief, Egypt, had pointed out to the War Office that in the event of war in the Western Desert, it might be necessary to pick up wounded as much as eighty miles from base and move them back by ambulance over roadless country, a journey which could be made better by air. He put forward the suggestion again early in 1939. On both occasions the War Office took the matter up with the Air Ministry, and on both occasions it was agreed that aircraft could not be spared to form an ambulance flight, which was envisaged as likely to be only sporadically active, and therefore wasteful of skilled man-power as well as scarce machines. It was vaguely suggested that a civilian air ambulance might be specially chartered on occasion, or that communications flight aircraft attached to various headquarters could be used for carrying the sick, at the discretion of the A.O.C. Disarmament had been the avowed policy of successive Governments, and what money had been granted to the Air Force did not run to the purchase of aircraft for purely medical use. The Army already had a full scheme of medical ground communications, and these must suffice. Accordingly, for the time being, the matter dropped.

It seems probable that the Commander-in-Chief, Egypt, had had in mind the large-scale movement of wounded by air to base. This, however, was certainly not the way it was seen in London. There, an air ambulance service was envisaged as merely a particularly quick way of carrying a dangerously ill man to the best specialist treatment, exactly analogous to the rôle of the ordinary civilian ambulance in the everyday

life of peace. It may be that the very use of the word 'ambulance' was mentally restricting through its associations and if 'evacuation' had been substituted different decisions might have been made. It is also true that the adoption then of air evacuation as a policy would have involved considerable imagination and boldness in planning, since it required a new disposition of medical ground forces to operate, a disposition which eventually grew up in the field under the stress of battle.

EARLY AIR EVACUATION

Whatever the explanation, no plan existed, but the medical officers in the field quickly improvised one. On September 28, 1939, twenty-five days after the declaration of war, a signal came to Halton Hospital from Panther, the Advanced Air Striking Force in France, to give warning that 25 patients, including 3 stretcher cases, would be arriving by air on the following day. A further party of 20 walking and 5 stretcher cases arrived on October 3, and further batches crossed sporadically from the Continent in the succeeding days. These men were for the most part R.A.F. reservists who were unfit for overseas service and were being repatriated by air as the only quick way of getting rid of them. In a letter written to the Director-General of Medical Services on October 9, the P.M.O., Panther, explained that from No. 4 Casualty Clearing Station at Épernay to the base hospital at La Baule (Nantes) was a difficult and doubtful journey of about 350 miles and he therefore thought it better to by-pass this official line of communication if air transport was available. The C.C.S. was of course an army unit. Of the two R.A.F. medical receiving stations which might have contained large numbers of unfit men, No. 1 M.R.S. had only just opened (September 25) and No. 2 was not ready till November 6. Consequently the need to evacuate the men was urgent.

The aircraft used in this first war-time casualty air evacuation belonged to the Air Transportation Service operated by Maintenance Command with civilian aircraft. They were engaged in carrying full oxygen cylinders and other stores to Villeneuve-Amiens (France) and normally returned to Brockworth empty.

Mostly they were D.H. 84's, 86's, and 89's, with some Hadrian and Hannibal transports with a cruising speed of only 75 m.p.h. which made them very slow for casualty work. They flew only during the hours of daylight and this in autumn and winter meant a very limited time in which to make the round trip, since the aircraft were not allowed to stay on the Continent overnight. They arrived in France with very little warning and, since they could not wait, had to be loaded with patients on the spot. Consequently, only about three hours' notice of the aircraft's arrival, with details of the number of stretcher and walking

cases on board, could be given to England for preparing the hospital. This was a cause of complaint by people who did not appreciate the situation of the Expeditionary Force in France.

At the receiving end, an organisation to cope with the returning men had hastily to be improvised. Halton had no ambulance fleet to collect patients from the airfield and bring them in, but the British Red Cross was able to help. Brockworth, the transport base, was seventy miles by road from Halton, and arrangements were therefore made for aircraft to land intermediately on their return flight at Benson, which is only twenty miles away. At first patients were reaching hospital in poor condition through hunger, having breakfasted in France at 0700 hours, and eating no other food till some time after their arrival at Halton at 1815 hours. This situation was improved by making Benson sick quarters responsible for providing refreshment to all arrivals. There was also difficulty in returning to France the attendants who came with the patients, and the medical equipment used on the way.

These matters all took time to arrange. Meanwhile the Air Transportation Service came to an end on December 9, 1939 and almost all stores henceforward went by sea. In consequence, large-scale air evacuation also ceased, though isolated cases were still occasionally transferred by air. In the two months of organised operation, about 140 patients had been carried, and much valuable experience gained. This latter fact is evidenced in a letter written by the P.M.O., Panther, to D.G.M.S. on November 23, 1939, which suggested a scheme that in essence was eventually (1944) put into operation. He wrote: 'It is my firm conviction . . . that two ambulance aircraft be provided to work in conjunction with this hospital (at Épernay), one large aircraft to take at least eight stretchers and one smaller aircraft to take four stretchers. The large aircraft would be primarily intended for evacuation to the United Kingdom, the smaller one for collection of suitable cases from forward aerodromes, which are sometimes situated 200 km. from Épernay.'

When D.G.M.S. visited France in mid-January 1940, he promised two Oxford aircraft in a month's time for carrying patients, but unfortunately they were diverted to Arras and used in the Communications Flight, and so never arrived at Épernay. Meanwhile, attempts to convert Oxfords into true stretcher-carrying ambulances met with unexpected difficulties of design, and the first two air ambulances were only ready on July 25, more than a month after the fall of France.

The Army Commanders in the field, too, were conscious of the need for air ambulances, and as early as November 11, 1939, the War Office had approached the Air Ministry with the request that air transport might be granted to fly special cases home from France. It was not until

June 4, 1940, that the reply was made; this gave information that two Oxfords which would shortly be ready would be available on call from No. 24 (Transport) Squadron at Hendon.* Later, further air ambulances were provided—four D.H. 89 aircraft (two each at Abbotsinch and Wick†) and a Walrus amphibian which took sitting cases only, primarily with the idea of providing a service to the Scottish Highlands and the Western Isles, which in peace-time had been served by a civilian ambulance maintained by Scottish Airways.

The Medical Branch in fact was now alive to the medical value of air transport. Like many other Service departments they had entered the war both physically and mentally unprepared for the work, but they now had ten months' knowledge of France behind them and the experience at home of an air force expanding rapidly as more men were called up and more and more people were posted to distant and isolated stations far from hospitals. They now recognised the need for air ambulances and pressed for their provision, but unfortunately aircraft of any kind were scarce and only a few obsolescent types were available, mostly unsuitable for the work. But at least a beginning had been made by the establishment in Britain of seven aircraft for medical duties, and though the method of summoning them was cumbersome, they were available to all—Royal Navy and Army, as well as R.A.F. personnel.

The Battle of Britain was fought, and won, and the focus of the war shifted to the Middle East. Exactly as foreseen by the C.-in-C. in Egypt, in 1937, the Army in the Desert began to demand air transport for its casualties, and in London there opened a struggle, which dragged on for over two years, to provide the necessary aircraft. A War Office request dated September 7, 1940, for five air ambulances for the Middle East came at a time when the shortage of aircraft and of trained aircrew and ground staff was such that Malta had only shortly before received its first fighter squadron, and operational demands everywhere stretched the Air Force beyond its capacity. It is no wonder that the Air Ministry felt compelled to refuse the request.

Various plans were then mooted for obtaining the necessary aircraft specially from America, but since the British Purchasing Commission had already bought all of every available type for the general use of the R.A.F., there were no more to be had, and the idea fell through. It is in any case doubtful whether the necessary pilots and maintenance crews could have been spared for the work, even if suitable aircraft had been found.

* During the period August 1940 to June 1941, these Oxfords carried a total of 74 patients in 55 journeys.

† *See* R.A.F. Volume II, Chapter 3.

The matter did not rest long at this stage. During the autumn, Mr. Eden, then Secretary of State for Air, visited the Middle East on a tour of inspection, in the course of which he telegraphed to the Foreign Secretary (Lord Halifax) the suggestion that the American Red Cross should be approached to donate air ambulances, which were urgently needed. He suggested that twelve would be required. Various explorations were made by diplomatic representatives in Washington, and it was clear that unless the British Service Chiefs would make the provision of ambulance aircraft a top priority there was no hope of getting them. This the air authorities were not prepared to do. The Silver Thimble Fund and the Girl Guides had presented the ambulance aircraft established at Hendon and elsewhere. But the trouble was not a shortage of funds—the Exchequer could be regarded as inexhaustible—but shortage of aircraft.

In January 1941, a new Secretary of State for War (Captain Margesson) appealed once more for twelve air ambulances, in a personal letter to the Secretary of State for Air (Sir Archibald Sinclair) but this had no better result than any preceding request. At the same time, but independently, Major-General Cunningham, in command of East African Forces, wrote a personal letter to the Chief of the Air Staff asking for six aircraft to carry the wounded from the front line to the railhead, 300 miles distant over difficult country. The D.G.M.S. added his voice, appealing to the Air Member for Personnel to provide two aircraft as ambulances for West Africa, particularly the Gambia and Sierra Leone regions. The answer in every case was the same as before—shortage of aircraft.

The *impasse* began to resolve, however, in an unlooked-for direction. The Australian Minister for War had also visited the Middle East and on his advice, the Australian Government decided to equip three D.H.86's to carry six stretchers and two sitting cases each, and to offer them with crews and maintenance staff as a complete air ambulance unit, for the use of the Army in the Western Desert. It would, to say the least of it, have been undiplomatic for the British Government to refuse this offer, though its acceptance was contrary to the policy hitherto followed, and the Royal Australian Air Force No. 1 Air Ambulance Unit came into being in March 1941.

General policy, however, could not yet be changed. An appeal from South Africa to be given two S.C. 3G engines for two Lodestar aircraft it was desired to convert into ambulances was turned down in April, as was a request for five Rapides for the same purpose, for which the South African public had subscribed £30,000 on the direct appeal of Field Marshal Jan Smuts for funds to buy these aircraft. Fortunately South Africa was able to contribute one complete Lodestar ambulance entirely from internal resources.

It is noteworthy that all who visited the actual site of the war returned impressed with the need for this special air transport. Despite this, however, it was impossible owing to the shortage of aircraft, to allocate even a few to the single task of casualty air evacuation.

Meanwhile, practical solutions to the problem were being worked out at the battlefront. Faced with the real gravity of the situation in the Middle East, the men on the spot, led by the P.M.O., had begun informal arrangements by which transports, taking supplies to the fighting zone, flew back to base with a load of wounded—the same principle that had been used in the British Expeditionary Force in France. A number of Bombays and Valentias had been modified to carry stretchers and small numbers of wounded were being brought back, in spite of organisational difficulties. It was with the knowledge of these successful arrangements that the Army re-opened the question in September 1941. The War Office forwarded to Air Ministry requests from Commander-in-Chief, Middle East, and Commander-in-Chief, India, that transport aircraft should be suitably modified to carry stretchers and authorised to carry wounded when not engaged on other duties. (*See* The Army Medical Services, Volume I, Chapter 13.)

Soon after these experiments, policy changed. On October 21, 1942, D.G.M.S. was able to issue a Directive on the Evacuation of Casualties by Air, in which the R.A.F. accepted full responsibility for air evacuation from the moment the wounded man was delivered on the airfield until the time he was ready at the reception end for transfer to hospital. Clinical factors for the selection of cases suitable for air transport were detailed, the handling organisation outlined and the medical stores to be carried by all transport aircraft likely to act on occasion as ambulances carefully specified. It was, of course, based on Middle East operational experience, and was modified gradually in the light of subsequent events. What that experience was will now be discussed.

WESTERN DESERT

For the reasons recorded above there was no regular or organised service for the air evacuation of sick and wounded until the beginning of the winter offensive of 1941. The Army lines of communication, however, were good, and evacuation by railway to the Delta or along the good coast-road east out of Mersa Matruh was relatively quick and satisfactory.

But aircraft were used from time to time for special purposes. Valentias of No. 216 Squadron, then based at Heliopolis, would come forward to Matruh or other landing grounds to evacuate individual cases needing urgent specialist treatment to base hospitals in the Cairo area. Considerable unauthorised use was also made of operational aircraft returning to base, by private agreement between R.A.F. medical

officers and the captains concerned; and when, during the offensive of 1940–1, advanced operational refuelling and bombing-up landing grounds crept forward into Cyrenaica, closer to the forward Army units, many Wellingtons carried walking sick and wounded direct to the Canal Zone. On an average, each aircraft would carry five or six of these 'hitch-hikers' and at dawn when the bombers landed from their sortie over the Benghazi area, the medical officers at Kabrit and Shallufa would each be faced with the disposal of fifteen or more British, Australian, or Indian wounded.

When No. 21 M.R.S., a mobile field hospital, moved out to Fuka in April 1941, similar use of Wellingtons and bomber transports was made on a more organised basis. R.A.M.C. units in the neighbourhood of Fuka were told that if they liked to transfer their urgent cases to the M.R.S., there was good prospect of getting them an early airlift.

It was now clear to all the medical authorities that the coming operations would require air ambulance transport if the wounded were to be evacuated from the forward areas, and repeated requests for such transport were made to higher authority. In October 1940, for example, a survey of the medical arrangements for cases at Siwa and Giarabub, both about 150 miles inland from the coast road, showed that ambulances would have an arduous three-day cross-desert journey to get to the 8th South African Casualty Clearing Station (C.C.S.) at Matruh, and there was little hope of any but minor cases surviving this ordeal.

The Australian Air Ambulance Unit, it will be remembered, was formed in March 1941 and sent at once to the Middle East, but ever since its arrival it had been retained in Palestine, since it would have been impolitic to use it away from the Australian troops it had been sent to succour, and there were no Australians then in the Western Desert. In view of the pressing need in the desert, there was a continual agitation by both Air Force and Army medical officers to get it transferred to the territory where it was most in demand. The arrival at the front of No. 3 R.A.A.F. Squadron finally made the move possible. On November 16, 1941, just forty-eight hours before the opening of the winter offensive, the air ambulance unit was transferred to the area of active warfare.

At this eleventh hour, news also came that five R.A.F. Bombays were being fitted to carry stretchers, while the South African Red Cross were giving a Lodestar, already on its way to the Desert. The arrival of all these aircraft, which were added to the Australian unit under the control of No. 216 Group, was very welcome, though at first there was considerable confusion, since no plans had been made for them and they arrived unexpectedly just as the attack was due to start. Army medical units had to be told of the procedure for summoning air ambulances, and had to plan their sites and movements in relation to the available forward

landing ground facilities. These facilities were not as good as they might have been since the ambulance aircraft, being obsolete, flew on a lower octane petrol than the majority of machines, and this fuel was not available everywhere. Their special spares were held in small quantity away at Heliopolis, so that if they became unserviceable, as they frequently did, there was a long delay until the new parts could be sent up.

In fact the difficulties were such that the numbers evacuated back to the C.C.S. at Matruh—and the good coast road to the Nile Delta—from the Fort Maddalena area (about forty miles inland along the Libyan-Egyptian frontier) would have been quite nominal if other arrangements had not also been made. But the Senior Medical Officer of Rear Air Headquarters had persuaded Bombays of the Air Transport Wing to carry back wounded after delivering their freight in the forward zone. No. 21 M.R.S. was eight miles from their forward transport airfield, and acted as the casualty holding unit, transferring patients to the airfield by ambulance as required. The aircraft which flew in could not wait long to pick up casualties, as continuous local air superiority could not be guaranteed, and in any case any delay on the ground wasted valuable time which might have been spent flying in another load of stores. Consequently patients waited on the airfield for the aircraft, and not the other way round, and the M.R.S. supplied them as notified. In spite of the awkward ground journey they had thus to travel at short notice, and all the other difficulties, 237 cases were flown out in the week ending December 6, 1941—a good figure in the circumstances.

Attempts were made to open up other airlines during the battle. No. 17 Indian Field Ambulance at 'Conference Cairn', twenty miles north of the M.R.S., was flooded with casualties from the battle round Sidi Omar, and was still a full day's very rough drive from the C.C.S. at railhead. A temporary landing ground was prepared nearby, but before the first ambulance aircraft could put down they were all switched southwards.

And so, having roped in all hands to help prepare the runway, the disappointed Indian Field Ambulance unit had to be left without ambulances or even, it is believed, an explanation; such were the difficulties of communication existing at that time. For the situation was then so fluid that whole units would move without warning to other interested parties; and it even happened that one day the S.M.O. returning from a day spent contacting the forward squadrons, found his base, Advanced Air Headquarters, had vanished in its entirety from the site it occupied that morning, leaving nothing but some scattered débris in the dust to tell the tale.

Communications long remained a problem in air evacuation, and not only in the Western Desert. Vital land-lines were often out of action for hours or whole days at a time, and medical messages could only be

passed on the general radio channels with very low priority. Co-ordination between forward transport terminal and surrounding M.R.S., C.C.S., and other army units on the one hand, and with base transport terminal and group operations on the other, was an immense problem, which became increasingly important as evacuation grew and the war became mobile.

After the relief of Tobruk, December 9, 1941, the Army advanced rapidly, taking Benghazi on December 24, and reaching Agedabia and finally Agheila. Road communications became much easier. Medical units, including No. 21 M.R.S., were all on the move, which would have made air evacuation forward of Tobruk very difficult if it had not in any case been almost impossible as far as the R.A.A.F. ambulances were concerned, through unserviceability of aircraft. One D.H. 86 had been shot down in flames without any casualties on December 8, 1941, the Lodestar and a Bombay damaged on the ground, and at least two D.H. 86's were in the Delta awaiting repair. Indeed, air evacuation in this zone ceased completely between December 14 and December 28. In spite of this, in the first six weeks of the campaign, a total of 881 cases (612 of them stretcher cases) had been transported by air. Seven-eighths of this total were army personnel.

In the new year, evacuation began again, but not for long. Rommel counter-attacked on January 21, 1942, and the British forces were pushed back across Cyrenaica once more. With the confusion of rapid retreat, routine air ambulance runs became an impossibility. Subsequently, when the position was stabilised as the opposing armies rested for the summer, routine flights were re-organised, and the Air Transport Service ran a daily shuttle from Heliopolis *via* Wadi el Natrun to Amiriya on the outskirts of Alexandria; this was later extended to Burg el Arab further west, when air superiority was assured. The Service was controlled from the operations room of No. 211 (Fighter) Group, since it worked up to the rear of the fighter zone and its deliveries depended on forward air superiority. The medical arrangements fitted the transport service: No. 24 M.R.S. at Burg el Arab, No. 21 M.R.S. at Amiriya, No. 22 M.R.S. at Wadi el Natrun, and of course the R.A.F. Hospital at Heliopolis. The R.A.A.F. ambulance unit (of 3 D.H. 86's) was also at Burg el Arab, and was used for Australian casualties, who were flown back to the land strip beside the Australian General Hospital at Buselli.

The sum total of all this experience was yet insufficient to provide a sound basis for the new offensive of October 23, 1942, which opened with the battle of El Alamein, the turning point of the North African war. It served well enough in the static stage, but when the fresh advance into Cyrenaica began, it was found inadequate for the development and elasticity required in the mobile phase of the battle. As the

8th Army moved ever further from the Nile Delta, they relied increasingly on the air delivery of stores, and the return of casualties by air in even greater numbers—in fact at the end of the year, 200 patients a day (the total daily local sick and wounded) were being flown east out of 'Marble Arch'.

But this greater flow of patients demanded medical units specially to care for them on the airfield, since an M.R.S. had other work to do and could not always move with the moving forward transport terminal. It was axiomatic that patients should wait for transport, and not the aircraft for the patients, and a holding unit on the airfield was essential. The Army supplied the 14th United Kingdom Field Ambulance for this purpose. It joined the Advanced Air Transport Centre at Gambut, about forty miles inside Libya. Subsequently, they moved forward together to Tmini, Marguba, Benina (outside Benghazi) and to Agedabia, accompanied by the R.A.A.F. ambulance unit, and the Army Blood Bank, so that rapid forward delivery of fresh blood was simple to arrange.

With lengthening lines of communication came a new complication, the development of two separate air transport runs—one from the Heliopolis area to the Rear and Advanced Headquarters, the other from El Adem to the fighting area. The latter was contributed by No. 216 Group and overlapped the other route to some extent. By special arrangement of the medical authorities, aircraft returning from Headquarters to Egypt called intermediately at El Adem to pick up patients flown back from the forward areas by the other airline. Control of all movements, including those of air ambulances, was vested as before in No. 211 Group, though later No. 216 Group came to share in this work. The organisation was such that 200 men a day could be flown the 700 miles back to Egypt in returning transport aircraft. Nevertheless the existence of the two semi-independent air transport services was a great nuisance, and the medical authorities hoped that the rear and forward services would use a common terminal in all future operations.

A special survey of the working of the Casualty Air Evacuation Organisation, made at the very end of 1942, revealed some interesting points. Except in bad weather, all cases were being flown back from 'Marble Arch', and medical and surgical conditions were represented approximately equally in the aircraft loading. Yet at the final disemplaning at Cairo West, the diagnosis of 90 per cent. of the cases was infective hepatitis or psychoneurosis. Investigation showed that the surgical cases were being deliberately creamed off by C.C.S. *en route* and replaced by chronic medical conditions, and that this sorting process was possible because air passengers often had to stay overnight in a C.C.S. near an airfield. What happened was simply this. Inevitably on a long journey the aircraft touched down, and sometimes stayed overnight at several

staging posts. These staging posts had virtually no medical facilities, and for an overnight halt all patients had to be moved off to the nearest hospital, and brought back again first thing in the morning to continue the flight. In the particular case of El Adem this meant a fourteen-mile ambulance drive over shocking roads, to the C.C.S. at Tobruk, a journey unlikely to benefit most of the patients, and clearly some kind of medical staging post was needed actually on the airfield itself.

The decision to retain patients in the C.C.S. and substitute chronic cases and convalescents went beyond essential care for those patients whose condition was deteriorating and might not stand further transfer. It was part of a policy of forward early surgery which the Army elsewhere pursued with such success. But here it was mistaken because the speed of air evacuation was not appreciated. Operation under the rough and ready conditions of a C.C.S., perhaps under canvas and with desert-style sanitation, would only be a few hours earlier than treatment under the first-class conditions of a Cairo hospital, and since all patients loaded at 'Marble Arch' were carefully selected as fit for journey to base, a few hours' delay meant little to the majority, whereas the quality of specialist attention and environment might mean much. Part of the value of air evacuation was the speedy arrival in Cairo of acute surgical cases for whom rapid transfer was life-saving. Until the policy changed, however, air transport was being wasted on convalescents and neurotics who could well wait for a ship or stand the journey by road.

Another important point the survey disclosed was the need for proper reception arrangements for casualties at Egyptian airfields. Some were being flown to Heliopolis or Helwan instead of to Cairo West, and although these other airfields were nearer to hospital they had no casualty reception organisation and ran a constant risk of being flooded out suddenly with patients. It was necessary to make Cairo West a strict rule for all ambulance transport.

A big problem was the return of stretchers and nursing orderlies from Cairo to the front. Mostly they got back slowly by road, and though a special aircraft for stretchers only, say once a week, would have been the best solution, as everyone agreed, it seemed impossible to organise.

Meanwhile, on November 8, the Allies had invaded North Africa, and the war south of the Mediterranean was drawing to a close.

A classic example of the tactical value of air evacuation was provided by the turning of the Mareth Line—Montgomery's famous 'left hook'. The line ran from hills to the sea, but the New Zealand Division was able to travel over rough ground around the hills in the night, and surprise the enemy with a flank attack. The route they had traversed was impassable to field ambulances, and the Division had to rely on its own medical strength, which included a C.C.S. It had had previous experience of the working of Casualty Air Evacuation,

however, at 'Marble Arch', near Tripoli, and therefore constructed two landing strips, each half a mile long and fifty yards wide, close to its main dressing station. When, as had been expected, the casualties sustained were swamping the Division's medical facilities on the fourth day of the battle, a signal brought in five Bombays and the S.A.A.F. Lodestar with medical stores, and 420 patients were evacuated eastwards to a forward landing ground 130 miles away behind the Allied lines. Without this air service, the 'left hook' would have lacked full medical cover, which might well have imperilled its success.

It is interesting to note that at the conclusion of operations a telegram was received by the P.M.O. Western Desert from General Freyberg, commanding the New Zealand Forces, in which he expressed his gratitude to all concerned and his appreciation of the skilful evacuation of the New Zealand wounded.

The use of transport aircraft for casualty evacuation now became well established and on a large scale, and the Australian Air Ambulance Unit continued to do good work. Its activity in its best period is shown by the table below which gives a picture of a typical day's work in Tunisia. At this time the unit was based at Sfax, about forty miles from El Djem and seventy-five miles from Kairouan, and was operating four aircraft, each of which made two or three separate trips during the available hours of daylight:

TABLE

Date: April 22, 1943.

	Take off from		*No. of patients*		*Arrived at*	
Bombay L5827:—						
	Hani West,	0800 hours	20		Sfax,	1200 hours
	El Djem,	1320 ,,	17		Sfax,	1445 ,,
	El Djem,	1500 ,,	14		Sfax,	1630 ,,
	El Djem,	1655 ,,	12		Sfax,	1820 ,,
Bombay L5810:—						
	Hani West,	0840 ,,	19		Sfax,	1310 ,,
	Hani West,	1515 ,,	19		Sfax,	1720 ,,
Lodestar:—						
	Kairouan,	0810 ,,	12		Sfax,	1040 ,,
	Sfax,	1155 ,,	8		Castel Benito,	1645 ,,
D.H. 86 b:—						
	Hani West,	0815 ,,	9		Sfax,	1030 ,,
	Hani West,	1110 ,,	8		Sfax,	1310 ,,
	Monastir,	1450 ,,	1		Sfax,	1635 ,,
			139			

Only journeys carrying passengers are shown. The times quoted between take off and arrival include the total time taken to load and off load patients at both points.

In the final stage, when it was based at Enfidaville, the unit did a useful job in flying round the front line to Medjez-el-bab where an Indian C.C.S. was overflowing with Indian casualties and could not dispose of them westward to Algiers, since there were no Indian hospitals that

way. On the outward trip the ambulance carried British head injuries, on the return Indian casualties for transfer by British transport aircraft from Enfidaville down the coast to Sousse and Sfax where the Indian 8th Army hospitals lay. The head injuries were for transfer by American transport back to Algiers. Previously the American transports had terminated eastwards at Souk-el-arba; now they came forward to Medjez-el-bab. Thus the Air Ambulance Unit was able to play an invaluable shuttle rôle in linking two distinct communication routes, the transport-casualty airlines of 1st and 8th Armies.

By the close of the North African campaign therefore, about 12,000 patients had been carried since the beginning of air evacuation in 1941. In the final seven months the Americans with their organisation modelled on the British had carried approximately another 18,000 cases. What may be termed the experimental phase in the development of casualty air evacuation only ended, however, after the invasion of Sicily, and before proceeding to any discussion of problems and techniques, it will be appropriate to describe briefly the planning and execution of operation 'Husky'. (Code name for the invasion of Sicily.)

SICILY

At the planning conferences before the invasion, the Army estimated that about 7,000 casualties might be incurred in the actual landings, while the R.A.F. medical authorities announced that if all the returning aircraft of the combined R.A.F.—U.S.A.A.F. transport fleet were utilised, 5,000 patients a day could be evacuated from Sicily to North Africa. This was based on the already successful practice of 'freight up and casualties back' used in the North African campaigns, and on the proviso that only aircrew movements were to take precedence over casualty evacuation, in the empty transports returning to Africa for further freight loads. It was thought that this evacuation could start on D-day plus 2, i.e. two days after the beginning of the invasion.

Although the D.G.M.S. Directive of October 21, 1942, had stated that the care and handling of patients on airfields would be an R.A.F. responsibility, this was as yet impracticable owing to a shortage of the necessary R.A.F. medical personnel, and for the Sicilian operations the Air Reception and Evacuation Units (A.R.E.U.) as they were then called, were provided by the Army; field ambulances were stationed at advanced and rear transport terminals and at base, to provide the necessary attendants in the aircraft as well as care on the ground. These A.R.E.Us. were to work alongside the freight-handling Air Despatch and Reception Units of the Transport Groups. In addition, wing evacuation centres were formed on the forward fighter airfields (controlled by Nos. 322, 324, and 244 Wings respectively) by pooling the squadron medical

facilities in a common wing sick quarters; these were of course wholly manned by the R.A.F.

The Army at first asked that as far as possible all serious cases should be kept together, so that some aircraft would carry only stretcher cases, others only walking wounded. Since only the former would require medical attendance by orderlies in the air, this would economise in medical man-power. The R.A.F. pointed out, however, that where many stretcher cases had to be loaded on or off a single aircraft, great delay would result while all the stretchers were manhandled. There was the risk also of an aerodrome becoming cluttered with stretcher cases waiting to make up full aircraft loads. It was agreed, therefore, and subsequently found to work well, that no more than one motor ambulance load should be put into each aircraft. Thus a C.47 would carry four or five stretcher cases and fourteen walking cases, and loading would be complete in five minutes.

As a preliminary to the main operation, it was necessary to free beds in the North African base hospitals, and the R.A.A.F. ambulance aircraft were able to play a useful rôle in this. The movement of 400 patients westward passed unnoticed where the use of an ambulance train would have excited comment among the civilian population and jeopardised the secrecy of the invasion.

So much for plans and preparations: the practice was rather different. D-day was July 10, 1943, and little resistance was encountered in going ashore, so that far from the initial casualties being numbered in thousands, the British suffered barely 400 and the Americans a similar number. The first transport aircraft landed at Pachino (Sicily) on D-day plus 3, more or less on schedule, and the following day the first sixty-five casualties were evacuated to Africa. This was not maintained, however. Transport aircraft continued to bring in supplies on all the succeeding days, but the number of casualties transported back was very small. From July 15 to 18 inclusive, the grand total of patients carried was sixteen, and it was not until July 22, when 101 cases were lifted in twenty-four hours, that air evacuation began to get under way.

This twelve days' delay may have been due in part to the unexpectedly low casualty rate. It was also due to lack of understanding of the organisation by field dressing stations and C.C.Ss. in the vicinity of the forward transport airfields. There had been time in the first three days of the invasion to brief local army medical units to have cases ready for transfer at a moment's notice when transport touched down, since aircraft would never wait, and to explain that only adequately resuscitated cases would be accepted. But as the battle developed, the units moved and were replaced by others completely ignorant of the technique of air evacuation. In consequence, there was no supply of patients for airlift.

But probably the most important reason for the early failure of air evacuation was the difficult nature of the country. Very soon the fighting was too far away along difficult mountain roads for casualties to be easily brought into the transport airfields, and it was only when the R.A.A.F. ambulance unit had begun to operate in Sicily after July 18, that the wounded began to flow back regularly. The ambulance aircraft started a shuttle service backwards and forwards, principally between Lentini, a forward fighter airfield, and Cassibile, the Advanced Air Transport Centre near Syracuse. The two were forty-five miles apart by road, but only twenty minutes by air, and No. 322 Wing at Lentini was able to send back to No. 159 Field Ambulance at Cassibile a total of 1,918 patients in the three weeks of the shuttle's operation.

Even with this arrangement, evacuation was by no means perfect. The most forward airfields took time to repair (it was customary for forces retreating to mine and plough up airfields and strips), and the light ambulance aircraft could not always get right to the actual area of fighting, in which case the orthodox lines of communication were still preferred for moving wounded. Thus on August 15, casualties were evacuated from Catania by hospital ship, rather than go a further twenty-five miles over indifferent roads to Lentini and thence by air to Cassibile and Tripoli or Tunis, in spite of the fact that the sea voyage was so much slower. On an earlier occasion, however, air evacuation had proved its worth in an emergency; hospital ships had failed to arrive on time at Syracuse, and transport aircraft were hurriedly and specially summoned to empty the overcrowded C.C.Ss., thus relieving an awkward situation.

A minor problem encountered was the fear many patients had of flying over the sea in undefended aircraft, and propaganda to reassure them had to be prepared. In fact, Allied air superiority was such that not a single casualty was lost in the whole of this campaign.

In addition to the Lentini Shuttle, the Air Ambulance Unit also visited Francesco and Pachino airfields, in some cases flying patients direct to Luqa (Malta). Here an air evacuation centre had been set up, as transport aircraft often landed to refuel, and any patient not travelling well could be transferred to hospital at once in Malta instead of continuing to Africa; in fact, over 600 cases were so retained.

By the end of the campaign as a whole on August 21, 1943, approximately 9,400 men had been lifted out of Sicily by the combined U.S. and R.A.F. air transport fleets; of this number, just over 2,000 had also been carried in the R.A.A.F. Ambulance Shuttle. Since a good deal of redistribution by air went on also in Africa, the total number of air passenger movements was very much higher, of the order of 16,000, for the same man was carried by different aircraft at different stages of his journey and appeared as a separate person in the returns made of each flight.

What stands out in this operation is the considerable service rendered by the R.A.A.F. Air Ambulance Unit, working always with obsolete aircraft, few in number and in constant danger of serious mechanical failure. This was to be their last contribution to the war. After the finish of the Sicilian campaign, their six Bombays were judged unsafe for passengers and the special low (77) octane petrol for their two D.H. 86's was no longer obtainable. The unit was left with two Lodestars and moved with these and the Bombays to Italy at the end of September. There they carried a certain amount of medical freight in the Bombays, and a few patients on occasion from Naples to Bari (their base) in the Lodestars, totalling twenty-three in all for the month of November. After that, the aircraft became completely unserviceable and further replacements could not be obtained. Eventually the Australian Government decided to withdraw them home and they finally left Italy in February 1944. The unit had to its credit the movement of 8,252 casualties during its time in the Mediterranean area.

PROBLEMS AND SOLUTIONS

On a single day in 1943, the Desert Air Force shot down fifty-seven JU 52 German transport aircraft and fighter escorts. This fact is a reminder of the importance of air supremacy for the successful working of large-scale casualty evacuation by returning freight aircraft.

Given this supremacy, such working is an economical way of removing the sick and wounded and compares favourably with other techniques—a sea crossing by hospital ship, for instance. This movement is not only much quicker, it is more economical in man-power in general. It might have been expected that bad weather would hinder air traffic more than movement by sea, but surprisingly, in the invasion of Normandy (1944) at least, the reverse was found to be the case.

The question of whether to display the Red Cross was much discussed. It was clearly impossible to paint ordinary transports white (in accordance with the rules of the Geneva Convention), though it was possible for them to display temporary red crosses when carrying wounded. The main argument was over the use of red crosses on purely ambulance aircraft, which carried only medical stores (e.g. blood for transfusion) in addition to patients, and were therefore in a special category. Once the policy for these was laid down, the policy for transports followed naturally.

Those in favour of following the Geneva Convention argued that the sight of an air ambulance in white with red crosses prominently displayed would be very heartening to the morale of troops, a visible symbol of medical aid, close at hand. They thought too, that operational commanders would be more prepared to let such an aircraft into an actual zone of warfare than they would a light aircraft painted like any other

warplane. On the other hand, commanders had been known to appropriate aircraft provided primarily for ambulance work and put them to other uses on the plea that this must be in order since they were part of a Communications flight—and this diversion could hardly happen if the machines were distinctively painted.

Against the scheme for distinctive markings was the risk that white aircraft would give away the site of an otherwise carefully camouflaged airfield: perhaps hessian screening would have lessened this danger. Aircraft not painted white, but with red crosses on the wings, were liable to be mistaken for German aircraft with black crosses, and shot at by Allied anti-aircraft gunners and fighter pilots. There was also a fear that the enemy would make a dead set at aircraft which advertised their defencelessness with medical signs—a fear due to a belief that the enemy had no respect for the Red Cross, though the evidence suggests rather that genuine mistakes were made by enemy pilots who found difficulty in recognising the detail of aircraft markings at a distance during the aerobatics of warfare.

The experience of the German Air Force is interesting in this connexion. At first the JU 32's of their ambulance flights were painted in full accordance with the Geneva requirements. But the difficulty over airfield camouflage led to repainting as transports, with the addition of a red cross on a white ground on the wings and fuselage, and in 1943, after numerous attacks on ambulances on both Western and Eastern fronts, the Red Cross emblem was abandoned altogether. The head of the Medical Service of the Luftwaffe reported that he was himself attacked while flying to North Africa in an ambulance aircraft marked with red crosses, though the Allied pilot later flew off when he realised his mistake.

The R.A.F. solution finally adopted was in line with this experience. The aircraft of the air ambulance unit were painted with the usual R.A.F. roundels but in addition carried red crosses at certain positions, notably fuselage. All other aircraft which at any time carried casualties had no distinctive marks at all. In any case, after the early days—the end of the North African campaigns—air supremacy was such that no patients were ever lost through enemy action.

The use of returning freight aircraft as ambulances had two important organisational consequences. One followed from the fact that transport aircraft never reached forward as far as the front line. The forward fighter airstrips either had runways too short for large aircraft, or, where these were satisfactory, there was no marshalling space to park large aircraft if they landed. But many casualties occurred near these fighter bases. The result was the need for a forward shuttle of light aircraft which could carry the wounded back to the transport terminal—the rôle played by the R.A.A.F. air ambulance unit in Sicily.

The second consequence of the use of freight aircraft engaged on ordinary transport runs was the need for patients to be ready awaiting their aircraft, actually on the airfield. A medical holding unit for them had to be developed, and when the R.A.F. accepted responsibility for this, officers, men and equipment had to be found.

The D.G.M.S. Directive of October 21, 1942, took some months to reach the Middle East and North Africa; in fact, the Army medical authorities there did not become aware of it, or at least take notice of it, until D.G.M.S. gave them copies during his visit in March 1943, when they began to press for the R.A.F. to take over the function for which it had agreed to accept responsibility. Within the R.A.F. itself, discussions on manning slowly got under way earlier than this, though they were given some urgency by the Army's request and by the approach of fresh operations—the invasion of Sicily—in mid-July.

The Casualty Air Evacuation Unit, as it came to be called, was envisaged as of modest dimensions. It was to cater for about thirty patients, and was to be completely mobile in two lorries which could become the pivots for canvas pent-houses. The establishment proposed was one medical officer of the rank of flight lieutenant and thirty-two airmen comprising six nursing orderlies, twelve A.C.Hs. to act as stretcher bearers, and the rest made up by drivers, cooks, mechanics, a clerk, a wireless operator, and other necessary helpers. It was thought that three such units could rely on one mobile field hospital as parent, and that the latter would in addition carry on its strength a number of nursing orderlies as air ambulance attendants. These attendants would only travel on those aircraft which had gravely ill patients aboard, where trained attention in flight was likely to be needed.

The Americans in North Africa provided a qualified nurse for each transport aircraft carrying casualties. The R.A.F. had not the nursing sisters to do likewise, but it seemed desirable to attach one or two if possible to each air evacuation unit to supervise the nursing of seriously ill casualties while they awaited transfer, for although these units were expected to confine their medical work to resuscitation (blood and plasma transfusions), maintaining the patients for a further four hours or so, C.C.Ss. would not be willing to send their serious cases for air evacuation unless they were certain of skilled handling *en route*.

A message from H.Q. Middle East to Air Ministry dated June 14, 1943, put the matter briefly thus:

'Estimate that maximum 6 such units will be required together with a pool of 42 nursing orderlies making grand total of 6 medical officers and 234 airmen. Will also require 30 additional ambulances.

'If you intend us to undertake these responsibilities in the forthcoming operations request immediate despatch personnel, and arrangements regarding vehicles.'

Air Ministry replied that Middle East had been informed by signal on April 1 of the general man-power shortage, and since on June 15 their medical personnel were 99 per cent. of establishment, while there was a 15 per cent. deficiency at home, he felt that they should manage somehow with the men they already had.

The Director-General of Medical Services also at first felt that this should be possible. He suggested that mobile field hospitals themselves should do duty as casualty air evacuation units, criticising their tendency to act as static hospitals, and pointing out that in addition to a total of six M.F.Hs. now available in North Africa, they had five R.A.F. hospitals each of 300 beds. The expected commitments in air evacuation should surely not be greater than they were when there were only four M.F.Hs. and one hospital.

Middle East replied by correcting some misapprehensions. They had only four M.F.Hs. (the other two in North Africa being under N.W.A.A.F. control) one of which was actually running one of the five R.A.F. hospitals until the proper personnel for the latter arrived from England. A hospital should not be placed actually on an airfield which might be a military target, and a casualty air evacuation centre, on the other hand, was useless two to five miles away. To make an M.F.H. into one or more C.A.E.Cs. was wasteful of specialists, and since it was established to do one job, namely medical and surgical care of the sick, it would be ill-equipped for another—air transport loading. In any case, the R.A.F. had been co-operating with the R.A.M.C. by placing M.F.Hs. where there were no Army hospitals; to remove them and to convert them to C.A.E.Cs. replacing the R.A.M.C. units at present acting in that capacity, was merely robbing Peter to pay Paul. Finally, Middle East disagreed with the view that the air evacuation commitment was not a growing one. Since many transport aircraft now existed and were often empty on the homeward run, surely every effort should be made to fill their space with casualties, and so gain the maximum benefit both operationally and individually, from the organisation which had grown up. They added that this organisation was working well and that D.M.S. (Army), Middle East, had agreed that the R.A.M.C. should carry on its part as heretofore until R.A.F. man-power improved.

The Director-General of Medical Services at Air Ministry now called a staff conference on the subject, and as a result was able to make fresh proposals for the future. New units, officially called Casualty Air Evacuation Units, were to be formed, based on M.F.Hs. or independent, and the personnel and equipment were to be obtained by turning a certain number of projected new M.F.Hs. into two C.A.E.Us. each. Thus an agreement on July 5, 1943, had been made to supply Tactical Air Force with three M.F.Hs. per Composite Group. This would now be

changed to two M.F.Hs. plus two C.A.E.Us. with a gain in mobility and elasticity and a saving in staff and transport requirements.

In view, however, of an overall shortage of man-power, and of the fact that Transport Command was providing forward staging posts (F.S.Ps.) to unload freight at aerodromes on the Continent, when these should be in Allied hands, it was later proposed that each C.A.E.U. should form an integral part of an F.S.P. and share the establishment of cooks, clerks and A.C.Hs.; thus the C.A.E.U. was to be merely a medical section of the F.S.P. with two medical officers and twelve medical orderlies, but with a lien on a further twenty-six men when the evacuation of casualties demanded it.

These proposals were approved in principle by the Air Member for Personnel and the Director-General of Organisation, and accordingly planning for C.A.E.Us. for the invasion of France in 1944 now went forward. The request from Middle East, though it had resulted in no change of organisation for the invasions of Sicily and Italy, had stimulated an exchange of views and drawn attention to the need for more thought and planning which was to bear fruit the following year.

Many other matters received attention at this time. Stretchers had to be standardised, for American and British general service stretchers were of different dimensions, while those of the Australian air ambulances had been different again, complicating the design of aircraft stretcher racks.

Air ambulance orderlies had to be trained. At first air attendants had been provided partly by the R.A.M.C., from anyone available at the time of take-off, and the majority of aircraft carried no medically trained persons. Then the training school at Hendon underwent expansion. This School had existed rather informally since March 1942, giving six orderlies at a time a month's course.

It had grown from the time when the first war-time air ambulance had been based at Hendon, and a need for special orderlies to go with it had arisen, and then a further need for more orderlies for the other machines subsequently established. In September 1942, the training was put on an official footing with the S.M.O., Hendon, as Officer-in-Charge of the School, and twenty-five orderlies came through each week for a shortened course. By June 17, 1943, some 605 R.A.F. and 391 W.A.A.F. had passed through. On that date the Air Ambulance School was rapidly re-organised on the express instruction of D.G.M.S. It now came under the Medical Training Establishment and Depot, who provided the instructors and supervised the syllabus, though it continued to lodge at Hendon until it was closed in June 1944, when it was estimated that at least 1,500 men alone had received training.

This course lasted about 30 hours, including 5½ hours on practical first aid (stretcher drill, splinting, artificial respiration, the use of

morphia) and a further 1½ hours on blood transfusion methods; lectures of one hour each on freight handling, M.T. convoy discipline, sign-posting, functions of R.A.F. and Army field medical units, map-reading, and the treatment of gas casualties; lectures of two hours each on elementary sanitation in the field, stretcher loading of different types of aircraft, setting up and storage of tents, equipment and documentation. The course was completed by a half-day's field exercise, and as much air experience as weather permitted, enabling orderlies who suffered from continued air sickness to be withdrawn from the course. A passing-out examination selected, from all those who completed the full programme, the orderlies actually most suitable for the work.

The active service kit of each orderly came to include a parachute pack and harness, a 'Mae West', tin hat, first-aid box, and the two air ambulance panniers, (*a*) containing urine bottles, bed-pan, hot-water bottles, torch, etc., and (*b*) thermos containers for hot tea, sandwiches. The details were later further altered.

Documentation of casualties in transit was modified gradually in the light of experience. At first, attempts were made to book each patient in and out of the Admissions and Discharges Register of each air evacuation centre, just like any sick personnel admitted for treatment to a hospital or sick quarters. At the same time, ordinary aircraft passenger lists (F.1256) were prepared in sextuplicate at the forward staging post (transport terminal), one each for S.M.O. Transport Group, P.M.O. Tactical Air Force (responsible for forward zones) and A.D.M.S. local areas, one for the unit file, and two copies for transmission by the aircraft captain to the medical officer at the rear transport terminal, who kept one copy and forwarded the other to hospital with the patients.

In the Sicily campaign, this procedure was proved to be quite impossible to work. Aircraft arrived suddenly with little warning and left promptly after speedy loading, and in the rush the cumbersome documentation suffered; it was impossible also to anticipate most of it, since the passenger list for each aircraft was never known till the last minute, when the number of ferry crews for return became known, for they, it must be remembered, had absolute priority.

In late 1943, a duplicate ticket system was therefore suggested, one half to be collected from each patient on emplaning, the other half being given up on arrival. Nominal rolls on F.1256 could then be made up at leisure from the collected tickets, during slack periods. The forward staging post (F.S.P.) was to prepare four, one each for P.M.O. of the Tactical Air Force (T.A.F.) and A.D.M.S. forward area, one for Transport Command competent medical authority, and one for file. The airfield of arrival made seven—for hospital, for Transport Command (base) medical authority, for Army, for Navy, for Air Ministry, for airfield competent medical authority and for file. Unfortunately this scheme

still left an enormous burden of clerical work on a unit which had long periods of intense activity disposing of patients.

The ticket idea, however, was a good one and by February 1944, the whole routine had been simplified on this basis. The A. and D. book was done away with for patients passing through for evacuation. The ticket, F.2074, was in triplicate similar to one already in use by the U.S.A.A.F., with little more than number, rank and name and aircraft number and unit stamp on it. Part A was torn off and retained by the emplaning F.S.P., Part B torn off at the airfield of arrival, Part C taken by the hospital of reception and returned to the casualty air evacuation unit of arrival as receipt for safe admission. From the Part A or B the casualty air evacuation unit could at leisure prepare its nominal roll of arrivals or departures, in triplicate, one for S.M.O. Transport Wing (to which the aircraft belonged), one for file, and one for S.M.O. Transport Group. To the last-named was transferred the responsibility of notifying the War Office, Admiralty, and other interested authorities of the names of patients carried. Thus the paper work was largely transferred to the part of the organisation best fitted to cope with it—the Group Headquarters.

NORMANDY, 1944

Planning for Operation 'Overlord', the re-entry into North-West Europe, first envisaged in 1942, was thus already under way by the end of the Sicilian Campaign. It had all the advantages of previous experience of air evacuation, summarised in specially prepared reports on the Western Desert and Sicily, while in the Medical Directorate-General at Air Ministry and among the medical officers of Transport Command were men who had served in France in 1939–40, in the Western Desert and in North Africa. The general duties officers concerned in planning had also for the most part experienced active warfare and been convinced of the value of air evacuation. One of them wrote:

'The underlying principle of casualty evacuation is not so much the seriousness of the casualty as the need for creating space for more casualties. In other words . . . preventing the formation of bottlenecks.'

Another new feature of the general atmosphere was the willingness to experiment. A report dated December 10, 1943, discusses the practicability of using glider ambulances, and even of glider-borne mobile hospitals. The idea was that the glider could be a fully prepared operating theatre and would have the advantages of warmth and weather resistance, compared with an operating tent; unfortunately, though, it was more vulnerable.

Various types of glider were considered. Hamilcars, with a high landing speed (75 m.p.h.) and difficult handling on the ground, required large aircraft tugs of which there were few available. Horsas (landing speed 55 m.p.h.) were towed by Dakotas and were altogether more

suitable, but in the end they were not used, because, although a Dakota towing a Horsa meant a much larger load of casualties than a Dakota could carry by itself, the combination was much slower, less manoeuvreable, and more vulnerable to air attack. The Hotspur was more promising since it could be towed by a Spitfire and could have carried casualties back to the F.S.P. from a forward fighter airfield—the forward shuttle. Other developments, however, were promising, and for the time being the glider programme dropped.

A prime factor in the planning was naturally the number of casualties to provide for. The War Office suggested that the Royal Air Force should carry 10 per cent. of the daily expected wounded, or about 200 casualties a day. For every 50,000 troops engaged they then reckoned on four stretcher cases and two walking wounded for return by the forward shuttle, and twelve stretcher cases with eight sitting cases for return in the main shuttle.

It was decided therefore at Air Ministry to make plans to move a maximum of 600 casualties a day. All transport Dakotas would be fitted with stretcher racks or later with special webbing supports, which would easily and quickly stow away or let down, as required, and these aircraft would operate the main shuttle. For the forward shuttle there was a choice of several types. Seventy aircraft from Anti-aircraft Command* were fitted with a special loading door above the port wing and could be quickly converted inside to carry two stretchers and an attendant, a modification devised by a sergeant at Hendon. These had been allotted to the European theatre of operations. There were also a number of obsolescent Harrow bombers which had been 'gutted' and renamed Sparrows, carrying fourteen stretchers each. It was decided to use these in the first instance, and a flight of six aircraft was formed for the forward shuttle, an ambulance flight in fact but not in name. The other aircraft were in reserve; thus it was planned, for instance, to use the Ansons when Dakotas were tied up exclusively in special operations involving the parachute dropping of supplies and troops.

No. 46 Group of Transport Command was to have the task of carrying all the freight and casualties for the invasion. It was formed on January 17, 1944, with its three main base airfields in the United Kingdom at Down Ampney, Blakehill Farm and Broadwell, all close to Swindon and to Royal Air Force Hospital, Wroughton. It was planned that each of these stations should handle 200 incoming casualties per day, and that each should have a special casualty air evacuation centre attached to the sick quarters for the reception and disposal of patients. In addition, R.A.F., Watchfield, was prepared as a fourth centre, to be used when the main bases of No. 46 Group were 'sealed' for security reasons just

* These aircraft (Ansons and Oxfords) were co-operating with the Army in anti-aircraft training.

before and during periods of airborne operations. Provision was also made of a list of relief landing grounds to which aircraft could be diverted in case of bad weather, overcrowding, or accident. These diversion airfields were chosen so as to be as near as possible to some Royal Air Force hospital or special medical centre, and the medical officers at each were briefed on the duties they might have to perform, and extra equipment was supplied.

The main base casualty air evacuation centres (C.A.E.Cs.) were expansions of existing Nissen-hutted sick quarters, the kitchens with extra ranges being able to cook for 300 or so, and the medical staff, with the addition of a graded surgeon, nursing sisters, and more orderlies, able to do the additional medical work. Thus at Blakehill Farm the enlarged staff consisted of five medical officers and seven sisters, as well as thirty-five air ambulance orderlies under a sergeant; two-thirds of these orderlies were women.

The centres were planned to be in tents, but fortunately at Down Ampney it was possible to make local arrangements to take over some contractor's wooden huts scheduled for demolition. Blakehill Farm and Broadwell both suffered greatly from the temporary nature of their accommodation, which was unsuitable for a normal cold wet English summer, let alone the autumn and winter which followed. The tents leaked, they could not be satisfactorily heated by oil stoves, and there were difficulties about lighting them, especially at night.

Tents were inevitable for the mobile C.A.E.Us., which went forward alongside the freight-handlers of the forward staging posts, though attempts were always made to commandeer suitable permanent buildings near the airport at which they were working. The hospital consisted of a number of ridge tents which gave cover to eighty patients and a staff including two medical officers and eleven nursing orderlies under a sergeant, fourteen A.C.Hs., drivers, cooks, a carpenter, a clerk and a motor cyclist; while transport consisted of three 3 ton trucks, a jeep and a motor-cycle for the advance party, and four ambulances and a water tanker for the rear.

The F.S.P. operated at the forward transport terminal, where the forward shuttle and the main shuttle met, while for the front line end of the forward shuttle no special handling party was devised as it was expected that local units would be able to hold and load their own small groups of casualties. Main base airfields and transport aircraft were under Transport Command orders, while 2nd Tactical Air Force controlled forward transport terminal and forward shuttle, but not the F.S.Ps. This led to some friction and continued discussion during actual operations; 2nd T.A.F. argued that since it was responsible for the whole invasion terrain, medically it ought to control all units in it, and the C.A.E.U. of the F.S.P. ought therefore to be a 2nd T.A.F. unit, for

if extra staff or equipment were needed, 2nd T.A.F. would in any case have to supply them. However, the advantages of unified control of the main shuttle under Transport Command were felt to outweigh this counter claim for unity until considerably later, when the main effort of Transport Command was shifting to South-East Asia.

D-day for Normandy was June 6, 1944. By the end of January road improvements were already in progress at Down Ampney and Blakehill Farm, and the necessary domestic developments decided and started. Early in February liaison visits were paid by the Principal Medical Officer, Transport Command, accompanied by the Senior Medical Officer, No. 46 Group to the D.D.M.S. of the 1st (Canadian) Army and D.D.M.S. 2nd Army, who were presented with copies of two pamphlets, *Principles and Practice of Casualty Air Evacuation* and *Casualty Air Evacuation for Medical Officers*, which had been produced by Headquarters, Transport Command. In the middle of March the F.S.Ps. moved to their assembly posts: No. 91 F.S.P. to Down Ampney, No. 94 F.S.P. to Broadwell, Nos. 92 and 93 F.S.Ps. to Blakehill Farm (No. 92 later went to Watchfield), and an exercise, 'Blighty', was held April 4–8 to test them out. Movement by road and air, unpacking and setting up, communications and maintenance were all tried out and timed, and it was shown that they could be ready to receive casualties within three hours. Now the British Red Cross Ambulance arrived, and the Army moved in ninety ambulances and six troop carriers, and road transport arrangements were complete. An exercise, 'Pickford', was held towards the end of April to practice on- and off-loading, and in this No. 5 C.A.E.U. (a 2nd T.A.F. unit) and the nucleus of a Canadian air evacuation unit also took part. Exercise 'Shuttle' on May 22–23, included nursing sisters and practised the removal of patients from aircraft, their sorting, treatment and disposal and showed that, contrary to previous intention, it was better to move all patients straight to the air evacuation centre and sort them there, rather than try to examine and classify them on the tarmac as they came out of the Dakotas. It had been intended to wind up this exercise with another, 'Beecham', in which the Army would practise the removal of 200 patients from three main base airfields, but this was cancelled.

The experience thus gained was the subject of several discussions between Royal Air Force, Army and civilian Emergency Medical Services, who were to accept the casualties into their hospitals. (*See* Emergency Medical Services, Volume I, Chapter 6.) In general, satisfaction was expressed with the arrangements with one exception, that the special ambulance train facilities were not ready. As many patients as could stand the journey and the delay in treatment were to go by train from Shrivenham (Wiltshire) to E.M.S. hospitals in the Midlands, and an extra siding was to be built at Shrivenham so that a train could

always be waiting. Three days before D-day, work on it had not begun, and it was only ready eventually in the last week in June, nine days after casualty air evacuation had started. Its absence threw an extra strain on the C.A.E.Us. which had to hold 100 patients or so overnight, instead of emptying completely at the end of each day, ready to start the morrow afresh. It is true that, contrary to Sicilian experience, the planners had insisted that air evacuation would only start on D-day plus 40 and had this been so the railway would have been ready in time. Repeated attempts to persuade the Allied Expeditionary Air Force (A.E.A.F.) and Air Ministry that organised air evacuation should start as soon as the first transport entered the beachhead had been unsuccessful and efforts to obtain permission for forward shuttle aircraft to go in on D-day plus 2 had proved equally unavailing. The first three Dakotas, complete with W.A.A.F. air ambulance orderlies, landed in Normandy on D-day plus 7, and on the evening of that day the first twenty-four patients were flown to Blakehill Farm. The flow built up rapidly in the succeeding days and since No. 93 F.S.P., which was to move into the beachhead by sea and act as forward evacuation terminal, had not yet arrived, improvisation was once again the order of the day. This account of events by the officer placed in charge of the improvisation gives a good idea of the emplaning and of casualty evacuation in its first three weeks:

'There was in existence an elaborate scheme which called for advanced casualty air evacuation units feeding forward staging posts (of Transport Command), which were, in turn, to fly the patients to England. The personnel of these units were trained for their task and keen to perform it; but as yet they were not in France and not likely to be for many days. Moreover, at that time, a unique situation confronted us, a situation which can best be explained by a review of the T.A.F. organisation for making and manning airfields after the Invasion.

'In brief, such an operation consisted of three phases. First an advanced party arrived by sea to co-operate with the Royal Engineers in preparing the airfields. Thereafter, when Phase 1 was complete, came the main party—again by sea. This was Phase 2. Lastly came Phase 3—the "Air Lift"—comprising the rear guard, essential persons, supplies and apparatus. The "Air Lift" party was flown in by Dakotas of Transport Command, usually twelve to fifteen in number. Let it be emphasised, therefore, that each airfield had one "Air Lift" only. These Dakotas, when unloaded, were available to transport material—human or otherwise—back to the United Kingdom.

'Such was the general plan; and the S.M.O. of No. 83 Group decided to use the aircraft for transporting wounded to England. There were two courses open—the first that the aircraft, after unloading their "Air Lift" party at an airfield, should fly to a central evacuation point and emplane casualties, the second that casualties should be emplaned at the

strip at which the "Air Lift" disembarked—that is to say a different strip each day. Of the two, the former course commended itself for simplicity of organisation, but was vetoed by the A.O.C. for operational reasons; so that the second plan had necessarily to be adopted.

'Now clearly, to achieve the best results, one unit had to be charged with the responsibility of receiving and emplaning the wounded. Moreover, this unit must be highly mobile if the casualties were to be successfully emplaned at points far apart on succeeding days. Provision must be made, also, for holding the men if the weather or battle conditions suddenly changed, and they must be given food after their long journey by ambulance.

'This then was the situation governing the conduct of the evacuation. We began in a small way. Three Dakotas were scheduled to land at B.2 airfield (Bazenville) on June 13. Fifty walking wounded were called forward from an Army C.C.S. to fill them. As acting S.M.O. of the airfield I was instructed to see to the loading. The aircraft were due to arrive at 1000 hours and the arrangements were made accordingly. The walking wounded were to be transferred directly from their transport to the aircraft. Suddenly, however, the estimated time of arrival (E.T.A.) was changed to 0600 hours. Nevertheless, the arrival and loading of the casualties were achieved in good time. Unfortunately the weather became unfavourable at the United Kingdom bases and we were forced to unload (to the great disappointment of the men) and send them to No. 52 Mobile Field Hospital for safe keeping. Towards the afternoon conditions improved and we were able to re-load and despatch the flight by 1600 hours.

'This day taught us two things—firstly that the reported E.T.A. of our aircraft was most unreliable, secondly that we must be prepared to hold cases for a considerable time. Of these two, the first became more and more exasperating in succeeding days and was in great part due to bad liaison between the United Kingdom and Normandy. Not only were we never certain when aircraft would land, but which is worse, we frequently were to get conflicting information where they were going to land. Our task was thus complicated very considerably.

'The success of this initial venture decided the S.M.O. to form an air evacuation unit to take advantage of the "Air Lift" parties due to arrive in the days ahead. The unit chosen was the advanced surgical team of No. 50 M.F.H. excluding the specialist members—that is to say the surgeon, anaesthetist and theatre staff. The officer in charge was myself. The unit totalled one officer, two sergeants, one corporal, six airmen and a despatch rider. We were given advanced surgical team equipment, excepting only the operating theatre. The vehicles at our disposal were one three-tonner, two ambulances and two motor-cycles.

'It is convenient here to give a brief description of the aircraft used for

evacuation work—the twin-engined Douglas Dakota. Quiet and steady, the type is admirably suited for transporting wounded. The fuselage is equipped with eighteen stretcher racks in tiers of three. When they are not needed, the racks fold neatly away and leave seating accommodation. The normal casualty load is eighteen stretcher cases and six "sitters", but with seats in place and the stretcher racks folded, there is the alternative load of twenty-eight, on short hauls, with only small petrol needs. Each aircraft carried pilot, navigator, wireless operator and nursing orderly, W.A.A.F. or airman. The orderly carried the normal air ambulance scale of equipment, including the emergency oxygen apparatus. All types of cases were carried by air, but severe sucking chest wounds and patients with abdominal section (up to ten days after operation) were excluded as far as possible.

'Our scratch team (of the ten of us only two, both L.A.Cs., had ever previously approached an air ambulance) was formed on June 14 and despatched at once to B.3 airfield (St. Croix-sur-Mer) to take advantage of an "Air Lift" scheduled for June 15. We found the airfield in a stage of flux! No. 126 Wing were on their way out and No. 144 on their way in. The C.O. of No. 144 Wing, despite his preoccupation with his airfield problems, was most helpful and gave me *carte-blanche*.

'The site we chose was an orchard some 400 yards from the air strip, conveniently linked by roads with the marshalling area and the main road to the camp. We sign-posted the route with fifty M.F.H. signs and set up our hospital marquee and cookhouse. The casualties began to arrive at 0800 hours the following morning. It seemed to me that there must be four phases in an evacuation: one, receive the patients; two, a hasty examination to see that the cases were fit for flight; three, feeding and comforts; and four, loading. With nine men only at my disposal, some system was essential. On this first day we did our best to form a pattern which, with modifications as we gained experience, might become our routine.

'The patients, on arrival at our orchard, were hastily examined in the ambulance. Any unsuitable cases—colostomies, recent abdominal sections, etc., were weeded out. Meanwhile, tea, chocolate and cigarettes were taken around and a meal was in preparation. The senior N.C.O. and the despatch rider (D.R.) were engaged in maintaining the flow of ambulances to the centre. The aircraft duly arrived and when they were unloaded I selected one L.A.C. as master of ceremonies, whose job was to stand at the approach to the aircraft marshalling area and to apportion patients to the aircraft under my general direction. Four aircraft at a time were to be loaded and one of my staff was assigned to each of these aircraft to supervise the loading. For the actual stretcher bearing we were forced to rely on the assistance of the large number of casual people who inevitably gather round large aircraft on the ground. Helpers fortunately

were not lacking. Meanwhile, one sergeant on his motor-cycle was to keep sufficient ambulances moving from the centre to ensure a steady flow without congestion at the marshalling area. The other senior N.C.O. was in charge of the centre. With this plan we succeeded in loading 115 patients (seventy of them stretcher cases) in forty minutes. The crews of the aircraft were most helpful. They handled stretchers, did anything they were asked and co-operated to their utmost. Indeed everyone on the airfield was anxious to help the unfortunate casualties in any way. This attitude encouraged us considerably.

'The start we had made was satisfactory; but it also served to show just how much we had to learn. I was most gratified with the excellent way in which each man in the section worked and the great keenness displayed. The S.M.O. of No. 83 Group was a tower of strength and, like a conjuror, produced anything for which I asked. After the aircraft had left, our other sergeant was despatched to the detail issue depot (D.I.D.) to fill up our coffers; and thereafter this excellent man cajoled each D.I.D. into giving us most generous supplies of everything—from enamel mugs to cigarettes.

'In the evening we packed up and moved to B.2 (Bazenville) ready to receive at 2100 hours. We selected a site some 300 yards from the strip and well served by roads. Red paint (secured from the neighbouring G.C.C. Sick Quarters) and "compo" lids gave us signs of our own—"TO AIR EVACUATION UNIT"—and these we proudly displayed on all the routes serving the airfield. The Army Police on point duty were informed that a large number of ambulances were to be directed to us in the morning. When I returned I was dismayed to find a Spitfire taxiing into the middle of our centre, for dispersal, but the pilot promised to move it in good time.

'By 1000 hours on June 16, we held 160 patients, 130 of them stretcher cases. They were provided with refreshments and eventually lunch. The more serious cases were unloaded into the hospital marquee and the ambulances released. The E.T.A. of the aircraft was given as 1415 hours but changed to 1545 hours. Meanwhile, more ambulances arrived and we eventually loaded 220 men in forty minutes. We were improving. One notable feature was the presence of a piper who was prevailed upon to play the wounded into the aircraft, to the great joy of the press and camera-men. That night we set off to B.5 (Camilly) to load the No. 121 Wing Air Lift. The airfield was reputed to be under shell fire.

'Two hundred and sixty-seven cases arrived in the morning (June 17) but as soon as the aircraft landed the shelling began. We started loading, but the firing became rather accurate and some of the casualties were, understandably, agitated. When one of the Dakotas (fortunately empty) was blown up, we decided to leave. The aircraft flew to B.2 and the remaining casualties were transferred and loaded there.

'All this time occasional Dakotas and Ansons landing at airfields were filled with casualties by the local medical officers, notably at B.2. The Army D.D.M.S. was greatly pleased by the numbers evacuated by air and stated that at this time we were dealing with two-thirds of the total casualties.

'From B.2 we made for Beny-sur-Mer (B.4) where No. 126 Wing were settled. In all these moves we badly felt the need of a light vehicle for reconnoitering a site and maintaining communications between airfield flying control and the evacuation centre. A jeep was the answer, but none was available. The alternative seemed to be a horse, so I approached the Mayor at Beny and requisitioned a German officer's mare, a light hunter. In the days that followed she did yeoman service and was well worth her keep. At Beny also, we acquired two young Frenchmen, Fernand and Charles. The former was covered with psoriasis with much secondary infection and came along in the hope of treatment. Charles accompanied him; and when (to everyone's surprise) the condition immediately reacted to simple therapy, they announced that they proposed to stay with us. And so, ever since, they have formed part of our equipage, proving incredibly industrious and loyal.

'On June 18, we evacuated 203 cases using a modified loading procedure. The master of ceremonies remained at the centre with a list of the aircraft numbers, and detailed sufficient ambulances as they left the centre to give a complete load to each individual aircraft. Thus there was no confusion on the air strip, no rushing to and fro to find how many more cases were needed for each Dakota. Each driver knew where he was going and thus there was an orderly cluster of ambulances around each aircraft, and each was unloaded in the minimum of time. Again one of my orderlies was assigned to each of four aircraft and these four were loaded first. The orderlies then moved to another four and so on. Indeed, the only limiting factor to the number of aircraft we could load at once was the number of available orderlies. Had there been twelve, we could have loaded all twelve aircraft simultaneously.

'The system worked well. We loaded 203 casualties in twenty minutes. From the arrival of the aircraft loaded with freight and personnel to their take-off loaded with wounded only 1¼ hours elapsed. At the end of this day we had loaded between 800 and 900 casualties in five days. No definite figures can be given because our counting of heads seldom tallied with the number of air evacuation labels we retained—firstly because these labels were in short supply and numbers of the wounded were without them, secondly because we were so few that all our energies were devoted to getting the casualties aboard quickly and in good condition. There was inevitably a rush. Sometimes casualties were late in arriving, more often the times of landing and take-off of the

aircraft were changed. Again the take-off had to be synchronised with that of the fighter escort, which was sometimes so early into the air that its petrol was likely to run short. So it will be appreciated that speed was the essential.

'During the next few days the weather made evacuation sometimes sporadic, often impossible, but just before we received reinforcements we passed the 1,000 mark.

'On June 23, a half section of No. 5 C.A.E.U., the official evacuation unit trained for the job, joined us at Beny-sur-Mer. The command now passed to the flight lieutenant whose section this was. We then totalled two medical officers and twenty-one other ranks. They brought additions of transport, viz., one 3-tonner and an ambulance, and tentage, considerably increasing our emergency holding capacity and solving our man-power problem.

'On June 25, we moved to B.11 (Longues) a very considerable distance, ready to receive by 1200 hours. To us came ten ambulances with drivers and orderlies, from No. 33 F.D.S., in order that we might be able to unload cases, release ambulances, and yet have no difficulty some hours later in loading the aircraft. In parenthesis it may be said that the Army ambulances were far superior to our own. The patients began to arrive by 1400 hours and some 208 were evacuated. The day was marred by our first death—a quite unsuitable case for air evacuation (a severe sucking chest wound with grave blood loss) who died one hour after his arrival despite heroic attempts at resuscitation.

'The 26th was a day of rain; but at 2130 hours we were bidden to take up our equipment and move to B.10 at Plumtot—the greatest distance yet—by first light on the 27th. The men were undismayed and by 2345 hours we were on the road. A D.R. was sent ahead to plead with No. 52 M.F.H. (at Reviers) for a haven for the night and they responded nobly. The rain was torrential, but we made good time to No. 52 M.F.H. and had some hours' rest before continuing our journey at 0600 hours the next morning. We selected a site and were ready to receive by 1000 hours.

'The air strip was in bad condition because of the severe rain and the aircraft were postponed until the afternoon. The morning was enlivened by a few mortar shells which did no damage. The airfield remained unserviceable and we could get no information about the aircraft, where or when they would land. It seemed best, therefore, to the S.M.O., to send us to No. 50 M.F.H. at Creuilly with the ambulance convoy; and upon our arrival we were directed to B.6 where casualties to the number of 233 were emplaned.

'The unit now remained at No. 50 M.F.H. until June 29, when this phase of air evacuation virtually closed with a grand effort at B.8 of 730. The task was henceforward to become the daily routine of the F.S.Ps.,

one of which had by now arrived. Thus, inevitably, the adventures and improvisations passed out of air evacuation and it began to run to a timetable from a central airport. The pioneer work was over. We had travelled the whole of the British Sector, mobile in the fullest sense of the word. I cannot praise too highly the work of the men. Their hours were long, they had little comfort, they contended with dust and rain, their meals were irregular and life was full of uncertainty. But they believed that they were doing something really worth while and they never spared themselves. Without such enthusiasm, tolerance and devotion, the task would have been unenviable.'

On the return flight to England, aircraft were in contact with the air evacuation control centre, known as A.V.A.C., at Stratton St. Margaret (near Swindon), which knew the casualty figures and daily bedstates of hospitals and home base B.A.E.Cs. and E.T.As. of all aircraft in transit, and could thus regulate the flow of casualties, arrange for R.A.M.C. orderlies when they were required, and generally co-ordinate. Naturally, A.V.A.C. was composed of both Army and R.A.F. liaison officers.

Air ambulance orderlies were originally included in the establishments of the C.A.E.Us., but later it was found more suitable to include them on the strengths of the transport squadrons. They were drawn in strict rotation to avoid jealousy and competitiveness. Their duties included the provision of bottles or bedpans if required, serving out tea (and cigarettes, until Transport Command decided there must be no smoking in the aircraft), moving unconscious patients with head injuries and paraplegics every twenty minutes, watching for haemorrhage and shock and giving morphia where necessary, and acting as general comforters. Spring and rubber mattresses on top of the general service stretcher were found very useful in the transport of spinal injuries and high fractures of the femur. Air sickness was fortunately no problem among the casualties: there was an incidence of about 1 per cent., mostly among sitting cases in the tail of the aircraft, where movement was most pronounced. In addition to the two air ambulance panniers carried by the orderly, the aircraft carried water on the scale of ½ gallon per patient.

The home base C.A.E.C. was warned some time in advance of the approach of aircraft, and got its ambulances out on the airfield. At the forewarned time the aircraft landed, displaying their international Red Cross flag to signify 'I have wounded on board', and taxied off the perimeter track to a tarmac apron. There white guide lines were often painted to show pilots the precise positions they should take up in one of two rows of aircraft which stood approximately parallel to the approach road and the line of waiting ambulances. These were backed slowly up to the Dakotas in turn, as required, to receive the stretchers handed out by two men in the aircraft and four on the ground. Once

loaded, the ambulance drove quickly to the C.A.E.C. and when emptied, returned again to the airfield for more.

At the centre, the walking wounded were sent to a tent containing beds where they could sit or lie down until they could be examined. Stretcher cases were carried into other tents and huts and either placed on the beds (at Broadwell, where many beds were specially adapted for carrying stretchers by the addition of welded irons at head and foot), or stood upon petrol tin or brick pillar supports, or upon special inverted U-shaped irons which could be hammered into the ground. Down Ampney had brick, and this was the best.

While the wards were thus filling, the nursing work started—bottles and bedpans, a drink of tea, a cigarette, and for all but the most seriously wounded a wash or shave. Until barbers were posted in, the padres undertook the last named work, and it was they too who saw every patient to give reassurance, and to arrange messages to relatives by telegram, or postcard. Welfare work was, indeed, of extreme importance, and the provision of beer, games, and pleasantly decorated rooms with vases of flowers, by the British Red Cross, created an excellent morale among those patients awaiting transport to hospital after their medical examination, who were fit enough to enjoy these amenities.

Meanwhile the surgical examination of the casualties was going on. An eye-witness report states:

'A reception hut takes thirty stretcher cases. To work efficiently to ensure a smooth and rapid flow from aircraft to final disposal, a very rapid examination is carried out. This is done in the following order: the field card is read, and the date and time of injury, site of the lesion, and any previous treatment noted. The injured part is inspected but no dressing is disturbed. The pulse is taken, and occasionally the blood-pressure. The general condition of the patient is assessed: condition of the tongue, dehydration, pain, sleepiness, restlessness. Special attention is paid to the smell of the dressings. This examination can be done in two minutes if the surgeon is accompanied by a sister and clerk orderly.'

This examination settled the immediate treatment (diet, continuation of sulphathiazole, penicillin, etc.), which at Down Ampney was then chalked up on a small blackboard fixed by the head of each bed. It also decided the disposal of the patient in one of four directions: the less seriously injured to Shrivenham and an ambulance train ('B' cases); the more serious cases to some nearby hospital ('A' cases); special types of injury (e.g. burns) to a special centre (unofficially termed 'C' cases); and a very small group in need of immediate resuscitation and perhaps a life-saving operation, to the sick quarters.

The detailed arrangements for hospital collaboration changed as air evacuation developed. At the start R.A.F. Hospital, Wroughton, with its 1,000 beds and six surgical teams was reserved for R.A.F. patients and

for any major emergency surgery which could not be handled in the station sick quarters working with the C.A.E.C. It lay twelve miles by road from Blakehill Farm, and many patients complained that these last miles of jolting were the worst part of the whole journey from the battlefield.

Army patients went to Stratton St. Margaret (E.M.S.) Hospital or its annexe at Swindon Public Baths (total of 620 beds; operating capacity twenty to forty cases per twenty-four hours); or to Oxford where the 107th General Hospital and the Radcliffe Infirmary kept open house for as long as they could. St. Hugh's, Oxford and the Royal United Hospital at Bath, specialised in head and nerve injuries; there was an E.M.S. burns centre at Gloucester; and a maxillo-facial unit at Basingstoke. All these hospitals were reached by road ambulance, and to them went those patients whose treatment could not be greatly delayed, the so-called groups 'A' and 'C'.

Further afield, in the Midlands and the North, were a number of E.M.S. general hospitals, which accepted the less serious cases, the group 'B', who could wait at least twenty-four hours for treatment without coming to harm. They were reached by ambulance train.

These arrangements had to be modified for two reasons. One was that the road distances to the special centres were found to be too great. Maxillo-facial cases for Basingstoke arrived in poor condition, and an orderly could not be spared to go with each ambulance load; consequently R.A.F. Hospital, Wroughton, began to accept them. The other factor was that the proportion of serious cases was much larger than expected, and the Oxford hospitals which had worked heroically with four or five surgical teams operating eighteen hours without a break, were forced to close their doors. Earlier requests that R.A.F. Hospital, Wroughton, should be detailed to take all cases had not been agreed, but now the hospital was thrown open to all suitable surgical cases, and No. 56 M.F.H. was moved in to Down Ampney; these two could handle up to 50 per cent. of all casualties arriving in England by air, and went a long way to meeting the recommendation made from the very beginning that a C.C.S. or similar hospital should be placed near the three main base airfields. Further special centres were also made available after August 30, when a special daily air service began to take these cases north to Manchester, Newcastle-on-Tyne, Birmingham and Winwick (Warrington, Lancs).*

Why was the proportion of 'A' cases, the serious cases, unexpectedly large? On the basis of their previous overseas experience, particularly at ports of disembarkation, the Army had expected the 'A' cases to amount to 10 per cent. of the total, and the ambulance train or 'B' cases to be

* *See* account of the work of the R.A.F. General Hospital, Wroughton, during 'Operation Overlord' in Chapter 5.

90 per cent. When the lifts began to come in, however, the disposals decided upon, though varying in sum from day to day, in general allotted 50 per cent. of cases to the 'As'. The matter was sufficiently serious for the R.A.F. Consultants in Surgery each to spend a week at one of the main base airfields studying the sorting, and a Ministry of Health official also investigated what was going on. The points that emerged fell into two categories, which may be termed the organisational and the medical.

Under the first heading was the fact that since 200 patients (or even more) might arrive all at once, their classification had to be done at great speed (two to four minutes each) which allowed little time for a full investigation; for the patient's good, the doctor might err a little on the side of safety and classify the injury as more serious than it was. He was the more likely to do this because of the great uncertainty over ambulance trains, their availability and their time *en route*. Classifying a man as a 'B' case meant an indefinite postponement of his treatment. For example, 'B' cases which had arrived at 1700 hours might have to wait till 1200 hours next day before going twenty miles by ambulance to catch the first available train. This train might take two hours or so to load, and a corresponding time to unload at the other end, with an indeterminate journey in between; (the Ministry of Health later issued an assurance that this would never be longer than four hours). It was understandable, therefore, that a surgeon should hesitate to condemn a man to category 'B'.

At the same time two minor administrative points were clarified. There had been a tendency to equate stretcher cases with the 'As' and walking cases with the 'B', but this was mistaken since whether a man walked or was carried depended more on the position of his injury than its gravity. Similarly, special centre cases (e.g. head injuries) of which there were often many, though in a medical sense not serious or urgent, were always classified 'A' since they went to local centres and not by train among the 'Bs'.

On the medical side it was noted that some of the medical officers were influenced in their classification by their estimate of the probable good functional end-result for the patient of early as opposed to late treatment, rather than by the immediate seriousness of the case. But it was also found that many patients arriving by air had had little or no investigation or treatment, the field medical unit in Normandy trusting to the speed of air travel to justify the postponement. Thus of 51 patients in one lift to Blakehill Farm on July 4, 13 were classified 'A', and of these 11 were untreated; the 38 'Bs' were made up of 24 stretcher cases (7 untreated) and 14 walking cases (3 untreated); this was typical.

It seemed that the existence of air transport made a difference in the selection of cases for evacuation; not only did the field officer often

eschew investigation or treatment, he quite rightly selected his most serious cases, including particularly those destined for special centres, to send by air, and kept the residue for the orthodox lines of communication. It was thus that repeatedly there occurred incidents similar to the arrival of the fourteen head injuries in one aircraft on August 2, which called forth protests at the excessive strain on the air orderly who had to accompany them, and the extreme labour for the C.A.E.C.

In fact the Army experiences of sea evacuation and port handling facilities were seen to be irrelevant. The railway facilities at a port were infinitely superior to those at Shrivenham, and the medical facilities on a hospital ship had to be better than those on an aeroplane. The attitude of field officers was also a new factor. Because the circumstances were quite different it was useless for the administrators to try to cling to the old inadequate estimate with which they had been supplied, or all the value of air evacuation would be thrown away. The practical answer, as already noted, was to increase the nearby hospital accommodation and to provide rapid air transport to more distant places.

Some of the general difficulties of organisation experienced in the early stages in France were the subject also of complaint in England. Lack of accurate E.T.As., and the sudden arrival of all the Dakota airlift for the day at a single airfield instead of even distribution to the three, were upsetting and recurrent incidents. But the fundamental soundness of the base organisation was proved by the fact that in early October it was possible to shut Blakehill Farm and concentrate the work at the other two C.A.E.Cs., and at the end of the year the whole volume of casualties was flowing through Down Ampney alone.

At H.Q. Transport Command a special officer, Deputy P.M.O. (Operations), had been appointed to survey the overall working of casualty air evacuation, to smooth out difficulties and advise on improvements. He summarised the early operational difficulties already referred to, in his first report submitted at the end of June. In this the efficiency of the air evacuation service was assessed by comparing the number of patients actually carried with the number that could have been lifted if all vacancies in returning aircraft had been filled. Thus, up to D-day plus 19, there were 216 Dakota sorties. If each aircraft carried 18 lying or 25 sitting cases, there were vacancies for 3,888 stretcher patients or 5,400 walking wounded, whereas in actual fact only 2,163 men were evacuated.

In his analysis, though lack of specialised medical handling units (C.A.E.Us.) and enough ambulances in the beachhead in the early days contributed to this loss of efficiency, the main difficulty encountered was in knowing the time, place and size of aircraft arrivals. Messages received were often conflicting or wrong, and the fact that aircraft, when they did come, came all at once instead of conveniently time-spaced, made their

medical loading very rushed and difficult. He instanced the events of June 20, when forty-six Dakotas landed on three airfields all within a very short time. To have filled them would have meant a pool of 828 patients close to the airfields, and a correspondingly large staff to tend them and load them at high speed in the very short time the aircraft would wait in Normandy. If, instead, only eight aircraft had landed every two hours throughout the day, loading would have been less confused, and patients could have been summoned in a steady flow from neighbouring hospitals. The same considerations applied at the main base airfields in Britain. The sudden arrival of twenty-five or thirty aircraft loaded with casualties threw a great strain on the C.A.E.C. and the ground transport organisation.

There were those who felt that by carrying more than the stipulated 10 per cent. of daily casualties as initially agreed with the War Office the R.A.F. had already more than done its job, and that any talk of what extra number might have been carried by better organisation was misleading and irrelevant. It had been foreseen that the early days in Normandy would require *ad hoc* methods. But what caused the real storm over this report was its author's main recommendation. He suggested that most of the operational difficulties in any future invasion would be avoided if it became the policy to build a special transport air-strip at a very early phase of the operations, as indeed was U.S. practice, instead of constructing only fighter and bomber strips in the beachhead and using any or all of them for transport work as occasion offered. If this idea were adopted, all the freight and casualties would pass through one (transport) airfield and scheduled services would be possible from the beginning.

This proposal was not accepted by the various Headquarters (2nd T.A.F., A.E.A.F., T.C.). The trouble was that 2nd T.A.F. were responsible for the construction and initial use of all beachhead airstrips while transport was a matter for Transport Command. At the same time the actual disposition of airstrips and general use of air transport was a matter of high policy decided at least at A.E.A.F. level, and medical convenience was not likely to be their first consideration. In his report, however, published in January 1947, on Air Operations by the Allied Expeditionary Air Force in North-West Europe from November 15, 1943, to September 30, 1944, the late Air Chief Marshal Sir Trafford Leigh-Mallory, K.C.B., D.S.O., Air Commander-in-Chief, recommended that in any future campaign the airfield construction programme should envisage the immediate provision of at least one air transport strip per army and that these landing strips should be constructed so as to be capable of handling a minimum of fifty to sixty aircraft per hour.

The consultant neuro-surgeon to the Army, reporting on air evacuation in general as part of his special autumn survey of medical services in France, wrote on September 16:

'I was most favourably impressed with the keenness, unstinted energy, and efficiency of all R.A.F. and R.A.M.C. personnel engaged in air evacuation, from the medical officers to stretcher-bearers and ambulance drivers. Once in action, air evacuation appeared to work very smoothly. The plane in which I returned to the United Kingdom was loading at a distant part of the airfield within ten minutes of notice that it was available; eighteen stretcher and three walking patients were loaded with their kit in seventeen minutes. On the journey the nursing orderly looked after the patients with unobtrusive competence and kindness. At Broadwell the arrangements for reception were equally efficient.

'But everywhere I went I found at all levels dissatisfaction and frustration at the difficulties of organising this inestimable and now indispensable method of evacuation. Cases are ordered to the airfields and may wait there several hours, only to find that planes have been withdrawn and the patients must then be returned to the hospital whence they came, for there is nowhere to retain them at the airfield. Patients may be carried on a plane without a nursing orderly while another plane from the same airfield which carries a nursing orderly is sent home empty. Planes with nursing orderlies have lain overnight at an airfield in Belgium, and have departed empty in the morning, while at nearby hospitals and airfields there were patients to be evacuated. The mischances are more than can be accounted for by operational needs and vagaries of weather. Although the medical air liaison organisation works well in the details of air evacuation, it seems as though no one concerned with the movement of the planes appreciates the needs of the R.A.M.C. No one person who can be approached by the R.A.M.C. seems to be able to control the planes.

'In the present war of rapid advance, with no rail communications or working ports, the evacuation of battle casualties depends entirely on the air. Of the great value of early and rapid evacuation of wounded to the efficiency of the Army and to the saving of life and good health there can be no question. Indeed air evacuation of patients is no longer a luxury; it has become a necessity. Ten to twelve planes allocated to the use of the R.A.M.C. for carrying medical stores and returning with patients would not only move more patients than are moved at present, but would also effect a considerable economy in flying hours and a great saving of time and worry on the part of the R.A.F. and R.A.M.C. medical personnel.

'It would seem also that some R.A.M.C. representative should be attached to the nerve centre of movement control of Transport Command; there seems to be a missing link somewhere in the organisation.

'A holding unit of 200 beds at the airstrip working in conjunction with the C.A.E.U. would also seem to be essential; D.D.M.S. 2nd Army has provided for this in the last few days by sending an F.D.S. to Evere.'

The Principal Medical Officer of Transport Command had some extremely interesting comments to make on this report, in a letter to D.G.M.S. which ran in part as follows:

'I think (the consultant's) comments are generally speaking fair and substantially correct, though it is clear that he does not fully appreciate the operational side. . . .

'At Brussels the position was slightly different. There were plenty of aircraft and plenty of casualties, but the rush to get aircraft away in order to keep up vital supplies needed for the advancing Armies often meant that they could not wait until casualties were supplied for their back-load. It was here, too, that the trouble with regard to aircraft not carrying nursing orderlies arose. This was due to the fact that the number of aircraft sorties exceeded the number of nursing orderlies available, and, though every available nursing orderly was put on the aircraft, it was often impossible to find those aircraft which carried nursing orderlies among the hundreds which were parked on the airfield. This we hope to overcome by the establishment of pools of nursing orderly air attendants on each terminal staging post. Another factor in the Brussels set-up was that the Army had only a total of 2,000 beds available in the Brussels area and they had to rely practically entirely on air evacuation to see themselves out of the jam in which they found themselves.

'His complaint about the planes departing empty after having lain overnight on the airfield in Brussels, is clearly a question of operational requirements. Owing to the urgency of the supply situation such aircraft could naturally not be diverted to other airfields and similarly could not wait for patients to be fetched up for them. This problem has been settled, in part at least, by the setting up by the Army on the airfield boundary of a field dressing station which is now holding about 150 patients each night to provide lift for the early morning take-off. In general, so far as Brussels is concerned, the advance was so rapid that everything was completely chaotic. The Army had outrun their own supply lines and were largely dependent on air lift to see them out. I agree that a holding unit of at least 200 beds at each airstrip is an essential under the present method of working. Presumably he means an Army holding unit independent of the C.A.E.U. It would not be necessary to have such a holding unit on the airfield if the Army, having been supplied with the necessary information, sited their hospitals in relation to the Transport Airfield. Under present arrangements, however, it would seem that this was impossible, and, therefore, in order to solve existing difficulties we must either set up our own hospital on the airfield or ask the Army to supply one. I do not think an F.D.S. is sufficient and consider it must be a hospital which admits cases and evacuates them as required through the C.A.E.C. In this case the hospital would

need to be sited in relation to the airfield, just out of reasonable range of danger from enemy action. Likewise the C.A.E.C. would be on the airfield or just far enough away to keep out of the noise and dust, and would revert to its originally envisaged function of a waiting-room preferably under the control of the staging post commander.

'The basic factor, on which Air Evacuation rests under the present system of using returning empty freight aircraft to carry the casualties, is the careful planning of air transport. This has never been done and all air transport since the inception of the battle of France has been run largely on an *ad hoc* basis.

'The direct result of this lack of air transport planning is that it is impossible to give the Army a clear picture of the transport field which is to be used, and consequently they are unable to site their hospitals in relation to it. This is shown all over the battle areas at the present time and it is the direct cause of the suggestion by the Consultant in his report, that it was essential to have a 200-bedded holding unit on the airfield.

'To come to the solution of the present difficulties, I suggest that it is a matter which lies at the feet of the Air Staff in their planning. They have not yet learned to appreciate that air evacuation of casualties is a vital factor in any battle and not a luxury. They have not learned that it is just as important a part of their planning task to prepare and pave the way for the efficient operation of this service as it is to plan the actual operational side. I doubt whether they will ever do this and, though it goes against the grain, I find myself reverting to the opinion often expressed by the Army that we should have our own air ambulance squadrons controlled by medical officers. I want to make it clear that this, I consider, is the only easy way out of the difficulty and that I definitely think that there is no doubt that the system of using empty returning freight aircraft for the carriage of casualties will work, if only the Air Staff will consider it carefully in their planning.

'One other factor which I have not mentioned in the present battle and one which has always been a thorn in the flesh to us, both from the ordinary freight angle and from the casualties angle, is the ruling given by A.E.A.F., that aircraft of the No. 46 Group squadrons shall be frozen for Air Support Operations. It is not within my province to criticise the operational necessity for this, but I can state that considerable numbers of aircraft have been lying idle waiting for the expected air assault task when they could have been employed carrying freight in and casualties out.

'I would, next, mention the question of co-ordination from a medical point of view. I consider that the whole of the air evacuation arrangements from the battle line to base hospital should be vested in one man. This was attempted with the appointment of D.P.M.O. (Ops.) who

failed in his task through lack of the necessary co-operation from the Tactical Air Forces employed. His journey to the beachhead had to be arranged on a wangle by attaching him to Headquarters 2nd T.A.F. who gave him no executive authority and told him that he was to consider himself as subservient to S.M.O. No. 83 Group. He was discouraged from the word "go" and was finally practically told that he was not required in the beachhead. I am absolutely convinced that there must be a medical officer in complete charge of casualty evacuation who has the power to issue definite orders to all medical people, from P.M.Os. downward, connected with this important task. I would even go so far as to say that we should put an Air Vice-Marshal into this job if rank makes any difference. If this Officer were appointed he must know all the secrets, be on the highest planning staffs and have the necessary *entrée* to all and sundry connected with the operation, together with the necessary power to issue orders to execute the plans he has prepared.'

This correspondence caused D.G.M.S. to raise again the question of establishing, say, ten Dakotas for ambulance work. The soundings of opinion taken among the Air Staff showed however that there was little likelihood of a change in Air Council policy, and so the request was not pushed. To the Medical Branch, casualty air evacuation naturally appeared as work of the highest priority; but to the air staff officers, the tying of even a dozen Dakotas to ambulance work seemed a loss of flexibility, the creation of difficulty for a field commander who might want transport for some other more important operation. Until such time as they came to change their opinion, or a surplus of aircraft accumulated, air ambulances were out of the question.

There was, however, one grain of comfort in the fact that hence-forward thirty-five Dakotas were to be reserved for running the scheduled freight and casualty transport services, no matter to what other operations (e.g. paratroop dropping) the rest of No. 46 Group might be diverted. Some continuity of transport operation was thereby assured.

D.G.M.S. also took the opportunity to post the D.P.M.O. (Ops) from Transport Command into the P.M.O's. staff in 2nd T.A.F. This placing of Daniel in the lion's den turned out to be a fortunate move. The P.M.O. and the Air Staff became enthusiastic in favour of organising casualty air evacuation fully, just at the time when the F.S.Ps. and all routing of aircraft over the Continent were put into their hands. Transport Command had growing responsibility for flights to and in the Far East, and its European responsibility was on the wane.

Scheduled transport flights into scheduled airports were started for the first time, and the first true casualty air evacuation unit was formed by collecting together all the F.S.P. medical personnel around an inactive mobile hospital, No. 54. Three senior officers (medical), 10

PLATE LI. No. 271 Squadron unloading a stretcher case from a Dakota air ambulance at a base airfield near Brussels.

PLATE LII. No. 271 Squadron. 'Walking wounded' in the air *en route* to the base hospitals.

[*facing p.* 520

PLATE LIII. No. 1 Casualty Air Evacuation Unit. The rest room alongside the holding ward at No. 1 C.A.E.U. base where the less seriously wounded casualties could listen to the radio, read the latest newspapers or books, and have a cup of tea whenever they felt like it.

PLATE LIV. No. 1 C.A.E.U. The 'holding ward' where late arrivals who could not be disposed of the same day were kept overnight.

PLATE LV. L5 light ambulance taking off wounded from a forward air strip in Burma.

PLATE LVI. No. 6 Casualty Air Evacuation Unit of the R.A.F. in Burma.

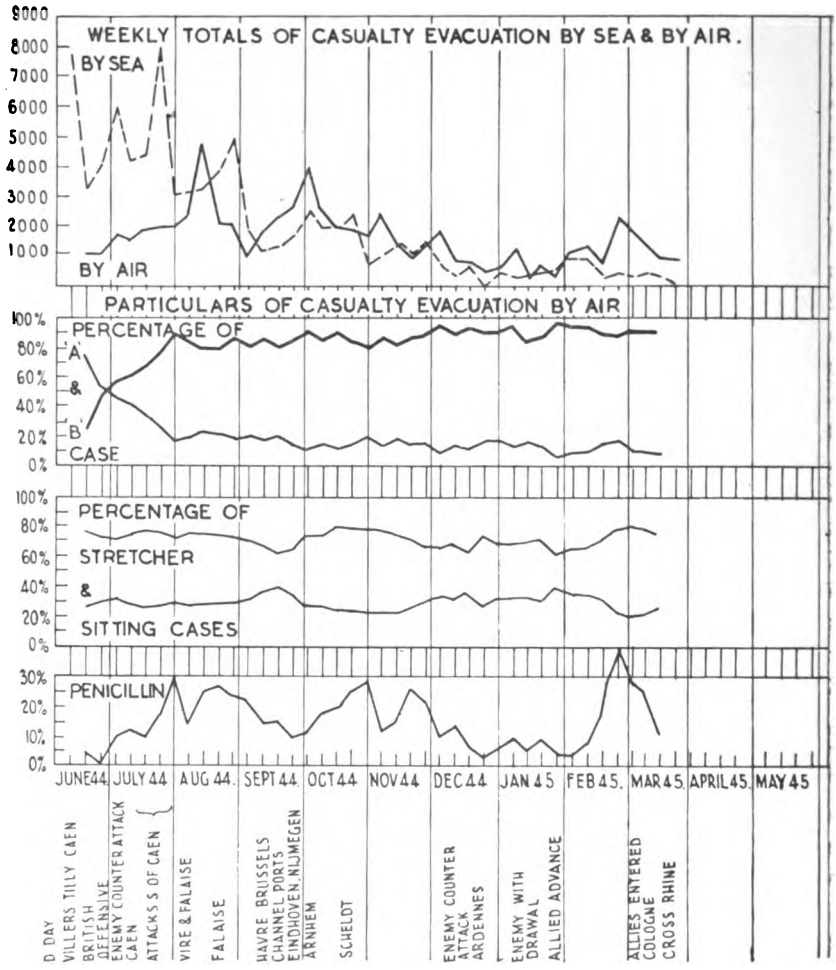
medical flight lieutenants, a quartermaster, 12 nursing sisters, 83 medical orderlies and a dispenser, 168 A.C.Hs., together with clerks, drivers, etc., made a grand total of 386 members, who were divided into three flights and smaller separable sections. Thus instead of having to rely on the goodwill of an F.S.P. commander beset with many tasks in order to get enough men to handle and care for the wounded, the medical unit was now totally independent and self-supporting. It had sufficient holding capacity to manage without Army help, it was mobile, and it could split off sections to operate from minor airfields temporarily opened up. And the fact that everyone knew in advance on each day what transport aircraft were going where, enormously simplified the work of the casualty evacuation organisation, Army as well as R.A.F.

With all the difficulties which have been stressed, that the casualty evacuation scheme was nevertheless a success is shown by the figures even for the first three months of operation. In June, the 29th was the busiest day, the 690 cases moved (sixty-one of them head injuries) representing about half of the total British casualties for the day. The end-of-the-month summary reported a total of 3,176 (2,113 stretcher cases) classified by injuries as follows: head 7½ per cent.; lower limb 29 per cent.; upper limb 20 per cent.; abdominal 3½ per cent.; chest 4½ per cent.; maxillo-facial 2½ per cent.; burns 2¾ per cent.; medical conditions 23¾ per cent.; others 6½ per cent.

The ten thousandth case was moved just before the end of July, the grand total from the start being 10,743 (7,365 stretcher cases) on July 31. The classification had changed somewhat and now read: head 9 per cent.; lower limb 33 per cent.; upper limb 21 per cent.; medical 18 per cent.; others 19 per cent.; while the Service origin of the patients was Army 10,495, R.A.F. 155, Navy 93.

In August, when the whole scheme was in full swing, the month's total surpassed June and July together—12,106 moved (8,955 stretcher cases). August 11 was the busiest day, with 934 casualties carried and Down Ampney receiving 523 of them, which meant among other activities 1,150 extra meals cooked there on that day.

A glance at the accompanying graph shows how the number carried fell away in the late autumn and winter, partly no doubt because of poor flying weather, but partly because the armies were now firmly established with their bases on the Continent, and needed the service less. Analysis of the air passengers in this period showed that a significant proportion were being transferred home from base hospitals; a sixth of them had been wounded more than five days before the flight, and a further two-thirds more than two days before, while only one-sixth of them were fresh cases with their injuries twenty-four hours old. It is interesting to note, too, *en passant*, that limb injuries had risen to account for two-thirds of all patients carried.



By the end of 1944 the real interest in casualty air evacuation had shifted to Burma and the Far East. With Brussels as a fully functioning airport and regular air services daily between Belgium and England, a great deal of the improvisation was over, and when the final advances came into Germany, the increase in the flow of wounded was easily handled. For the Rhine crossing the disposition of Army medical units was made in full consultation with the R.A.F. air plan and virtually all evacuation was by air; this was a sign that the R.A.F. was at last giving the best possible service and that the Army appreciated and relied on the fact. It is interesting in this connexion to note that the D.M.S. (Army) at this time had been a senior officer in the Western Desert at the birth there of the modern air evacuation service three years earlier. After V.E. Day air evacuation slackened off markedly, but trickled on

for some time, and at the end of August 1945, about 40 to 100 patients were still being flown back daily in four Stirlings from B.A.F.O. Plates LI to LIV illustrate some features of the casualty air evacuation service in Europe.

BURMA, 1944–5

In the early days of the war in South-East Asia, casualty air evacuation was virtually nil. It was a period of retreat before the invading Japanese, a period without air superiority in which very few aircraft of any type were available, and in which the numbers of troops engaged at first were not large. Any air evacuation which did occur was arranged on the spur of the moment, often by individual private treaty.* It is recorded that on one day in April 1942, beleaguered forces at Myitkyina suffered 188 casualties, of whom 90 were flown out to Dinjan in Assam, mostly by returning supply aircraft of No. 31 Squadron. During the first Wingate expedition behind the Japanese lines in North Burma in March, April and May of 1943, supplies to the ground forces were dropped by parachute and a few hundred casualties were evacuated by light aircraft (Fox Moth), or by daring personal efforts like that of one pilot of No. 31 Squadron who landed his Dakota on an improvised airstrip and took off seventeen stretcher cases.

January 1944 saw the Japanese offensive towards India, aimed at Imphal and the Arakan. With a front which had been static for some time and an improved air supply position, 131 casualties were evacuated in January alone, while in February the figure was 666, and a regular organisation had grown up, with a light aircraft shuttle from forward 'kutcha' airstrips to Ramu near Cox's Bazaar. Here the Wing S.M.O. had formed a ground handling organisation to transfer casualties to the Dakotas, which had been supply-dropping in the forward areas and would now fly back to base at Comilla or Chittagong. Other airfields (Goppe Bazaar, Bawli Bazaar) were also served by Dakotas specially summoned under fighter cover from Comilla at the request of D.M.S., 15 Corps; six Ansons were available at Bawli for a light shuttle. At this time, and for a long time to come, evacuation by air was in the hands of the R.A.M.C.

The second Wingate expedition set off in March, and in the first month 278 'chindits' were brought back from the jungle, mostly by gliders carrying 16 sitting cases and snatched in turn by Dakotas. They got airborne in 50–80 yards with a jerk estimated at 1½g.† and cleared

* During the 1942 retreat a C.A.E. service was organised for civilian and Service casualties using both British and American aircraft.

† g is the acceleration caused by gravity, i.e. the force of attraction due to the mass of the earth, conveniently expressed in the British system as an acceleration of 32·18 feet per second per second.

surrounding trees by 30 ft. Later six Dakota strips were built 200 miles behind the Japanese front, while two flying-boats sent from Ceylon to the upper waters of the Brahmaputra river were able to evacuate a further 500 by daily trips to and from the Indawgyi lake.

In the progress of their offensive the Japanese surrounded Imphal and direct communication with the garrison would have been severed but for aircraft of U.S.A.A.F. Troop Carrier Command and the R.A.F. Dakota squadrons, who carried out casualties totalling 1,200 to 2,000 per week to Agartala, Comilla and Chittagong in a regular daily service.

It was reckoned on the basis of all this effort that no less than 23,000 patients had been transported in the first five months of 1944. Between March and September the figure is given as 45,000. There were no air ambulance orderlies on these flights, and consequently no treatment given in flight, but occasionally a R.A.M.C. orderly flew with a special case. The air evacuation ground organisation grew up informally as a R.A.M.C. commitment, since the R.A.F. had not the man-power to cope with it. Thus from March to September at Imphal No. 64 Field Ambulance with No. 29 Motor Ambulance Section was the dispatching unit, which arranged the flight programme direct with No. 194 Squadron at Agartala, or the Wing H.Q. there, while Indian staging sections acted as reception units at Agartala and at Comilla, which was becoming the special centre for burns, eye and head injuries.

This system worked well during the war's static phase, but when the monsoon was past and Allied forces began to advance and fan out into Burma, airstrips multiplied rapidly, until there were about ten main ones, each with at the most about 200 patients a day to dispatch. A field ambulance was too large a unit to waste on a casualty commitment of this size; No. 64 at Imphal had been handling an average of over 1,000 a day. An Indian staging section, with the addition of a motor ambulance section, seemed to be the best interim answer. The casualty air evacuation organisation thus evolved as it had done in the Western Desert, from *ad hoc* methods to an army ground organisation which was workable only as long as the front remained stationary, but failed at first under the stress of advance. There were certain new factors however. One was the presence of different races with differing attitudes to cleanliness, cooking and religious convention. It was estimated that only 40 per cent. of the wounded were British Army troops, the large remainder being Indians, both Mohammedan and Hindu, and East and West Africans. Another was the multiplicity of short jungle airstrips which could only be used by Tiger Moths, L1, L5, or other light aircraft requiring less than 200 yards for a take-off; and these aircraft were still insufficient in number in September 1944.

As before in the Middle East, it took time for army commanders to realise that Dakotas were not taxis waiting on a rank to be summoned

as required, and that it was essential to site both rear and forward medical units close to airfields if patients were to get airlift. By the autumn of 1944, however, considerable re-siting was going on, and attempts were being made to provide the R.A.F. with fortnightly casualty estimates in advance. Comilla became the main transport base, linked with Agartala by rail and thence by river steamer and hospital ship with Madras and Calcutta; the latter city also received one to six flights daily from Comilla. In addition, special flights mainly for neuro-surgical cases were made to Secunderabad and Ranchi.

By the agreement of 1942, casualty air evacuation was really a R.A.F. responsibility. From the end of June 1944, R.A.F. medical officers began to arrive for C.A.E.U. duty, while in August came a Transport Command squadron leader with wide experience to join the staff of P.M.O., 3rd T.A.F. as a C.A.E. organiser. In his report of September, he estimated that thirteen C.A.E.Us. would be required, and pointed out that conditions in the East differed in some respects from those in Europe. Everywhere east of the Brahmaputra river (i.e. even west of Comilla) was an operational area under the control of A.O.C.-in-C. 3rd T.A.F.; Transport Command had no control, and their forward staging post organisation did not exist. Thus each C.A.E.U. would have to be a completely self-contained unit unless it got Army help. Further, in view of the many airstrips, it should be capable of easy breakdown into smaller groups. A three-flight division would meet the bill; H.Q. flight and A and B flights between them could man a main transport airfield and two advance transport airstrips or four light aircraft strips. This was in fact the C.A.E.U. organisation then growing up in Belgium. Already at the beginning of July, Air Ministry had agreed to the formation of seven C.A.E.Us., with one medical officer and thirty other ranks each, to be assisted by an Indian staging section as required, and Nos. 7 and 8 began to form at Comilla in mid-September. A senior officer visiting them on October 10 wrote 'I found a Boy Scouts' camp that bore no resemblance to a C.A.E.U.'—in fact the medical officer and nursing orderlies had been put on to routine unit medical work by 3rd T.A.F. authorities. This unsatisfactory state of affairs was quickly corrected after protests, but preparation for active service proceeded very slowly owing to unserviceable transport and barrack equipment and shortage of replacements; it took eight weeks to get stores sent up from the M.Us. in Calcutta. It was therefore decided in December, when fresh personnel arrived from the United Kingdom, to form Nos. 9 to 15 at Jharsuguda, 300 miles west of Calcutta on the main Bombay-Nagpur-Calcutta railway, with the idea that supplies would be easier in a non-operational area. As it turned out, however, things were not much better here. On December 15 the units had tents and the promise of the remainder of their equipment within four weeks, but no

motor transport, and no hope of any—in fact it was even difficult to borrow any for a day's training. In the end after much hanging about, which was very bad for morale, especially as many of the men had been hurriedly drafted overseas without embarkation leave, units were told to come forward and draw their transport from the operational area.

In the meantime the aircraft position had been improving. The Air Command South-East Asia (A.C.S.E.A.) had asked for air ambulances at the beginning of August, a request turned down by the Air Council, who, however, at first offered to distribute 156 stretcher-carrying Ansons to the squadron communications flights, not appreciating that Ansons were too heavy for the forward airstrips. When the matter was further explained, a supply of L5s (Sentinels) was forthcoming in November at the rate of eight per squadron. Thus 64 Sentinels were allotted to Nos. 221 Group and 224 Group, with 30 aircrew and 90 maintenance men to operate them. It is interesting to note that by mid-February all these men and aircraft were engaged on routine communications flight duties, and forward casualty air evacuation was mostly being done by the Americans. Later, in mid-April, a further 32 Sentinels were attached to H.Q. Burma flight, and 3 Tiger Moths each to Nos. 228 and 225 Groups, while 100 more light aircraft were promised for June.

No. 7 C.A.E.U. finally drove the 800 miles from Agartala and took over from the R.A.M.C. at Imphal at the end of 1944, over three months after its formation. The C.A.E.U. officer establishment had been increased by one Administrative and Special Duties (A. and S.D.) officer to handle unit administration, since it had been found that the medical officer could not cope with this as well as his medical work, and the C.A.E.U. therefore now consisted of 2 officers and 39 British other ranks. They were replacing a R.A.M.C. unit, containing 7 medical officers and 270 other ranks—Indian and British—and although the main flood of casualties out of Imphal was now subsiding it was still 300 patients per day, falling by mid-January to a daily 80 sitting cases; half of No. 8 C.A.E.U. was therefore moved in to help. No. 8 C.A.E.U. could not become operational as an independent unit until at last it got its transport in mid-February 1945; it then took over Imphal and No. 7 C.A.E.U. moved to Shwebo, 40 miles north-west of Mandalay, in 33 Corps area, becoming operational within twenty-four hours of arrival.

At the end of March 1945, by which time Mandalay had fallen to the Allied advance, Nos. 7 and 8 C.A.E.Us. were still the only operational R.A.F. units in casualty air evacuation. The total evacuated had reached approximately 60,900—one-third of them stretcher cases, and one-third of the total contributed by light aircraft. The bulk of these patients had

been handled on the ground directly by the R.A.M.C. It is not surprising therefore that they were loth to let the R.A.F. ground units take over.

The other C.A.E.Us., however, except for No. 15, became operational in mid-April and were distributed thus: No. 7 at Ngazu and No. 9 at Meiktila (33 Corps medical centre); No. 8 at Myitche and No. 10 at Kyauk Padaung (4 Corps medical centre); No. 11 at Chittagong and No. 12 at Akyab, both doing staging post duty; No. 14 at Comilla, and No. 13 in reserve at Cox's Bazaar.

The personnel of No. 15 C.A.E.U. were being used to staff No. 9 R.A.F. General Hospital, owing to the extreme shortage of nursing orderlies, but at the end of April, the orderlies were released to make the air ambulance orderly pool up to thirty at Comilla. Owing to the extreme shortage of air ambulance orderlies (it was estimated that at least fifty-four were needed in the Comilla pool, if the Allied Air C-in-C's order of May 16, that all C.47s on C.A.E. duty must carry one, was to be followed) they were each doing two sorties a day for three days with the fourth day off, and averaging between forty and fifty flying hours a week.

The shortage of air ambulance orderlies was partly a reflection of the general R.A.F. man-power shortage, which so restricted the size of the C.A.E.Us., but also sprang from another origin. It will be recalled that the Air Ambulance School at Hendon had been closed in June 1944. It was re-opened with some of the original Hendon staff on November 9 at Leicester East, a Transport Command Operational Training Unit (later, Conversion Unit) where aircrew also received a brief three hours on casualty transport. The intake for the three weeks' course was fifteen per week. One week was spent at Leicester East, during which there were at least ten hours flying; a few days at R.A.F. Hospital, Wroughton; and the remainder of the time working in the C.A.E.C. of one of the main base airfields, mostly Down Ampney. From January to March 1945, out of 140 entrants, 10 were rejected on grounds of airsickness, 47 failed the final examination, and 83 passed. The European war ended in May and by July air evacuation from the Continent had so shrunk that the course had to be rearranged—two weeks at Leicester East, and one at Wroughton, with merely visits to Down Ampney.

By July too, the Burma campaign was drawing to its successful close, and plans were drawn up for the withdrawal of three C.A.E.Us. for Operation 'Zipper', the invasion and recapture of Malaya. There was at first difficulty in convincing A.C.S.E.A. planning authorities that there would be a need for a C.A.E.U. in the first three weeks of the invasion, but after hearing of the experiences in Sicily and in Normandy they agreed that No. 8 C.A.E.U. should be flown in not later than D-day plus 10. When the war collapsed suddenly in August, however, it was decided to use the C.A.E.Us. for the evacuation of released prisoners-of-war, and

for this the dispositions on September 9 were No. 13 C.A.E.U. at Singapore, No. 10 at Penang, Nos. 7 and 14 at Mingaladon (Rangoon) and No. 15 at Chittagong. No. 9 C.A.E.U. was at Bangkok staging from Saigon, where No. 12 C.A.E.U. would have been if it had not been held up at Akyab by lack of air transport. Meanwhile Nos. 8 and 11 were already disbanding at Yelahanka (Bangalore).

Casualties in Burma had thus flowed back almost entirely to Comilla, beyond which westwards there was no regular C.A.E. service. In July, a new route was opened; Catalina flying-boats began a bi-weekly service from Rangoon to Madras carrying six walking cases with an air ambulance orderly (A.A.O.) on each trip. Also, from the end of March, twenty-six Ansons had been established as a network of air ambulances throughout India to transfer patients in a 150-mile radius of the hospitals. They were distributed thus:

Trichinopoly (4 aircraft); Bangalore (4); Secunderabad (3); Calcutta (4); Raipur (4); Allahabad (4); Chaklala (3).

Plates LV and LVI illustrate air evacuation in Burma.

But the other big development in South-East Asia was the establishment of an air evacuation service back to the United Kingdom. It began as the utilisation of spare seats on returning passenger aircraft to the tune of 300–400 per month in December 1944 to March 1945. Only 'B' class invalids, fit to travel unaccompanied and due for repatriation were accepted, excluding those with chronic bronchitis, sinusitis, or pulmonary tuberculosis. Karachi was the main point of departure from India and No. 9 Transit Camp at Mauripur held twenty-eight men and six officers as a pool of invalids, while the Army had a larger pool at the British Military Hospital in Karachi. Air services from Calcutta, Ceylon and Madras brought in new invalids to keep the pool filled.

This service ceased on April 17, 1945, when it was ruled that men proceeding on leave took precedence over invalids. But meanwhile plans for something altogether bigger were being prepared. Reinforcements at the rate of thirty aircraft loads a day were to be flown from Britain to Poona, Arkonam and Chaklala, in the autumn, and the returning aircraft were to carry casualties at the rate of 2,000 a month. The Mauripur pool was to be enlarged, the air feeder lines developed, 100 A.A.Os., supplied to go with the Stirlings (15 stretchers), Lancasters and Halifaxes (12 stretchers each) which would operate the inter-continental service, and medical facilities improved at both the staging posts (Lydda, Castel Benito) and at the emergency stops possible at Bahrein, Shaibah, Habbaniya, El Adem and Istres (which had to be always ready for a possible 40 casualties). Trooping was planned to start in October, and the casualty return in December. The end of the war against Japan made the scheme unnecessary, and it was abandoned when already far advanced.

CLINICAL CONSIDERATIONS

The D.G.M.S. Directive of 1942, which laid down certain clinical criteria of suitability of patients for air evacuation, was naturally cautious in view of the very limited experience on which its authors could draw. The fortunes of war, especially conditions in Burma, where transport flights at 10,000 ft. were not uncommon, and where the air was often the sole possible evacuation route, gradually led to modification. Originally it had been advised that patients receiving sulphonamides were unsuitable for air evacuation, since the cyanosis sometimes seen (and probably due to sulphaemoglobinaemia) suggested they could not stand any altitude anoxia. Since it was a routine, however, to start practically all Army patients on these drugs before they reached the C.A.E.U., adherence to the recommendation would have denied air evacuation to the majority of army wounded, and actual experience showed that sulphonamide treatment was no bar to flight even at 14,000 ft.

The primary treatment of patients for air evacuation was basically the same as that for evacuation by any other route; haemorrhage had to be arrested, shock treated by blood or plasma transfusion, pain alleviated, fractures immobilised, sucking chest wounds closed. If a man was fit to go by road, he was, with a few exceptions shortly to be discussed, fit to go by air. Indeed he might be even fitter for air passage, which demanded less stamina, since most air journeys lasted for only three to six hours, and were usually altogether gentler, avoiding as they did the ruts and jolts of worn roads.

In the air three main physiological factors had to be considered: cold, anoxia, and decompression. The Dakotas used for air evacuation had cabin heating. In addition, a special electrically heated bag with zip-fasteners and large flaps was available, for individual patients, who could be placed inside it and thus kept warm. The air ambulance orderly carried rugs and hot-water bottles as a routine, and usually inquired from the pilot—who had just flown the route in the forward direction—what weather conditions to expect on the return flight, if he was not already himself aware of them. Large thermos flasks of hot drinks were also carried as a routine and it was therefore of first importance to mark patients not permitted to take drinks with a prominent NO FLUID BY MOUTH label.

The treatment of anoxia was hampered by the fact that Dakotas were American aircraft with the American system of oxygen delivery, to which British masks would not fit. In consequence, completely mobile oxygen outfits, with their own cylinders and reducing valves, had to be used and it was therefore advised that not more than two patients likely to require oxygen therapy should be carried on any one flight. The majority of flights could be planned to be below 10,000 ft., especially if

pilots could fly a zig-zag course through the valleys of mountainous country, and the average patient certainly did not begin to need oxygen any earlier than the aircrew, at 10,000 or 12,000 ft. The chief indication for the use of oxygen therapy was usually some form of anaemia, and if possible evacuation was delayed until the haemoglobin level could be raised to 50 per cent. or more. In all serious cases blood transfusion was the method of choice, the possibility of haemo-concentration being borne in mind.

The question of when actually to start oxygen administration was difficult. A white patient does not usually show cyanosis if he is anaemic; while a coloured man's skin pigment will hide any sign which might otherwise be seen. In any case it is rarely that a patient is in good light inside an aircraft. A disturbance of normal breathing rhythm is not specifically an indication of oxygen lack, and where it is due to anoxia is a late sign. Thus dyspnoea at rest, or in acute nephritis, does not indicate oxygen lack. Some form of exercise tolerance test has been suggested as the best criterion; observing for instance, whether a man pants after sitting up on his stretcher, or after so many flexions and extensions of his arms. It was thought that over caution was the best approach. If there was any doubt about a patient's condition, oxygen was started straight away—even at ground level.

As is well known, ears and nasal sinuses may require attention during any climb or descent, and under the reduced atmospheric pressure any gas in the chest or in the intestinal tract will expand and may give trouble. Thus mediastinal emphysema may hinder heart action and press on lung tissue; while a tension pneumothorax will expand dangerously, compressing areas of lung. In ordinary emphysema a bulla may rupture giving rise to pain and partial lung collapse. In the bowel, prolonged constipation may block the escape of intestinal gases and produce distension at altitude, and a laxative two days before the proposed flight is sound treatment.

In general these thoracic and abdominal complications of altitude were avoided by pre-flight selection of cases, and special treatment where necessary. Probably the most important single example of this was the handling of the acute abdomen (including penetrating abdominal wounds). Before operation, acute abdominal conditions travel well. Post-operatively, they must not be moved by air for a minimum of 10 days, and preferably 14 to 16, or they do very badly; a fact attributed to the tearing out of sutures and to the production of ileus by the distending gases, which find it easier to blow up the damaged intestines than to escape by a rectal tube.

It is of course always routine that conscious passengers should be told when the aircraft is about to descend so that they may clear their ears from time to time by yawning, swallowing, etc. Sleeping patients must

be wakened. If unconscious cases are carried, the pilot must be asked to descend slowly, occasionally levelling out, to allow for spontaneous physical equilibration of the air pressure behind the ear drum with that in the free atmosphere.

In flight, treatment included moving unconscious patients every twenty minutes to minimise the risk of pressure sores, massive pulmonary collapse, and hypostatic pneumonia. Sulphonamides were given, injections administered (penicillin was usually timed to be given before and after a flight), transfusions continued or even started in smooth flying weather, plasters split if necessary, pleural fluid or air aspirated. Restless unconscious patients were pinned or strapped into their blankets on the stretcher. Paraldehyde was often better than morphia, especially for severe brain injuries, and 8–10 c.c.s. intramuscularly was a routine and could be given in flight if this had not already been done at the C.A.E.U. Catheterisation was not advised in the air in view of the risk of infection, though more recent opinion regards this as over cautious.

Airsickness was not a big problem; fortunately being least in the most dangerously ill where it could be of particular harm, as in severe burns, acute abdominal injuries, and maxillo-facial damage with tracheotomy; it was more common in walking than in stretcher cases. The incidence in North-West Europe was less than 1 per cent. and in Burma probably less than 5 per cent., lower-type Indians being more liable than Ghurkas, Sikhs, or United Kingdom troops. Nauseating smells in the aircraft (often due to pyothorax cases) were a predisposing factor and Freon (anti-mosquito) aerosol bombs were sometimes used to provide a pleasant-smelling vapour. Another factor was the sight of others being sick, and sufferers were encouraged to do their vomiting in the lavatory compartment at the rear of the aircraft. Lying down in the central aisle, where there was less noise and vibration, diminished motion sickness, and drinks of sweet tea were helpful. A light nourishing meal within one hour of take-off was also thought of assistance in prevention. Drugs were rarely used. On some occasions acute abdominal cases were held back for later flights, if very bad weather *en route* was reported.

The selection of cases for evacuation was determined by the C.A.E.U. in the first instance by a system of priorities:

Extensive burns.
Penetrating wounds of the eye.
Gas gangrene.
Penetrating wounds of the abdomen (pre-operative).
Penetrating chest wounds (pre-operative).
Maxillo-facial injuries.
Damage to blood vessels with threatening gangrene.
Large flesh wounds and orthopaedic cases, especially compound fractures and joint penetrations (pre-operative).

Paraplegia from any cause requiring suprapubic cystotomy.
Small puncture wounds with extensive underlying damage.
Head injuries (pre-operative).

After the determination of the clinical state, a weighing of opposing factors took place: the flight conditions, probable maximum altitude and time at that altitude and total length of flight, against the ground alternatives. Thus an 'acute abdomen' could only go by air preoperatively; if the weather was very bad, it might still be better to send it, than to hold it, be forced by time to operate, and then have to go on holding it for a further fourteen days. A maxillo-facial injury might include damage to nasal sinuses or Eustachian tube blockage, which by themselves contra-indicated air passage. But here the primary condition is so serious, requiring highly specialised treatment and psychological reassurance, that secondary injuries must be ignored. Thus, on occasion, the decision whether to evacuate by air required good clinical judgment, and appreciation of flight factors as well as of the ground tactical situation.

Some idea of the actual sorting process in a C.A.E.U. has been given earlier in this chapter. To conclude this section, certain specific conditions will be discussed and war experience summarised.

All stretcher cases should pass urine before emplaning. If they have retention, it is dangerous to catheterise without full aseptic precautions (which are usually not possible in a forward C.A.E.U. or in an aircraft), and, unless a suprapubic cystotomy has been done, it is better to let such patients go on to overflow of their own accord, and be treated later at a base hospital.

Experience with severe burns has shown that it is important to maintain treatment for shock and toxaemia throughout transit, as otherwise a case in good condition at the start very quickly deteriorates. Resuscitation while in transit is a time-saving measure for pre-operative abdominal injuries, where speed to hospital is often so important. Post-operatively, after sixteen days, they can travel at over 8,000 ft. with perfect comfort, if attention is paid to their diet and to colostomy toilet where indicated, and a rectal flatus tube is passed.

Most extensive flesh wounds arrived at a C.A.E.U. immobilised in plaster. As with all plaster treatment, it was necessary to watch for underlying secondary haemorrhage and gas gangrene, for oedema and resultant ischaemia and nerve palsies; and sometimes the plaster had to be split and the limb elevated.

Of orthopaedic and ophthalmic cases there is nothing special to remark. There is a possibility that glaucoma might give trouble, but there is no record of a case ever being carried. Head and spinal injuries have already been discussed under various headings—the nursing of unconscious patients, the use of paraldehyde in preference to morphia, the fact that C.S.F. pressure does not rise with altitude but with anoxia.

With maxillo-facial injuries, a good airway free of blood clots is of prime importance; the tongue may have to be held forward by a through-and-through suture, or a tracheotomy performed. Morphine may be needed. The patient is carried face downwards on his stretcher, with his head free over the end of the canvas, and an additional canvas band slung between the handles for his forehead to rest upon. Intermaxillary fixation is better done with elastic than wire, though in practice it was often found that vomit could be forced out between the teeth even when the jaw was fixed firmly shut. Food (fluids) may be given by rubber tube, e.g. nasal catheter. It may be difficult to give oxygen in the aircraft, and various methods have been tried—tracheal tube, anaesthetist's airway, nasal catheter.

Of ear injuries it is only necessary to say that acute otitis media with perforation, and fresh radical mastoidectomy have both travelled quite successfully.

For chest injuries as for other chest diseases, it is necessary to bear in mind the effects of decompression. Sucking wounds must be closed, tension pneumothoraces aspirated (also extensive effusions), and patients with adhesions kept below 6,000 ft., or if with a fixed mediastinum only, below 9,000 ft. Of other lung conditions, pneumonia and acute bronchitis must travel as stretcher cases, while untreated tuberculosis in North-West Europe and among prisoners-of-war in the Far East have travelled satisfactorily below 6,000 ft. Tuberculous cases under treatment have been up to 20,000 ft. without the infection lighting up, at a time when the sputum was negative. Stretcher cases of tuberculosis should have effusions aspirated and should wear gauze masks and be placed on the bottom tier of stretcher racks in the aircraft if other cases are also carried. Oxygen should be available the moment distress is felt. In this way many cases have travelled at up to 12,000 ft. without haemoptysis or any other trouble. Patients on the other hand in whom breathing was affected by a respiratory centre disorder were unsuitable for air transport.

It was found that all medical conditions would travel satisfactorily below 3,000 ft. With peptic ulcer there was no risk of perforation, but there was a tendency to abdominal discomfort if the flatulence associated with this disease was not controlled. Typhoid was a disease in which the risk of perforation was regarded as much more serious, and patients in the second and third weeks of the disease did not travel by air at altitude if avoidable, since abdominal gases double in volume in rising to 18,000 ft. and may rupture a much weakened gut wall.

Other infectious cases besides tuberculosis and typhoid were freely carried, including infective hepatitis and malaria in Europe, and typhus, scrub typhus and dysentery in the Middle and Far East. Patients wore gauze masks and were carried on the lowest tiers, and D.D.T. was

freely used where thought necessary; attendants wore special protective clothing. In the case of scrub typhus over 200 patients were carried without incident, oxygen being given as a routine over 5,000 ft. and rectal tubes passed for distension, while paraldehyde was used for sedation. The end of the second and the third weeks was regarded as the least satisfactory time to transport them.

In the particular instances of cerebro-spinal fever, acute anterior poliomyelitis, scarlet fever and diphtheria, segregation was practised. That is to say that patients with these diseases were carried separately, and the crew got into the aircraft first, shut themselves away in their cabin, and stayed thus until the patients had been off-loaded on arrival and the aircraft disinfected with lysol, and formaldehyde vapour. Care was taken to see that all contacts were up to date in their vaccination and immunisation states, and throat swabs were taken from all who handled diphtheria and scarlet fever cases.

Finally, to add to the list of medical experiences, it may be mentioned that cases of meningitis, with rectal drips if vomiting was severe, and of epilepsy, accompanied by two orderlies with instructions to repeat the pre-flight 1 gr. of phenobarbitone if necessary, both travelled and arrived successfully. Anxiety neurosis cases travelled well; nembutal 3 to 6 gr., or sodium amytal 6 to 9 gr., or phenobarbitone 1½ gr., and oral or intramuscular paraldehyde were all used on occasion for sedation. Psychotics were not carried except in cases of extreme necessity, and were restrained and accompanied by a personal attendant.

Below are given some typical case histories:

(*a*) 12 cases were moved from 'Marble Arch' in the Western Desert to Cairo on January 5/6, 1943, in a Bombay aircraft. The diagnoses were a double amputation through the thighs, a shattered left knee-joint with fractured tibia and fibula, two cases of fracture of the humerus by gunshot wound, a convalescent appendicectomy, a head injury with severe laceration and concussion, two cases of severe burns of the hands and face, a lobar pneumonia, a bacillary dysentery and two cases of infective hepatitis. The lobar pneumonia and the two hepatitis cases were carried on the lower tiers and wore gauze face masks to prevent droplet infection. Their feeding cups were kept separate from those of the wounded men. The patient with dysentery had repeated diarrhoea, but his urinal and bed-pan and feeding cup were kept apart from the others. They were changed at the intermediate stop at El Adem, and both sets eventually sterilised. The tow used for toilet purposes was burnt. The aircraft was 'flit-sprayed' to destroy flies, and the two medical officers on board washed in Dettol each time after handling the infectious cases. All travelled well and arrived in good condition. A subsequent follow-up showed there had been no spread of infection.

(*b*) A Ghurka private sustained a perforating wound of the abdomen from a mortar fragment. A field dressing was applied and the patient,

fully clothed and without other treatment, was loaded as a stretcher case into a light aircraft at Meiktila, and flown to Myingyan, 80 miles to the rear. Here a transfusion was started and ¼ gr. morphia given, and fluid by mouth withheld. A transport aircraft was on the point of taking off and likely to reach base in only an hour longer than it would take to transfer the patient by road to the nearest C.C.S. At that time, all roads round Myingyan were congested by great convoys of motor vehicles, guns and tanks moving forward on Meiktila. There were thick dust clouds and the roads were torn to pieces. The patient was loaded with others on the transport aircraft, and his transfusion continued in the air. The flight took 2¼ hours and reached 12,000 feet at one stage. Beyond requiring an occasional adjustment of the speed of the drip, the transfusion was not affected by the altitude and was stopped after three pints had been given. The patient felt some discomfort from distension, but his condition on arrival was good. He was immediately transferred over a newly surfaced road on which ambulances had top priority to the general hospital. From time of wounding to arrival at hospital was approximately 6 hours; distance 600 miles.

(*c*) A soldier and an aircrafthand both sustained extensive burns of the body and hands and face in attempting the rescue of the crew of a crashed aircraft in the Arakan.

Resuscitation was carried out at a medical unit near the airfield. At that time (September 1944) the air evacuation services by freight planes were not fully organised, and as soon as the patients were fit to be moved they were put aboard a routine passenger plane for transfer to the burns centre at Comilla. When emplaned they were in relatively good condition, their burns had been dressed with gentian violet jelly, and they were accompanied by an orderly.

The passenger aircraft had two scheduled stops and ended its journey at an airfield 15 miles outside Chittagong, and 80 miles from Comilla. At each stop the passengers disembarked for a while but the casualties remained inside the aircraft which had to stand in the blazing sun. Both patients began to complain of severe thirst and were repeatedly given water by the orderly. When the aircraft reached its terminal, the patients were removed to the airfield sick quarters, but there was some delay because the control tower had not been advised of the situation by wireless before the aircraft landed, and no ambulance was standing by at the passenger bay to meet the plane.

The American medical officer on duty found both patients to be gravely ill, but he had to see the R.A.F. medical officer, who was off duty and could not be found for some time, to ascertain the procedure for their disposal. This officer decided correctly that the patients should go on by air to the burns centre rather than over a bad road to Chittagong, where there were no special hospital facilities. Permission was requested from Headquarters in Comilla for an aircraft to make a special flight, the squadron commander had to be notified, a fresh

crew found (for all scheduled journeys were over for the day), and the patients re-loaded. During this long wait they were given copious fluids by mouth and another ¼ gr. morphia, but no plasma. Their condition improved perceptibly.

Although there was no C.A.E.U. at this time, arrangements had been made for an ambulance to stand by at Comilla, meet the aircraft and take the patients straight to the burns centre. The pilot on landing unfortunately saw three ambulances belonging to the Indian Staging Section parked at the far end of the runway and taxied to them. The Indian drivers, not fully understanding his instructions, unloaded the patients but took the soldier to an Army general hospital and the airman to an R.A.F. mobile field hospital, both three times as far from the airfield as the burns centre. Both patients by that time—more than 12 hours after injury—were in a state of collapse. Both were given plasma transfusions. The airman became fit for transfer to the burns centre in 48 hours, and although toxaemia and sepsis followed and he was gravely ill for several weeks, he eventually recovered. The soldier, however, died the day after arrival.

This story illustrates the danger of:

(1) using aircraft not flying direct to the hospital base;
(2) using aircraft on which patients have not got top priority;
(3) not having aircraft on special call for emergencies;
(4) failing to make full use of air-to-ground radio communication;
(5) not having C.A.E.Us.;
(6) not having standardised instructions for all units—British, Indian, U.S.A.;
(7) not having a fixed 'Red Cross' loading and unloading area on an airfield;
(8) delay in transit;
(9) failing to give plasma in transit.

These nine points explain why casualty air evacuation is something more than merely putting a sick man in an aeroplane, and is at its best an organisational triumph.

CHAPTER 11

AIR SEA RESCUE

THE AIMS OF AIR SEA RESCUE

THE objects of Air Sea Rescue are threefold: to preserve trained man-power, to maintain morale, and to save life. These three aims are of direct concern to the Royal Air Force Medical Branch. Clinical skill may preserve trained man-power, medical support helps to maintain morale, and the humanitarian instinct to save life forms the basis of the medical profession.

DEVELOPMENT OF THE ORGANISATION

After the War of 1914–18 there was little provision for assistance to aircrews forced to bale out over the sea, and at first the aim was to salvage the aircraft by means of flotation gear. With the increase of flying over the sea by land-based aircraft, additional facilities were gradually provided, and in 1934 general instructions were issued regarding the steps to be taken when an aircraft was reported missing or in distress. These included the notification of the appropriate naval authority and H.M. Coastguards, and a broadcast from the local G.P.O. wireless station. Furthermore, the aid of shore-based flying-boats might be enlisted from bases such as Felixstowe, Calshot, Lee-on-Solent, Mount Batten and Pembroke Dock.

In 1935, authority was given for the construction of an experimental high-speed launch (H.S.L.) as a safety boat, and the first one was handed over to R.A.F. Station, Manston, in August 1936. It was capable of carrying four stretchers and could proceed to sea in all but the roughest weather. It was considered successful and in the same year orders were placed for a further fifteen launches. In 1937, it was suggested that the motorboat crew should be supplemented by the addition of a nursing orderly, or alternatively that all the members of the crew should be trained in first aid. In 1938, Bomber Command requested that their aircraft should be equipped with dinghies, which had previously only been carried by flying-boats, Fleet Air Arm aircraft, general reconaissance aircraft and torpedo bombers. These aircraft were therefore fitted with 'H'-type dinghies which floated free on ditching the aircraft. By December 1938 there were seven H.S.Ls. in operation, but the whole of the East Coast from Tayport to Felixstowe remained uncovered. In February 1939, following a conference at Air Ministry, the administration of the whole high-speed launch organisation was entrusted to

Coastal Command and thirteen more launches were ordered. In July 1939 the responsibility for co-ordinating air and sea rescue was vested in the coastal reconnaissance group commanders. These arrangements continued during the early part of the war, and aircraft which had ditched were searched for by aircraft from their parent units. For security reasons W.T. stations were not at first allowed to broadcast to shipping, but this instruction was later withdrawn owing to the mounting toll of losses over the sea.

In June 1940 there were still only fourteen H.S.Ls. in commission, based from Kirkwall to Guernsey. The intensity of air operations over the Channel during the Battle of Britain with increasing losses over the sea, resulted in the formation of a local Air Sea Rescue service organised by the Vice Admiral, Dover, in conjunction with the A.O.C. No. 11 Group. This service was of great value to pilots of Fighter Command, but could not be extended to crews of Bomber Command, and in August 1940, a draft plan for rescue work was discussed at Air Ministry. In October 1940, aircrew losses were 260, many of these over the sea, and accordingly the Chief of the Air Staff ordered the complete reorganisation of the Air Sea Rescue service.

A Directorate of Air Sea Rescue was formed and took up duty at H.Q. Coastal Command in February 1941. It proceeded at once to co-ordinate the rescue services and became responsible for the development and introduction of improved life-saving equipment. The Director of Hygiene became responsible for recommending suitable rations and medical aids for crews in distress.

Rations and fluid were at first carried as personal equipment, but in view of the danger that these might be left behind in the stress of operations, late in 1940 special rations were stowed in the dinghies, including chocolate, chewing gum, Horlick's tablets, biscuits, and three tins of liquid (each containing three-fifths of a pint) per man. The original fluids were tomato or apple juice, but these were later replaced by water and the number of cans was increased to four, while barley sugar and 'energy tablets' were added. First-aid outfits for dinghies were introduced in the autumn of 1940, and sedatives, stimulants and dressings were provided with full directions for the use of each individual item.

MARINE CRAFT UNITS

During the early part of the war rescues were few, but during the Battle of Britain it became clear that trained medical personnel were required to serve with the rescue service. The members of the motor-boat crews were fully occupied with their own duties, and in May 1941 it was decided to provide one nursing orderly for each H.S.L. to attend to the rescued. These orderlies were posted to the base and were interchangeable with other orderlies from the main sick quarters. They

became in effect members of the crew. The shortage of medical airmen was so acute that it was not always possible to provide adequate staff and during times of stress orderlies were frequently on duty for twenty-four to thirty-six hours, sometimes being transferred immediately from an incoming to an outgoing craft.

Marine craft crews operated in conditions which were safe or dangerous according to the activity of the enemy at the time. Attacks on H.S.Ls. were begun in August 1940, and resumed in 1941. By August 1942, the casualties were 16 killed, 24 wounded and 27 missing, while 6 of the launches had been lost. On August 19, 1942, the day of the Dieppe landings, many calls were made on the rescue vessels, some of which were subjected to deliberate attacks. H.S.L. 146 was last seen under attack by aircraft and shore batteries. H.S.L. 123 was attacked by two Focke Wulf 190s. and two of the crew were injured. A few minutes later she was again attacked by four Focke Wulf 190s. and finally she was bombed by a Heinkel. She was closed by another high-speed launch and found to be badly damaged with only five of her crew alive. By now both launches were incapacitated and more enemy aircraft joined in the attack until both launches were blazing. A daring rescue was made by H.S.L. 177 and R.M.L. (reserve motor launch) 153 escorted by two Spitfires. They managed to pick up all the survivors and then return to base.

The conduct of masters and their crews under extremely dangerous conditions was magnificent, and many officers and men were recommended for decorations. The citation in respect of one anonymous nursing orderly illustrates the very high morale. It reads: '. . . in spite of wounds he endeavoured to carry out first aid to the wounded, until he was picked up in a seriously wounded condition. The nursing orderlies on the high-speed launches have carried out operations in trying circumstances and are an essential part of air sea rescue. It is desirable to draw attention to their very valuable service and courage in circumstances with which they are not usually associated in the Royal Air Force.'

Bases were located round the whole of Great Britain and Northern Ireland and at some of the more isolated bases it was difficult to provide medical attention without undue wastage of man-power. Accordingly in 1941 certain stations in Coastal Command were provided with special equipment and increased facilities, which were of considerable value in dealing with the rescued. Living conditions at these isolated units were often primitive, and it was not always easy to keep the men fully occupied during their hours of leisure. Fortunately the type of work appeared to attract the right kind of man and morale was generally high.

CONDITIONS AT SEA

Accommodation varied with the different types of craft, but the sick bays generally contained let-down cots, settles and space for slinging

stretchers. In addition, the crews' quarters could also be used for the accommodation of the rescued. On a long trip clothing became sodden and men chilled; the only source of dry heat at sea was in the engine room and it was often quite impracticable to dry clothing. Most of the rations were prepared beforehand. At sea it was often impossible to use the galley. Emergency rations were held which could be used if a trip exceeded eight hours or in case of emergency. Hot drinks were carried in thermos containers because of the difficulty of preparing them at sea when they were really needed in cold and stormy weather.

FACILITIES FOR THE RESCUED

One of the chief problems was the transfer of rescued personnel from their dinghies to the launches, particularly as the freeboard of the launches was increased in later models. Boat hooks were provided but were obviously unreliable and dangerous in use. The most useful appliance was a rope net of wide gauge which was let down over the side of the launch into the water and used by the rescued with the assistance of members of the boat crew. On some boats a davit was provided which was used as a small crane to hoist men on to the launches. Further difficulty was experienced in getting a wounded man below, and this problem was eased when the rails of the companions were fitted with slides to take the metal lines of the standard stretcher.

The first task was usually to warm the patient. Blankets and clothing were warmed in the engine room and passed into the sick bay. In 1942 'Everhot' bags were provided which proved of the greatest service. Hot drinks, when the thermos supplies had been exhausted, could not always be provided if the weather was too stormy to use the paraffin stove in the galley, but later special tins of soup were introduced which were heated chemically by lighting a wick in the centre of the tin. These were invaluable.

A comprehensive first-aid kit was carried. At first the B1, as supplied to road ambulances, was used but this was later modified in the light of experience.

The judgment of the nursing orderlies was of supreme importance and it was sometimes necessary to impress upon them that their duties were confined to making the patient comfortable and warm, to splinting fractures and to preventing deterioration in the general condition by giving suitable food and drink until proper treatment could be given on shore. Such was the enthusiasm of the nursing orderlies that they were frequently tempted to exceed these duties in their anxiety to do as much as possible for their patients.

DISEMBARKATION AND DISPOSAL OF THE RESCUED

Craft were met at the quayside by R.A.F. or other ambulances with a nursing orderly or sick berth attendant and almost always a R.A.F. or

R.N. medical officer. Difficulties were experienced in disembarking the severely injured cases. Many bases had quays with internal steps and landings which were excellent for landing the uninjured or slightly injured, but at low tide it was often extremely difficult to land stretcher cases. At Felixstowe the craft were met at the quayside and a crane could be used to remove stretcher cases complete in a stretcher sheet if required. The medical officer carried out an inspection of all cases and disposed of them to station sick quarters a few hundred yards away or to dispersed sick quarters 4½ miles away.

The immediate disposal depended on the Service which was in charge. First-aid huts were available at some bases and R.A.F. sick quarters were within two to five miles at others. In the case of small isolated bases the line of evacuation followed that for dealing with the ordinary sick. Naval sick bays and hospitals or Emergency Medical Services hospitals were available at others, such as Dover. The patients taken to sick quarters were given food and drink and comforts and their injuries treated. At dispersed sick quarters, which were equipped with extra facilities, straightforward surgery was carried out after resuscitation. Cases requiring specialist treatment were disposed of to the appropriate centre, such as R.A.F. Hospital, Ely, from where a mobile specialist team was available to deal with a patient unable to travel. At Dover the E.M.S. Hospital had complete equipment for dealing with any emergency. Patients were brought direct from the quayside into a resuscitation ward capable of dealing with ten patients at a time. This was equipped with oxygen, blood transfusion apparatus and heat cradles, and it was here that the naval medical officer made his examination. Full-scale operating theatres adjoined this ward.

There were thus three main stages of disposal: first, preliminary first-aid treatment on board, at the quayside or in a nearby sick quarters; second, more thorough investigation and treatment including surgical operation in dispersed sick quarters or hospital; and third, definitive treatment followed by rehabilitation carried out in the big general hospitals, Naval, E.M.S., or Royal Air Force.

CONDITION OF THE RESCUED

Accurate figures of personnel requiring treatment were not kept, in fact during the early days of the war actual figures of total rescues were not available. Approximately 80 per cent. were uninjured, 10 per cent. had sustained ditching injuries, 8 per cent. had injuries due to enemy action, while 2 per cent. suffered from exposure. These proportions varied a little at different times and in different areas, according to the nature of the operations being carried out.

There were numerous cases of ditching injuries among the rescued. At first 'ditching drill' was taught without reference to the medical

branch. All medical officers were agreed on the necessity for a correct ditching procedure and emphasised the importance of the second impact on striking the water. The effects of exposure were variable, but were especially marked where men were continually wet. A man who managed to keep dry in a dinghy could withstand the lack of food and water to a surprising degree. Rescued personnel themselves agreed that, of thirst and cold, the cold was worse to bear. A striking feature was the extreme difficulty experienced in warming a man who had been immersed and had remained in wet clothes. Even with hot blankets, drinks and heat cradles some considerable time would elapse before any other treatment could be undertaken. On the other hand wounded personnel who had also been immersed showed a surprising resistance to wound infection, even before the introduction of the antibiotics.

Of conditions due to exposure, 'immersion foot'* was the commonest, and had it been more frequent would have been a serious source of invaliding. Case histories of a series of patients who had spent from forty-eight to seventy hours in dinghies showed that the longest period in hospital was thirty-eight days, but that complete recovery was delayed, often for months.

Problems of the same nature were of course encountered as a result of the sinking of ships at sea,† and though there were important differences between the position of men in a boat or on a raft and that of airmen in a dinghy, valuable guidance was obtained from the experience of shipwrecked sailors. A Medical Research Council Committee to discuss the problems was established in 1940. The Royal Air Force Medical Branch was kept informed of the proceedings, and in turn provided special information from the Royal Air Force point of view on the provision of food and water, and on prevention and first-aid treatment of the various conditions which resulted from exposure. The practical result was that the subject of discipline and leadership was re-emphasised and the measures to avoid immersion foot were detailed in a directive as follows:

(*a*) Avoid the water as far as you can by keeping the bottom of the boat (dinghy) as dry as possible or by raising the feet.

(*b*) Cold from the water will penetrate boots, so take off your socks and wring them out if they are wet. Put on a dry pair if possible, otherwise replace those you have wrung out.

(*c*) Move your feet and toes as often as you can, but do not expose them to the air unless the sun is out. Never rub your feet when they have become swollen, numb or tender, and only do it when they are merely cold.

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* *See* Volume on Surgery in this Series.

† *See* Volume on Medicine and Pathology, Chapter 11, in this Series.

(*d*) Do not wear tight clothing such as garters or suspenders.

Some indication of the extremes of conditions encountered is given by the story of the following ordeal:

A Hampden aircraft took off on the evening of June 4, 1942, and course was set for the Frisian Islands. Nothing untoward occurred until 0150 hours when the port engine failed without warning. The height of the aircraft was about 250 ft. and it immediately crashed into the sea, 70 miles from the English coast, and 100 miles from Holland. It sank almost immediately. The dinghy was released automatically and the pilot and another uninjured member of the crew dragged in the observer, who was dazed and half drowned after a blow on the head. The fourth member of the crew was not seen again. The survivors were dressed in standard flying clothes, and the gunner had his life-saving jacket and flying-boots in addition. Pigeons, emergency flying rations and other gear were lost with the aircraft. The crew did not bale out the water from the dinghy until daylight for fear of losing other equipment. Next day was fair and the dinghy was baled out while they tried to dry themselves and their clothing. They found that the dinghy food ration was unfit to eat, as it had become contaminated with petrol, and that they had three quarts of water between them.

As the sun rose they managed to dry themselves. The observer had not recovered from the blow on the head. No water was drunk on the first day and it was decided to restrict it to one sip each in the evening. The signalling pyrotechnics were found to be unserviceable, but they were confident of rescue. Three days passed in looking for boats by day and sleeping by night. On the fourth day, the weather deteriorated and a high wind blew spray over them, keeping them constantly wet and preventing them from sleeping. The storm continued till the eighth day and they had to drink more water. The first tin ($\frac{3}{8}$ pint) was finished on the fifth day and the second on the eighth. On this day a Junkers 88 circled above, and hoping that the pilot had seen them and that rescue was near, they drank the last of the water. However, a Beaufighter drove the Junkers away and vanished, despite all their efforts, without the pilot having seen them.

The observer died shortly after sundown, quietly as he lay. They kept his battle dress and lifted his body over the side. The ninth day was cloudy and rough, and an easterly wind drove the dinghy away from the coast of Holland. Four Hudsons came over at 600 ft. during the afternoon, but despite all efforts they were again not seen by the crews of these aircraft.

By the morning of the tenth day, the two survivors had been without water for thirty-six hours. The gunner was becoming weaker and had difficulty in baling the dinghy. He drank some sea water and the pilot had to throw away the drinking-can to prevent a recurrence. It rained

during the afternoon and the pilot managed to catch some rain water in a piece of the apron of the dinghy. He tried to persuade the gunner to drink this, but he would not do so and he therefore decided to take it himself; there were only about two tablespoonfuls in all.

The gunner died quietly about two hours later. The pilot kept his battle dress and managed with great difficulty to tip his body over the side. His mind became less clear after the tenth day, and he could not remember details, but on the thirteenth day he killed a seagull, an incident which he described in the following words:

> 'I was lying in the bottom of the dinghy very quiet when a seagull lit on the edge. It stuck its head under its wing. I grabbed it and cut off its head. I sucked the blood from its neck and ate the brain, heart, breast and fish in its guts. The flesh from the breast tasted bad. The rest I threw away. I was not struck with avidity or repulsion in eating the bird, only a desire to get something to eat.'

He spent the rest of the day lying on the floor of the dinghy and heard a ship approaching at 0045 hours on June 18. He stood up and shouted 'Ship ahoy' and was heard. He grabbed the line thrown to him and was taken aboard the rescue vessel after nearly fourteen days in a rubber dinghy, the last six of which he had been without water. He was admitted to station sick quarters, No. 16 Recruits Centre, Great Yarmouth, and was rational and able to give a fair account of all that had happened.

His general condition was good, the tongue still moist though the lips were cracked. He complained of soreness of the mouth, which gradually disappeared. His feet were swollen to above the ankles, the skin was pink to grey and the lower thirds of his legs were anaesthetic. His hands were red and swollen, but he was able to grasp the feeder. There were several areas of necrosis due to pressure, chiefly at the back of the left *tendo-calcaneus*, elbows and right buttock. This and other cases show that the factors of will power and determination to live are common to all, and that they seem to be at least as important as fluid, food or warm dry clothing. The man who has qualities of leadership as well, may succeed in sharing his determination with others not so well endowed.

RESCUE AIRCRAFT

In January 1941, there were only twelve Lysander aircraft, which had been borrowed from Army Co-operation Command, employed on search. In July, three Walruses from Coastal Command were allotted for search duties and by September four squadrons—Nos. 275, 276, 277 and 278—were formed with an additional twenty-four Lysanders and nine Walruses. Deep search was, however, still carried out by operational aircraft, which might at any time be required for urgent operational

PLATE LVII. A survivor sighted by a Walrus aircraft.

PLATE LVIII. Packing and checking a dinghy to be loaded into the aircraft in the background.

[facing p. 544

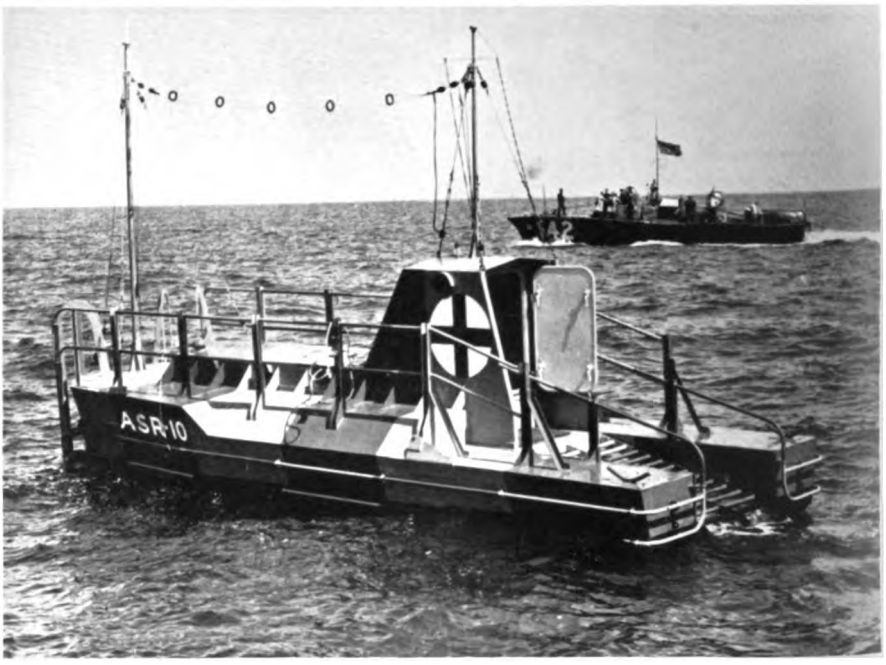


PLATE LIX. A rescue float containing comprehensive first-aid material and comforts.

PLATE LX. Life-boat dropped from aircraft to survivors.

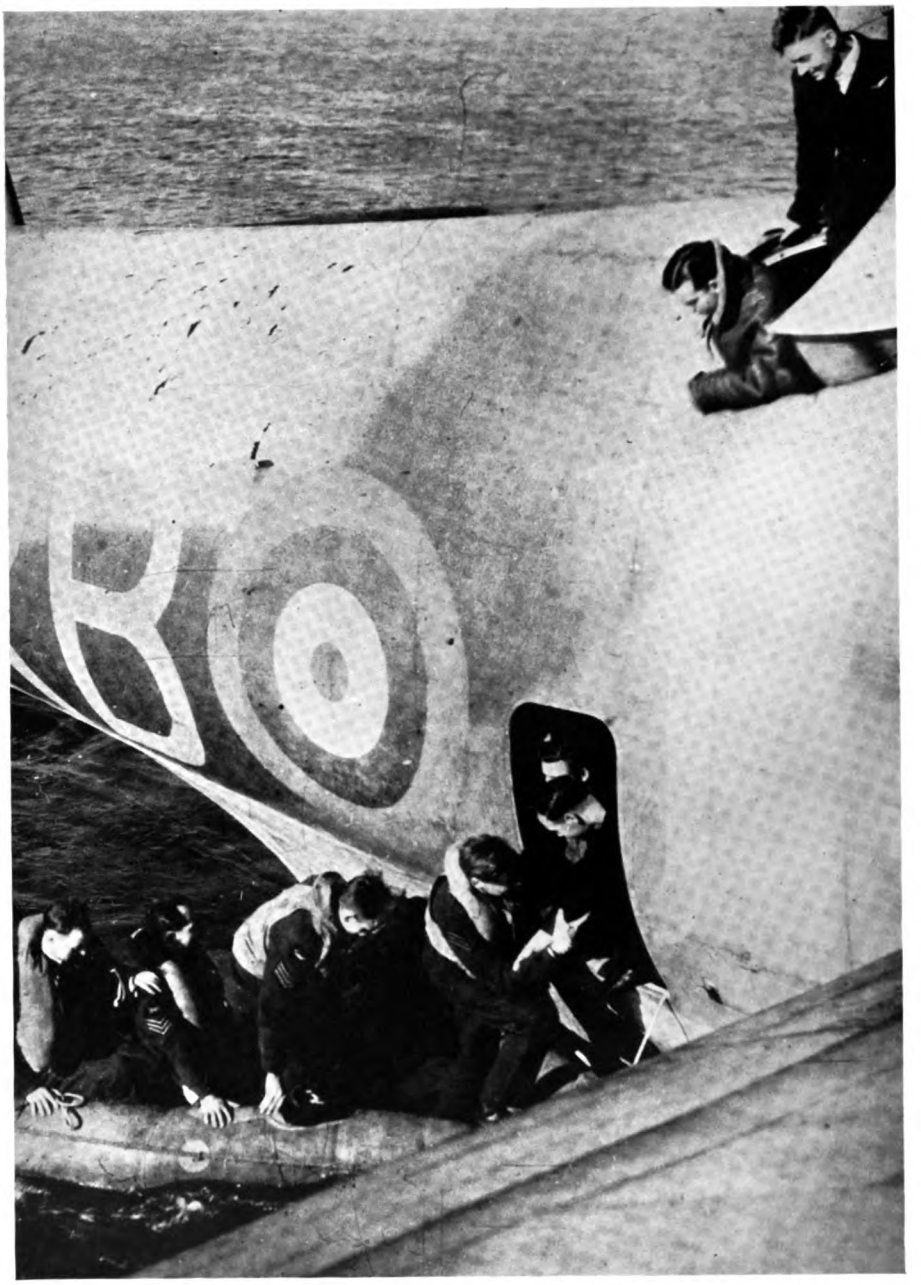


PLATE LXI. Emplaning survivors into the rescuing Sunderland aircraft.

PLATE LXII. Survivors paddling to the rescue launch.

duty, and after further discussion two squadrons of Hudsons were allotted for deep search.

There was a need for further expansion both of marine craft and aircraft units, and plans were made for world-wide cover. From February until May 31, 1941, only 213 aircrew out of 607 known to have come down over the sea had been rescued, and before this, though no accurate figures had been kept, the proportion was about 20 per cent.

To meet the requirements of the expansion further reorganisation took place and a Directorate of Air Safety was formed, headed by a Director-General. The Air Sea Rescue side was to be headed by a Deputy Director to serve under the Directorate of Air Safety. This was implemented in September 1941. Progress was made with improved rescue apparatus and plans were made for constructing an airborne lifeboat to be dropped by parachute, which would enable crews to travel long distances themselves in greater security towards rescue. Many technical problems had to be overcome but by January 1942 development work had commenced, and early in 1943 the lifeboat came into use. It carried food and drink for a crew of seven for seven days, waterproof suits with warm inner linings, first-aid outfits, 'Everhot' bags, and also a dinghy radio set.

Dinghies, too, were improved by the addition of covers, floating knives and torches, whistles, fluorescine sea marking compound, paddles, masts and flags and distress signals. During the year 1943 also, improvements were made in communications and by February, 1,600 radio transmitting sets had been issued to the service for use in dinghies. Later during this year Air Sea Rescue squadrons began to be re-equipped with Warwick aircraft built to carry the airborne lifeboat and Lindholme gear. A multi-seater sailing dinghy, the 'Q' dinghy, was under development in this year, but early models were found by aircrew to be too difficult to use.

In September some reorganisation began to take place in Air Sea Rescue in preparation for the forthcoming re-entry into North-West Europe. Fighter Command was to become responsible for rescues in areas opposite enemy coasts, and Coastal Command for all other areas. Marine craft were reinforced in the Southern Approaches, and by May 1944 the new organisation and the U.S.A.A.F. Rescue Squadron of Thunderbolts were ready to play their part in the liberation of Europe.

INVESTIGATION OF MEDICAL PROBLEMS

Meanwhile investigations were also being carried out at the Physiological Laboratory at Farnborough with a view to improving medical arrangements and equipment.

The investigations conducted covered:

(*a*) The standard life-saving jacket.

(*b*) Buoyancy and protection against cold afforded by ordinary flying clothing, and waterproof and water-repellent clothing.

(*c*) Transfer of dinghy crews to rescue craft.

(*d*) Artificial respiration.

(*e*) Comfort of motor-boat crews.

A great point was made of artificial respiration at all marine craft bases, Schafer's method being usually taught. By testing out various methods on the anaesthetised patient it was found that Eve's rocking stretcher was at least as efficient as Schafer's and was obviously the method of choice in rescue craft. Many ingenious devices were tried for facilitating the transfer of dinghy crews, including safety belts, platforms and nets. The purpose of the net was to pass it beneath the dinghy as the launch came slowly past. Experiments were also carried out by commercial firms with help from the U.S.A. to find an apparatus capable of making sea water drinkable. Finally in March 1943, the Director of Hygiene agreed to the production of a set suitable for use in multi-seater dinghies. The apparatus, later to be known as a 'de-salting kit', could produce nine pints of drinkable water and occupied the space of two cans of water (1·2 pints).

RE-ENTRY INTO NORTH-WEST EUROPE

There was a special concentration of rescue craft in the assault area, and 136 craft were operational. Certain craft were detailed for use as hospital and casualty clearing boats, and other launches were sent to specified rendezvous. The operation was completely successful, and very few Allied airmen were lost at sea; 66 airmen were rescued on D-day and 44 soldiers and sailors. During the first ten days, 163 airmen were picked up. After the first few days calls became less frequent and certain H.S.Ls. were based in the Mulberry Harbour area. Injured personnel were transferred to the nearest hospital ship. The following incident illustrates the many rescues carried out:

> On June 29, 1944 an H.S.L.from Great Yarmouth went to the rescue of a Fortress crew of eight in a dinghy. The survivors were picked up but the H.S.L. was immediately attacked by a JU 88 which killed one of the crew and one of the survivors and wounded seven others. Another two H.S.Ls. came to the rescue and found fifteen survivors in a Carley float and various dinghies. Medical aid was signalled for and two medical officers were flown out, who attended the wounded and administered plasma to the more serious cases on the way back to base.

With the success of the Allied forces, certain Air Sea Rescue units were moved to the Continent, and in July the responsibility for organising rescues from the Continent was vested in A.E.A.F. In September, with the move of the British Forces to the north-east, Air Defence of Great Britain again became responsible for rescues in the Channel area.

When opposition collapsed it was found no longer necessary to provide fighter cover, and by the end of 1944 all rescue operations were again in the process of transfer to Coastal Command.

In November 1944 a new Directorate of Navigation was formed and the post of Director of Flying Control and Rescue (formerly Aircraft Safety) was abolished. The Deputy Directorate of Air Sea Rescue therefore came under the control of the Director of Operations (Maritime) and became the responsibility of the Assistant Chief of Air Staff (Operations), instead of the Assistant Chief of Air Staff (General).

RESULTS

No accurate records were kept before the formation of the Directorate of Air Sea Rescue in February 1941, but the following figures give an indication of the extent of the rescue service:

In the first six months of 1941, aircraft representing 1,200 aircrew were lost, presumably over the sea. Of the aircrew 444 were saved—37 per cent. of the presumed total, but 46 per cent. of the incidents reported. In the six months ended December 31, 1941, 327 aircraft were lost, representing 1,037 aircrew, of whom 399 were saved, i.e. 38 per cent. During the first six months of 1942, 428 aircraft were lost. Aircrew involved numbered 1,321, of whom 405 or 31 per cent. were rescued, and during the latter six months 611 were saved out of a total of 1,622—over 37 per cent. During the whole of 1943, 1,138 aircraft representing 5,466 aircrew were lost over the sea, and 1,684 or 31 per cent. were picked up by all combined branches of the Air Sea Rescue service. To maintain an average of over 30 per cent. in dealing with such numbers represents a very considerable achievement.

During the assault period no record was kept of the actual number of ditchings, but during the first six months, 1,125 aircrew were saved, and in the latter six months 936. By the end of March 1945, the known total was 5,658 aircrew personnel alone, but during the whole period many others including soldiers, sailors and also enemy personnel were rescued.

It will be seen therefore that the first objective of Air Sea Rescue, the preservation of trained man-power, achieved considerable success, particularly when it is remembered that the average cost of training a member of aircrew of any category was in the region of £5,000. The result is not quite as good as it appears at first sight, because a certain number did not return to duty. Some died in the launches or in hospital, some were wounded or had been injured in ditching, some developed illness as the result of exposure, and others developed psychological illness, wholly or in part as a result of the experience of ditching.

The second objective, the maintenance of morale, could be judged by general indications. At first there was a surprising lack of knowledge among aircrew. It was hard to overcome their resistance to learning

ditching drill and they were slow to appreciate the value of their safety equipment. When a rescued crew returned to their squadron, however, the effect was marked, and they began to take a real interest. The value of this knowledge was very evident later, when confidence in the facilities available to save crews after ditching led captains of aircraft damaged over the Continent to attempt the sea crossing rather than bale out over enemy territory. They knew that they had a good chance of reaching home safely.

The third aim, the humanitarian desire to save life, was evidenced by the heroic devotion to duty of all concerned. The lengths to which rescue personnel, regardless of personal danger, were prepared to go, had practically no limits. Many incidents are recorded which illustrate this outlook, perhaps the most famous being the story of a Wellington which ditched in the Bay of Biscay in 1942. On the first day four Beaufighters and a Whitley were despatched to search the estimated position. The Whitley located the dinghy and later a Whitley of another squadron remained over the dinghy until a Sunderland was in the area. The Sunderland was being attacked by a Focke Wulf Condor. The Sunderland made an attempt to come down, but was wrecked owing to the rough sea, and there was only one survivor.

The next morning a destroyer sailed from Falmouth with a Whitley and a Beaufighter in attendance. The Beaufighter later attacked and probably destroyed a JU 88, and the Whitley was attacked in the neighbourhood of the dinghy after dropping a Thornaby bag. The Whitley failed to return to base.

Owing to bad weather no further air search was made for two days, when four naval launches were sent out, together with Beaufighters. Beaufighters and two Hudsons got in contact with the dinghy, and the Hudsons dropped a Lindholme dinghy gear. The next day the dinghy crew observed more friendly aircraft, an enemy surface craft, and four naval launches, one of which took the survivors on board. More escort aircraft arrived, and on the voyage home attacks were made by two Focke Wulf 190s, one of which was hit by the guns of the launch.

A balance was struck at the end of the adventure. On the debit side was the loss of a Sunderland and eleven crew, a Whitley and crew of six, and a Wellington aircraft. On the credit side, six aircrew from the Wellington and one from the Sunderland had been rescued, a JU 88 probably destroyed and a Focke Wulf 190 damaged.

The material considerations were, however, not a true indication, because the psychological value of the rescues effected was out of all proportion to the losses sustained. A crew had been rescued from the clutches of the enemy by dogged perseverance and with great bravery, and the story could not fail to impress the crews of all squadrons, irrespective of the commands to which they belonged. The Air Sea

Rescue Service was satisfied with the 200 hours of experience gained, and the knowledge that a grateful crew would spread the information far and wide.

Plates LVII to LXII illustrate a few of the phases of Air Sea Rescue.

CHAPTER 12

MEDICAL ASPECTS OF TROOPING

GENERAL ORGANISATION

PRE-WAR ARRANGEMENTS

BEFORE September 1939 the trooping season for Royal Air Force personnel proceeding overseas lasted from September to March, a period advisedly selected as being the coolest and therefore the healthiest time of the year for travel in the northern hemisphere. The only home port of embarkation then in use by the Service was Southampton although small numbers of men were occasionally despatched from Tilbury. On an average four R.A.F. troopships sailed from and back to Great Britain each season.

A R.A.F. Embarkation Office existed at Southampton under the command of an embarkation officer, a squadron leader, assisted by a small staff. This office was responsible for the embarkation of all outward-bound personnel and for all Service administrative arrangements connected with the ships themselves. Trooping arrangements overseas were the individual responsibility of the Commands concerned and were for the most part on an *ad hoc* basis, there being no permanent R.A.F. embarkation units established at overseas ports.

No permanent organisation covering medical arrangements in R.A.F. troopships existed before the war. At Southampton, the Senior Medical Officer from the nearby R.A.F. Station at Calshot undertook the duties of embarkation medical officer and was responsible for ensuring that ships leaving were properly furnished with medical stores and equipment according to scale. He was also responsible for seeing that there were sufficient medical personnel aboard and that accommodation was initially satisfactory from the hygiene and sanitation standpoint. On the ships themselves, medical care was in the hands of the most senior R.A.F. medical officer who happened to be travelling and who was able to undertake the post of S.M.O. of the ship. In this capacity he was responsible to the Officer Commanding Troops, and through him to the Captain of the ship, for the health and medical welfare of all on board although, on those vessels whose complement of ship's officers included a doctor, the latter normally undertook sole responsibility for the health of the crew and the sanitary supervision of their living and working quarters.

Medical facilities aboard consisted usually of a medical inspection room and a 'sick bay', which varied in its bed strength according to the

numbers of passengers and the size of the ship. The M.I. room and sick bay were supplied with stores and equipment to a scale which roughly conformed with that prevailing on R.A.F. stations at the time, allowing for the fact that emergencies might occur at sea which would require immediate treatment more extensive than that normally given under Service unit conditions. The sick bay was staffed with suitable medical personnel drawn from among the troops on board.

THE OUTBREAK OF WAR

The expansion of the Royal Air Force which followed the outbreak of war, combined with the greatly increased numbers of personnel proceeding overseas, required a corresponding increase in the size and scope of the whole R.A.F. trooping organisation. Embarkation units were therefore set up at Calais, Boulogne, Cherbourg and Marseilles (the latter to cover the overland route for personnel in transit to the East) and at other overseas ports, while the Embarkation Office at Southampton was greatly enlarged and a permanent embarkation medical officer added to its staff. Plans were also drawn up for providing permanent establishments to staff the ships themselves and by the end of 1940 each R.A.F. troopship was carrying a permanent O.C. Troops, usually a wing commander, an adjutant, a warrant officer (disciplinary) and three flight sergeants, namely a clerk, a physical training instructor and an equipment assistant. In addition, there was a senior medical officer, a flight sergeant medical orderly, a dispenser and a varying number of nursing orderlies according to the size of the vessel; ships transporting between two and four thousand men carried two corporals and six aircraftmen; ships carrying over four thousand men carried two corporals and eight aircraftmen.

To ensure an adequate supply of medical personnel for trooping duties, a pool of airmen was maintained at No. 1 Personnel Despatch Centre at West Kirby from which teams could be made up to staff ships' M.I. rooms and sick bays. At a later date medical airwomen were also included in this pool. Medical officers were borne on the strength of Air Ministry Unit and from here also it was customary to detail teams to staff ships—including an O.C. Troops, a S.M.O. and an adjutant. Additional personnel could always be drawn from among passengers and an effort was invariably made, when compiling overseas draft lists, to ensure that at least one medical officer was included.

EMBARKATION UNITS

Royal Air Force Embarkation Units (E.U.) were opened at Liverpool on January 1, 1939, at Avonmouth on September 1, 1939, and at Glasgow on March 7, 1940. No. 8 at Glasgow and No. 3 at Liverpool later became the most important embarkation units in the United Kingdom. No. 4 at

Avonmouth was next in importance and although the despatch and reception of freight rather than personnel was its main function, it handled a considerable number of repatriated troops in 1943 and early 1944. Embarkation units were also set up abroad at Mombasa in August 1940, at Alexandria and Port Said in October and at Port Sudan in December 1940. Others were set up in 1941, at Takoradi, Durban and Freetown in January, at Haifa in April and at Basra in July and Cape Town in August.

As the war progressed, the more important E.Us. at home grew larger and became self-accounting and self-equipping. They were under the direct functional control of Air Ministry (Directorate of Movements) which enabled other interested branches of the Service, particularly the Medical Branch, to maintain close liaison with them. Each embarkation unit had a senior medical officer (Glasgow possessed two medical officers) known as the embarkation medical officer (E.M.O.), who had a staff of medical orderlies and clerks.

The duties of the medical sections of the E.Us. were the care of the unit personnel themselves, the supervision of the embarkation and disembarkation of invalids, the advising of ship's medical staffs, the inspection of the transports and the maintenance of liaison with other Royal Air Force medical units and with members of the civilian medical services. The E.M.Os. exercised medical supervision over the living conditions of the unit personnel and the working conditions of airmen employed at the docks. Accidents at work also came within their province, but fortunately these were rare. The removal from ships of invalids from overseas and their distribution and disposal in the United Kingdom were among their most important functions.

MEDICAL ARRANGEMENTS FOR TROOPSHIPS

Each transport forming part of an outgoing convoy was inspected by a party of Marine and other officers in which the E.M.O. was included. Usually ships which arrived in port with a Royal Air Force staff on board, took that same staff with them on departure so that any criticisms or adverse comments recorded by the S.M.O. of the ship in his 'Voyage Report', a copy of which had already been seen by the E.M.O., could be personally assessed by the latter at the time of this inspection and dealt with before the next outward journey. Army S.M.Os. of troopships also rendered voyage reports to which the E.M.O. had access, so that it made no difference whether a ship was an Army or a R.A.F. staffed transport.

At this first inspection particular attention was paid to all aspects of accommodation on board, ventilation, the ablution and latrine facilities and the exits from the troop decks. It was the duty of the E.M.O. having learned the executive plan, to show where it might be endangered by

problems of medical or hygienic origin. When the general inspection was finished the E.M.O., either alone or in company with his colleagues of the other Services, would make an inspection of the ship's medical arrangements including the ship's hospital—the 'sick bay'. Details of construction including shape, ventilation, lighting, the dispersal and arrangement of cots (single or double tiered) and the number and use of wards were all considered. If required, facilities for women patients had to be provided and it was also desirable, though not essential, that officers and other ranks should be treated separately as far as possible—for the airmen's sake as much as for the officers'. In addition to the sick bay, the ship's isolation accommodation was inspected as well as the dental room, dispensary and hospital bath and lavatory accommodation, separate bath and lavatory accommodation being insisted upon for V.D. patients. The M.I. room and operating theatre were also inspected.

Difficulties most frequently met on first inspections were those of accommodation and ventilation and the provision of adequate water supplies. This was especially true in the earlier days of the war when, in many older ships in which the dynamos were already working to full capacity, improvement in ventilation could only be secured by reducing the numbers carried. Of the minor problems, however, many of them could be smoothed out by liaison between the E.M.O. and the civilian ship's surgeon, and a visit by the former to the latter was a regular feature of an initial inspection.

Embarkation began after the ship had been inspected and found fit to sail. Whenever possible, the O.C. Troops and his S.M.O. with their staffs, arrived at the port one or two days before sailing date. The S.M.O. was then interviewed by the E.M.O. who gave him a folder containing all the available information necessary. This folder had been compiled gradually as the result of experience of the medical necessities of trooping. It was based upon Army instructions and observations from embarkation units at Glasgow and Liverpool and was always kept up to date. The S.M.O. then went on board to make his own inspection of the ship, to survey the sick bay, and unpack and check his medical stores. The latter was a most important procedure as far as the R.A.F. was concerned because medical stores on troopships were the responsibility of the Army authorities and therefore any breakages or deficiencies found at unpacking had to be made good in the very short time before the ship sailed. On embarkation day the E.M.O. always tried to visit each of the transports which was carrying a R.A.F. S.M.O., but, if this was impossible, he was invariably present on the day of the final inspection. This was essential for it enabled him to see whether the decisions arrived at on the first inspection had been properly implemented and to see the drafts of troops actually in their quarters and at their stations all over the ship. It was found by experience that a full

ship presented problems often unforeseen at the first inspection, and changes had frequently to be made at the eleventh hour.

THE EXPANSION OF TROOPING

The number of ships carrying a predominantly Royal Air Force population increased rapidly in 1940 and 1941, and it was customary to detail a R.A.F. team to staff such ships. Many of the larger passenger vessels were used for Service trooping and, in May 1943, the Royal Air Force was allotted the *Queen Elizabeth* followed by the *Mauretania* and the *Nieu Amsterdam* in February and March of 1944 respectively. Apart from these ships, the *Pasteur* and the *Andes* were staffed for two years without a break by Royal Air Force personnel. The *Queen Mary*, *Aquitania* and *Ile de France*, which were Army troopers, each had on board a R.A.F. medical officer (a flight lieutenant), a flight sergeant and five aircraftmen.

INVALIDS

CLASSIFICATION

Among the most important functions of an embarkation medical officer, undertaken in collaboration with ships' S.M.Os., was to make arrangements for those R.A.F. or Dominion Air Force personnel who were being repatriated on medical grounds. Many such invalids travelled in 'hospital ships' which were entirely controlled by the Army. Many, however, returned home in ordinary troopships but under special medical care and special conditions of travel.

For the purposes of medical administration invalids were divided into three classes—Class A who were stretcher cases, Class B who were walking cases (both these categories were composed of patients who had been embarked as such), and 'sick transfer' comprising those men who had become invalids during the voyage. The latter fell automatically into the A or B Classes for the purposes of treatment and disposal.

MEDICAL ARRANGEMENTS FOR INVALIDS

At the beginning of the war a procedure was worked out for handling invalids by means of which the E.M.O. at the port of embarkation was informed in advance of the numbers who would be ready to sail in a particular ship, their names, diagnoses and classification (A or B). The E.M.O. passed this information to the S.M.O. of the ship, who could then make proper arrangements for their accommodation and treatment during the voyage. Further, the E.M.O. was personally responsible, when they reached the port, for ensuring that all invalids were safely embarked on the right ship and handed into the care of the S.M.O. At the port of arrival, Class A invalids again became the responsibility of

the E.M.O., who maintained constant liaison with various civil and military hospitals able to take such cases, and who undertook directly the supervision of their disembarkation and disposal. Class B invalids, other than those arriving in large organised groups, were subject to disposal under local arrangements at the embarkation unit.

Though instructions on how to deal with invalids were straightforward, numerous difficulties occurred from time to time, particularly when large numbers were to be carried. Frequently notifications did not arrive in time and, although it was in practice almost invariably possible to find accommodation for invalids, E.M.Os. always feared that they might find all invalid repatriate space on a given ship had been allotted while last-minute arrivals had still to be embarked. In spite of repeated efforts, it proved difficult to impress on hospital authorities the vital need for giving E.M.Os. and S.M.Os. of ships all available information regarding invalids as early as possible.

At overseas ports where there was no embarkation medical officer, further difficulties arose. Here invalids had to be embarked as such by the berthing authorities of the port and put on board by an embarkation officer without medical knowledge. It was not uncommon to find that personnel who were in fact invalids, were not embarked as such, particularly when their embarkation date was somewhere near the date of expiry of their tour of duty overseas, and it was also a too common practice at base and general hospitals overseas to repatriate individuals with their documents sealed and addressed to Air Ministry with instructions that the documents were on no account to be handed over for scrutiny *en route*. Although few difficulties were met when dealing with Class A invalids who were stretcher cases and whose condition therefore could not easily be mistaken nor disguised, it was a different matter when dealing with Class B cases who formed the bulk of invalids. Moreover, it occasionally happened that invalids who should have been categorised as Class A, such as cases of active pulmonary tuberculosis, were embarked as Class B. Sometimes also, cases properly embarked as Class B invalids had to be transferred to a Class A category before the end of the voyage on account of a deterioration in their medical condition.

These factors were among the chief causes of difficulty in locating individuals on board, and in discovering the vital documents upon which the diagnosis and details of treatment received were recorded. Thus it later became the practice to warn senior medical officers that they would make their work easier by calling for individuals on the 'Tannoy'* as soon as a ship had left any port where troops had embarked on a homeward journey.

* Internal loudspeaker system.

Since troopships usually travelled in convoy, invalids were liable to arrive at ports of disembarkation in hundreds at a time. Until 1944, the Medical Directorate of Air Ministry gave the embarkation units lists of hospitals to which patients were to be sent, but the splitting of convoys, part of which sailed to Liverpool and part to Gourock or Glasgow, caused confusion, so that the same bed was sometimes booked twice—once from Glasgow and once from Liverpool; to prevent this confusion it was arranged in 1944 that all Class B invalids arriving in convoys should be sent to West Kirby where they could be distributed according to the bedstates of the various reception hospitals by the embarkation medical officer at Liverpool who went to West Kirby to make the arrangements whenever necessary.

At Liverpool it became the embarkation medical officer's custom to visit ships of incoming convoys which were frequently held up at the bar of the River Mersey, twelve miles from the Port of Liverpool. The advantages of visiting ships were great; lists of invalids could be obtained in good time to make any special arrangements necessary and occasionally, in calm weather, invalids whose needs were particularly urgent could be taken off a ship and transferred in a tender sometimes forty-eight hours before the docking of the ship in which they had been travelling.

The physical problems of disembarkation were, however, more formidable at Gourock and Glasgow than at Liverpool. There were no docking facilities for large ships at Gourock and in consequence everyone had to be brought ashore by tender. This was the normal procedure in the case of Class B invalids who always came ashore in the same tenders as the drafts of healthy troops, but it was seldom possible to disembark Class A patients in this way for two reasons—firstly, Class A cases often required immediate transfer to hospital and could not afford to wait several hours for the first suitable tender, and secondly, it was very difficult in a crowded tender to arrange a passage to shore with enough physical space for invalids. Until 1944, stretcher cases at Gourock were disembarked with the help of the Civil Port Health Authorities who had a suitable launch, but after many representations had been made a pinnace was added to the small fleet of marine craft at Gourock and manned by Royal Air Force personnel. This pinnace was capable of taking off a maximum of twenty stretcher cases in one trip.*

In Glasgow itself, where there were docks, ships were able to berth alongside and disembark their invalids in the usual manner, but few ships sailed up to Glasgow. The normal disembarkation at Liverpool

* Crash boats were not suitable for taking off stretcher cases except in a flat calm, but they could be used to remove small parties of Class B invalids able to walk, on the rare occasions when it was necessary to get them off before the disembarkation of the main drafts.

was also by a dockside; ships there tied up at a floating landing-stage which was fitted with all the equipment necessary for disembarkation.

HYGIENE

GENERAL CONSIDERATIONS

Medical problems associated with trooping during the war were fundamentally problems of hygiene. From this point of view they can be adequately considered under five main headings—sleeping accommodation, ventilation, recreation, messing (including water supply) and sanitation. It was found by experience that provided these five things were satisfactory, health and morale among troops in transit by sea could be maintained at a high level.

SLEEPING ACCOMMODATION

Sleeping accommodation during war-time was of three main types, in cabins, tier-berth sections and mess decks; each type had its advantages and disadvantages, but it is approximately true that the order in which the types have been set out was in fact their order of quality. Accommodation was formally allotted in preferential order according to rank, but the accommodation which any individual secured depended upon the composition of the draft in which he was travelling. The general aim in fitting troop transports was to make cabin accommodation available for all first- and second-class passengers, to allot tier-berth sections to non-commissioned officers and to use the mess decks for other ranks, but changes were often necessary to ensure that the maximum carrying capacity of the ship was fully used; in practice this meant that cabins were sometimes occupied by other ranks or first-class passengers were berthed on mess decks; normally about 10 per cent. of the total passengers could be berthed in cabins and the remaining 90 per cent. in tier-berths or mess decks.

The standard of cabin accommodation in war-time was approximately the same as the standard of accommodation for steerage in peace-time. The advantages were the comparative privacy, a more generous scale of latrines and ablutions, and a position well above the water-line, obviously safer and more comfortable than positions below the water-line. The disadvantages were the inadequate stowage for baggage and clothes, the poor ventilation with sealed ports, and the fairly frequent infestation with bed bugs. Cabins usually did not provide more cubic air space per occupant than the troop accommodation since the *de luxe* suites and single-berth rooms vanished soon after the outbreak of war, when they were stripped of their furniture and their capacity doubled or trebled by the fitting of extra bunks. Many cabin blocks were gutted to form dormitories of ten to forty berths, and the individual bathrooms were removed to secure additional space.

Tier-berth sections were normally fitted in the peace-time public rooms of the ship, and sometimes in the holds. The tiers varied from two to four in number, one above the other, constructed in lines placed fore and aft, each line of a pair 1 ft. from the other, and one pair 3 ft. from the next to leave a small alleyway. British fittings were constructed of wood, with wire mattress frames, and the American fittings, called the standee, were of metal with a lashed canvas mattress. The American pattern was much the better because it could be folded up by day; the canvas mattress was cooler and allowed a better air circulation, and bed bug infection was absent because there was no woodwork. Some time after the entry of America into the war, the wooden British fittings began to be replaced by metal standees, with great benefit. The personal advantages of tier-berth sections were that they were fairly well ventilated, each occupant had his allotted space and the berths were always available for lying on during the day. The disadvantages were the barely adequate space for stowage and the frequency with which normally they became infested with bed bugs.

Mess decks were fitted in gutted cabin decks, 'tween decks, and holds. The standard British fitting as in peace-time was wooden quartering suspended from the deck head, carrying hammock hooks 27 in. apart, which allowed a 9 ft. sling from head to toe. Tables 20 ft. long, each seating eighteen men, were placed thwartships from the ship's side, and under them the men who had no slinging billet put their mattresses at night. Hammock heads were placed against the bulk heads to provide stowage for rolled hammocks and mattresses during the daytime, and the space between the deck head and the quartering was occupied by racks for the stowage of kit. The personal advantages of mess-deck accommodation were good ventilation, cleanliness, and the freedom from bugs. The disadvantages were the lack of privacy, lack of space, poor lighting, the necessity for stowing beds during the day and the unpleasantness of being below the water-line with narrow and vulnerable escapes to the open deck; there was a further disadvantage which will be considered in further sections of the narrative.

All types of sleeping accommodation in troopships were crowded even by the lowest of shore standards. Mess decks were the worst in this respect, because they were the only space in which extra numbers of passengers could be carried without further structural alterations in the ship. The number of bunks in the cabins and standees in the tier-berth sections determined the number of occupants of those types of accommodation, so that the prospective occupant could see, as it were, at a glance, what his environment was to be. The standard mess decks, however, underwent considerable alteration. The assessment of numbers carried in the mess-deck compartments always received the closest attention of the Ministry of War Transport and the Service Authorities.

In peace-time the rough rule had been to determine the number of fitted hammocks and then to allow 25 per cent. of this number as extra passengers on mattresses below the water-line. During war-time, however, as demands became more and more urgent, this empirical rule was modified and each mess deck was considered solely on its merits. At first the assessment board began with the immutable number of fitted hammock hooks and increased the capacity of the mess deck by estimating four mattresses beneath each 20 ft. table, one mattress on each shelf of the 6 ft. hammock bends, and one mattress to approximately 20 sq. ft. per bed set on the remaining clear deck area and the square of the hatch, if it was covered, as a reasonable increase. Alleyways, escapes and grating hatches which ventilated spaces below were left clear of mattresses. The resulting total was then considered in relation to the width of escapes, the efficiency of the ventilation of the compartment and the effect of any adjacent sources of heat, for example engine room and boiler room bulk heads; these factors were allowed for by reducing the estimate, and a compromise was reached by all interested parties which became the agreed figure for the compartment. The extra men carried after this agreement varied between 25 and 75 per cent. of the fixed number of hammock hooks, according to the obstruction caused by centre-line bulk heads or the shape of the compartment.

Mess decks were closely watched by senior medical officers, and in the early days few voyages were completed without comments on mess deck sections in the voyage returns. Sometimes improvements in ventilation, ablutions or latrines made it possible to continue to carry the agreed number in the mess deck, but if nothing could be done then the numbers were suitably reduced. During the earlier stages of the war, capacities were often kept small because of poor ventilation, but the greatly improved ventilation systems installed, in many vessels, in 1943 usually made possible the raising of numbers to the limits of the deck area.

VENTILATION

The primary importance of adequate ventilation was apparently not realised during 1940 and 1941, though it may be that the need for transporting large numbers of men quickly was so great that alterations could not immediately be put in hand. During 1941 and 1942 the voyage reports of senior medical officers were full of comment on the ill-effects and discomforts caused by inadequate ventilation of mess decks, particularly during voyages in the Tropics. It is likely that there would have been even more complaints had there been the necessary time and energy to write out fuller and more frequent voyage reports.

The most important factor in reducing ventilation below adequate standards was the blackout, whose effects were only appreciated fully by

those who had had personal experience of it at sea. It had some surprising results in that even spacious lounges, employed as messes or dormitories in war, became ill-ventilated, stuffy and uncomfortable, almost entirely as a result of the rule that all windows must be shut. In addition, the spaces put to unaccustomed use, for example the ship's cabins used for ship's orderly rooms, where staffs worked day and night, were particularly difficult to ventilate. Certain spaces, mess decks for the most part, were adversely reported on time and again, and it was clear that the senior medical officers were afraid of the consequences of an outbreak of upper respiratory infection or one of the acutely infectious fevers. In fact, there were no serious epidemics, but no one at that time could say with confidence that none would occur.

Moreover, there was no doubt about the discomfort and the bad effect on mental and physical well-being. An extract from a voyage report in April and May 1941 may serve to illustrate what is written above:

> '. . . There was considerable overcrowding on this voyage but this had no serious consequences, presumably because of the period of the year and the fact that large numbers of troops could be slept on deck. The only droplet infections which occurred were morbilli, the spread of which was controlled by routine measures, and naso-pharyngitis. There were six cases of morbilli. Both diseases were mild and had no serious complications. However, it is suggested that Section 5 is unsuitable for accommodation of troops unless a greatly improved system of ventilation is provided. Even then it is unlikely that Section 5 would be suitable for more than 100 troops.
>
> The heat and galley made Section 4 unsuitable for troop accommodation . . .'

Ventilation and similar matters were under constant review by several authorities, notably those of the Royal Air Force and the Ministry of War Transport. An examination of voyage reports on Royal Air Force troopships to Canada was made in January 1942, and many points were raised of which ventilation was only one. These criticisms were forwarded by the Director of Movements, Air Ministry, to the Ministry of War Transport for their observations.

Later in the same year it had become obvious that, of all the matters raised by the various authorities, ventilation had come to lead the field. At a meeting held at the Ministry of War Transport in November 1942, it was decided to appoint a small technical committee consisting of representatives of the Director of Sea Transport, the Director of Hygiene (War Office), the Director of Movements (War Office) and the Air Ministry, and a ventilation expert, to investigate the question of the ventilation of troopships. The terms of reference were to examine the problems of ventilation on troopships, ship by ship, and make the most

practical suggestions for improving ventilation and other means of reducing the liability to the effects of heat. The Embarkation Medical Officer at Liverpool was chosen to represent the Director of Movements, Air Ministry, on this committee, and a list of thirty troop transports which had been adversely reported upon from time to time, was nominated for investigation. The Committee visited the Port of Liverpool and the Port of Glasgow at suitable times where they were able to inspect sixteen of the thirty transports; they made specific suggestions for each ship.

Typically they found that inadequate ventilation was due to some or all of the causes set out below:

(*a*) *Inadequate Supply of Fresh Air*

i. Supply of fresh air markedly below the standards necessary for the service in which the ship was engaged.
ii. Fans of insufficient power.
iii. Dynamo capacity insufficient to maintain fans continuously at maximum output; ship's engineers conserving power by shutting off the ventilation fans.
iv. Unsuitable and inefficiently designed trunking.
v. Mutual interference of fans drawing from a common intake trunk.
vi. Closing down of deck inlet ventilators in exposed positions during rough weather.
vii. Troops interfering with systems by removing hand-hold doors on trunks, causing bad distribution and sometimes recirculation of foul air.

(*b*) *Lack of Natural Exhaust*

The blackout had removed many of the means of exhausting foul air. These had been normally relied upon to provide the necessary natural exhaust.

(*c*) *Poor Air Circulation*

Block obstruction by full complements of troops slung in hammocks with their kitbags stowed in racks; free circulation of air was prevented.

The first action was taken by the Director of Sea Transport at the Committee's request. He asked the Admiralty Convoy Equipment Officer to allow all such relaxing of the blackout regulations as would permit the maximum passage of air through exits to the open deck, consistent with a perfect blackout. The officer readily agreed and instructions to this effect were issued to Sea Transport Senior Inspecting Officers. Apart from this, the Committee recommended:

(*a*) The Merchant Seaman standard of 72 cubic feet of space per man as a minimum should be adopted and a better figure attained wherever possible.

(*b*) An air supply of between 1,500 and 3,000 cubic feet per man per hour should be provided.

(*c*) Each compartment should be assessed to ensure that the required amount of fresh air per man was supplied, and adequate means of exhaust provided.

(*d*) Mechanical exhaust ventilation should be provided wherever it was impossible to provide enough natural exhaust and wherever there were dead air spaces; care was to be taken to see that there was no inflow of air from adjoining spaces such as lavatories and galleys. Advantage should be taken of any means of fitting natural exhausts by outlets trunked to the atmosphere, or large mushroom ventilators in the tops of booby hatches.

(*e*) Fans of the Admiralty type with an output of between 1,800 and 2,400 cubic feet per minute, should be used wherever possible, and any other types used as a necessity should be as like these fans as possible.

(*f*) Mess decks should be ventilated mechanically with fore and aft supply trunks at the ship's sides, with the distribution of air through high velocity louvres at suitable intervals just below the kit racks but above hammock level. For convenience the main ducts in some ships might run over the kit racks or under the tables, with vertical branches to feed each group of louvres. Louvres might be so arranged on the vertical branches to deliver 80 per cent. of the air at the upper level and 20 per cent. at table level.

(*g*) Tier-berth sections in public rooms should be ventilated mechanically.

(*h*) All transports should be supplied with blackout windscoops for as many side lights as the master would allow, for use during voyages through the Tropics.

(*i*) The Officer Commanding Troops on each transport ship should be instructed to detail an officer on board to act as ventilating officer, whose duties should be to make himself familiar with all the ventilation arrangements, to supervise them in conjunction with the troop officer and ship's engineers, to manipulate the fans, ventilation louvres and scuttles, and prevent unauthorised interference with the ventilation system. This officer should also provide detailed reports on any defects, giving particulars of dry and wet bulb temperatures, with the corresponding deck temperatures. It was recommended that the attention of the owners and masters should be drawn to this proposal and that they should be asked to give the Officer Commanding Troops every assistance in carrying out these duties, and keeping the ventilation fans running at full power at all times.

(*j*) The existing fans and coolers in air-cooled holds and 'tween decks should be utilised to maintain comfortable conditions in the Tropics, provided that sufficient fresh air can be introduced into the circulating system. In these circumstances fresh air supply need not exceed 800 cubic feet per man per hour.

(*k*) The services of a consulting ship's ventilating engineer should be engaged to assist in designing suitable ventilation arrangements for

troop transports being fitted or refitted. His duties would be to advise the ship's inspecting officers about the most suitable arrangements for work in ships on which an adverse report was made.

These recommendations were largely accepted and great efforts were made to overcome the shortage of suitable fans, increase the capacities of dynamos and supply enough skilled labour to effect alterations in ships during the short time they were in port. Results began to appear in 1943, and ships' ventilation systems continued to be modified during that year and the first part of 1944. The results justified the work and the atmosphere on mess decks was vastly improved; it was possible once more to carry greater numbers in mess decks and tier-berth sections without lowering the standard of fitness of the troops carried, and the alterations greatly reduced the difficulties of the reintroduction of large-scale trooping movements later in the war.

RECREATIONAL FACILITIES

One of the greatest disadvantages in mess deck accommodation was the lack of space for recreation. Not only did third-class passengers have to eat where they slept, but they had to amuse themselves there as well. Change of situation at meal times was a privilege shared by the first- and second-class passengers, and later in the war by those third-class passengers in mess decks who ate in a separate messing space run on cafeteria lines.

Recreation space was not greatly curtailed in the first year of the war but in 1941 most ships' recreation rooms were appropriated for fitting tier-berths. After this nothing could be done to equalise the facilities at the disposal of the various classes of passengers, but disparities could be and were reduced to the greatest possible extent. In 1944, first-class lounges still provided more space per individual than the troops' recreation rooms, although such lounges rarely accommodated more than 30 per cent. of the first-class passengers for which the ship was equipped while second-class lounges, normally used by warrant officers and sergeants, held about the same percentage. Troop recreation rooms rarely accommodated more than 5 per cent. of the troops. The policy of levelling amenities for all classes of passengers was strongly emphasised in 1942, and from that time the largest rooms were allocated for troops, but the structural layout of the ship's public rooms did not permit the provision of more than a token lounge for the third-class passengers. Another difficulty was created by the use of troop recreation rooms for a considerable period of each day for lectures, organised instruction, cinema shows and concerts, so that the time during which the space could be enjoyed individually was short.

Canteen spaces were also provided and were used as extra recreational rooms for the troops. The furnishings were limited to wooden forms

round the side, but the central floor space could be used for card playing and games. Canteens varied greatly in the quality of their service and the variety of the goods offered. There were sometimes complaints about prices and, occasionally, what appeared to be competition between the official messing and the canteens, which led to too great a buying in the canteens and a waste of food served at mealtimes. After 1943, the sale of alcohol on all troopships was forbidden and the canteens became much less congested.

Deck space became progressively more restricted, because of the increasing numbers carried and the curtailment of deck area by increased armament and the construction of extra temporary deck houses. This limitation was such that the safety regulations in 1943 required space at emergency muster stations for only 75 per cent. of the total on board. In some ways the curtailment of deck space was the most serious of all restrictions on recreational activities. The monotony and unpleasantness of mess decks, and to a lesser extent tier-berth sections, could only be overcome completely by recreation on deck during the hours of daylight.

MESSING

Experience showed that on voyages up to a month's duration a reasonably satisfactory standard of messing helped to prevent any appreciable deterioration in physical fitness, but that on longer voyages, particularly under tropical conditions and the anticipation of active service on disembarkation, much greater attention had to be paid to messing if physical fitness was not to suffer. On the other hand, however short the voyage might be, the standard of messing affected the morale of the troops considerably and satisfactory messing was a very important factor in maintaining a good atmosphere in a ship and alleviating the inevitable hardships of accommodation.

The difficulties of conversion of passenger liners into troopships were reflected in the domestic arrangements for messing. The accommodation for the victualling, for example, originally ample for the normal complement of passengers, might become inadequate or badly situated when large numbers of troops were carried; moreover, the cooking apparatus in the galleys might be worked beyond its efficient capacity, and there might be no means of improving the position without making the vessel uneconomical in other respects.

The provision of rations was dependent upon the current supply position at the victualling ports, where chief stewards could exercise their discretion in indenting for supplies as the ration scale had to be interpreted imaginatively to ensure variety on long voyages and to use the allowances to the best advantage. The scale of rations for third-class passengers, laid down in Sea Transport Regulations, was as follows:

Articles	Ozs. per man daily
Meat, fresh	10
Fish, fresh	5
Meat, preserved	1⅔
Bread and flour	16
Dried peas or beans	1⅓
Vegetables, fresh	5
Potatoes	13
Butter	1½
Rice (cereals)	1
Oatmeal	1
Tea	½
Sugar	3
Dried and tinned fruits	1
Syrup and jam	1
Salt	⅘
Pepper	1/15
Mustard	1/10
Pickles	⅘
Milk, condensed, unsweetened	2⅔
Cocoa	¼
Fruit, fresh	3 times a week
Cheese	½
Bacon or ham	½
Eggs	—

This scale was regarded by the Ministry of War Transport as the minimum, and some companies provided more food than was allowed in it. On the other hand, it was very noticeable between 1941 and 1944 that certain companies adhered strictly to the Sea Transport scale and were at pains to show the embarkation authorities that the minimum scale of rations was also to be the maximum. Those shipping companies who provided more food, perhaps having appreciated the value of this provision as an advertisement, presumably met the extra cost from their own funds. Dutch troopships, particularly, provided a more generous scale of rations than the average British ship, and the scarcity of complaints of insufficient quantities of food on board Dutch troopships was noticeable.

The authorised Sea Transport rations provided enough calories for men who were not on active duty, but some senior medical officers stated in their voyage reports that in their opinion the rations were not enough for men who were actively employed during the voyage. Several fatigue parties were required each day on board ship to handle provisions and clean quarters; men were also required for supplementary gun crews and lookouts in exposed positions on deck. These men sometimes complained that they had not enough to eat. It was also suggested that the scale should be increased for troops who would be required to undertake active operations immediately upon landing, or who might be shipwrecked. The latter proposal, of course, meant an increase for everybody, as in war-time all were liable to be shipwrecked and to have to

withstand exposure afterwards. The suggestions did not meet with acceptance because, except in combined operations, men were not required to undertake active service without at least a short stay in a transit or training camp after disembarkation.

First- and second-class passengers who messed in saloons, received a greater variety and quantity of food than the third-class passengers and there was great disparity between the treatment of saloon and third-class passengers in the conditions under which the food was served and eaten. In 1944, a naval commander experienced in messing, who had been appointed ship's messing officer for the voyage, wrote in the voyage report that though he was quite satisfied that the quantities supplied to the men were those to which they were entitled, he failed to understand why there should be such a disparity between the feeding of the officers and the men. He added that the former seldom had to work or keep cold watches but, in addition to enjoying a good choice of food, they were asked to eat almost two and a half times as much as the latter, many of whom were working. He also maintained that it could not be said that the officers were paying for their extra food as they would be in an officers' mess ashore.

The explanation of the differences in standards of catering lay in the rates paid to the shipping companies from public funds for daily messing. From the beginning of the war until 1942 the daily rates were—first-class 6s. 6d., second-class 4s. and third-class 2s. 3d. Naturally the owners were able to provide more generously at 6s. 6d., than they were at 2s. 3d. In 1942 the allowances were reduced to 4s. for first-class and 3s. for the second-class passengers, and in 1943 there was a further reduction to 3s. for the first-class and 2s. 9d. for the second-class passengers; these drastic reductions certainly levelled the difference between the standards to a great extent, and in some ships it was stated that the food was the same for all classes.

Food was cooked in the ordinary ships' galleys, modified as far as possible to keep pace with the demands made upon them; these modifications were seldom far-reaching enough and usually cooking of meals had to be arranged as a continuous performance, providing a series of meals for various sittings. As a rule in British ships, three meals were supplied a day which meant that the galley staffs had to work hard with their overloaded cooking equipment. Food of good quality could easily be spoilt by cooking under these conditions and the many complaints reflected the difficulties. One voyage report specifically stated that the food was undercooked, because the galley had been designed for 200 persons and was on that voyage supplying 1,100. These difficulties were made worse by the problem of obtaining crews for the catering staff, extra stewards and galley personnel being drawn from the shipping pool. These men were not always trained in their duties and thus were

not fully competent. The additional employment of troops to help in the galleys added further difficulties; these troops were not familiar with the ship, the methods of the company's catering staffs or the peculiar problems of cooking on board ship. The tact of the senior members of the catering staff was often fully extended in dealing with the employees drawn from the shipping pool and there was no extra diplomacy left over to encourage the Service personnel who, however much they knew about catering ashore, were inexperienced in its peculiar arts at sea. Finally, the pride in cooking which the company's staffs could take in peace-time was replaced by weariness in preparing an endless succession of meals in war.

WATER

In June 1939, the question of water sterilisation on troop transports was taken up. Water taken on board outside the United Kingdom was always tested and chlorinated if necessary, but it was feared that in war-time this arrangement might break down and that a sterilisation plant on board was a necessity. It is true that on most ships water could be distilled and provide a portion of the ship's drinking water if circumstances compelled it, but this was not thought to be enough. It was therefore recommended that the Frederick E.C.D.* Chloramination Plant should be installed in troopships and the Board of Trade agreed to investigate the matter.

The rapid onset of the war, however, and the great expansion of trooping, combined with the general shortage of all equipment and supplies, led to this project not being implemented. Instead, the old method was continued—that is, water was only taken on at ports where the source was entirely reputable, while ship's water-storage tanks were subject to periodic checking and sterilisation. If any doubt ever arose that water taken on board might not be fully potable, it was chlorinated.

SANITATION

There were three difficulties in war-time in maintaining a high standard of sanitation on board ship. First there was the multitude of sub-divisions in the ship, secondly the divided control of passengers between the ship's crew and the Service authorities, thirdly the overcrowding of the ship's accommodation. The attention paid to general sanitation by masters and shipping companies varied within wide limits; the most slovenly and insanitary conditions were tolerated by some, whereas others kept their vessels in the finest order, knowing among other things that thereby they were advertising themselves well for post-war trade. Surveillance by port health authorities was limited and was mainly concerned with the control of rat infestation; in the absence

* Electrolytically Controlled Dosing. See Chapter 7.

of healthy commercial competition it was sometimes necessary to spur the authorities on.

The sanitary problems on board ship were of great variety, as on land. Latrines and ablutions for various classes of passengers, a supply of sufficient clean water, infestation with rats and bed bugs, cockroaches and weevils, the disposal of refuse and the storage, cooking and serving of food and cleaning of utensils set by far the most important of the sanitary problems. Of these, ablutions and latrines are considered below.

LATRINES AND ABLUTIONS

Latrines were provided on the scale of 4 per cent. for the first 300 passengers, and 2 per cent. thereafter. This provision was in practice the minimum. The occurrence of epidemic enteritis on board used to lead to embarrassment. The importance of keeping the latrines in full working order all the time may be readily understood, and for this purpose senior medical officers were recommended to ensure that sanitary squads were organised, among whose duties was the policing and cleansing of the latrine sections. The provision of a sanitary squad was an executive responsibility, but the senior medical officer could do much to see that additional men were detailed to clean the facilities allotted for their own use; thus, squads could be detailed among troops on decks using a certain set of latrines, and these troops would take care of them. The absence of a sanitary squad or lazy and inefficient work on the part of its members was invariably accompanied by blockage of water closets by tins, clothing and a variety of other articles which the ship's plumber had to clear.

The disposition of latrines throughout the ship depended upon the distribution of accommodation, but as latrines were constructed in blocks mess decks had often to be some distance from them. In the early days of the war, trough latrines were installed. They consisted of an inclined metal trough, through which a constant stream of sea water was pumped, and a series of improvised seats or bars. The trough latrines had two disadvantages; they involved a wasting of power in pumping such large volumes of water, and the seats invariably became soiled and malodorous. In addition, blockage of the outlet roses was frequent, with constant flooding. It is true that these obstructions could be cleared easily by a sanitary squad, but the frequency with which they occurred and the temptation to throw cigarette cartons, tins and magazines into an open trough proved serious handicaps. Some of these difficulties were slowly overcome by warning the troops against misuse of the latrines, supplying adequate toilet paper, and the constant patrol of sanitary squads. Later, more water-closet fittings were put into ships instead of the trough latrines. The latrine seats of water-closets were also subject to soiling and this was minimised by using small wooden or

plastic side pads which could be easily cleaned and were fairly durable; a suggestion was made by the Ministry of War Transport to remove all the seats, but the service medical authorities opposed it because bare porcelain seats retained a constant film of moisture and did not dry like wooden fittings. Some soiling of latrines was inevitable in ships because the provision of urinal stalls and troughs was so scanty that passengers were forced to use water closets, often in dim blue lighting, at night, and with the added rolling and pitching of the ship considerable fouling occurred.

The problems which arose when personnel of the Women's Services were carried were solved by increasing the scale of latrines to 8 per cent., and they were normally situated close by the cabin accommodation where the women were berthed.

FOOD-HANDLERS

In November 1938, the R.A.F. Consultant in Hygiene received information which led him to think that the galley staffs on board troop transports were probably not being examined bacteriologically from time to time to see that they were free from such infections as typhoid, dysentery and cholera. He pointed out that if they were not being examined there was a danger that personnel travelling on transports might be unduly exposed to the risk of gastro-intestinal infection. He therefore recommended that the matter be taken up with the Board of Trade in the hope that the examination of galley staffs might be undertaken in the same way as it was in the R.A.F. He further pointed out that outbreaks of dysentery on board merchant vessels were by no means uncommon. Private information thereafter came to hand from the surgeon superintendent of a company in India. He stated that crews for troopships were examined more or less frequently. This examination was thorough as far as venereal disease and the ordinary diseases were concerned, but it was stated that it was quite impossible to carry out the bacteriological examination of stools for so many men in the short time available (forty-eight hours). The surgeon superintendent added 'Personally, I think it is overdoing things to do these examinations in order to eliminate carriers among crews; I grant that it is very desirable and very nice and all that sort of thing'.

He gave further information about the difficulties, and added that such examinations were certainly not carried out at Bombay as there was no laboratory there.* He ended by saying that he had never heard of an outbreak of enteric or dysentery in any of the ships of his line and that it was an easy matter for the Services to have their cooks bacteriologically examined, but a different matter when dealing with crews. At the annual inter-departmental conference on trooping matters on

* This statement is, of course, quite incorrect—there were many fully equipped bacteriological laboratories in Bombay.

June 2, 1939, the medical inspection of crews was raised again; it was then stated that an interim reply had been received and that it reiterated that although Paragraph 25 of the Regulations and Instructions for the Sea Transport Service stated that crews of transports would, before the ship left, be medically inspected by a Government medical officer, details of the examination were not specified. The Air Ministry wanted to emphasise the importance of making an examination similar to that made of personnel employed in Royal Air Force cookhouses.

The report on the conference showed that the Air Ministry was to submit details to the Board of Trade, who would approach the owners on the matter. A minute dated June 25, 1939, reiterated that it was recognised as elementary in the R.A.F. that native personnel concerned with the preparation or handling of food are potentially dangerous as carriers of disease; frequent examinations should be made to detect them. It was thought that personnel who handled food on transports were likewise dangerous, and that therefore they should be similarly examined.

Throughout the course of the war cases of acute gastro-enteritis continued to occur, both sporadically and epidemically, in all troopships used by the Royal Air Force. In spite of investigation, it was not usually possible to determine the exact cause of these cases and for a long time their aetiology continued to remain in dispute. Water was frequently examined and found not to be the cause but it was still impossible to state categorically that infected food handlers were not responsible.

A voyage in June 1943 afforded an officer who had had some experience of trooping and of outbreaks of diarrhoea on board ships an opportunity to make some observations on colic and diarrhoea, although unfortunately limited to the clinical field. He suggested that many of the outbreaks might be due to chill and not connected with infection by poisonous or infected material. He distinguished what he called 'transport colic' from pseudo-diarrhoea associated with climate on the fourth to seventh day out of port, and 'gastric 'flu' with its premonitory symptoms of twenty-four to forty-eight hours.

He finally came to the conclusion in these cases that, in view of their histories, the cause of illness could be neither chloride loss nor infection. He felt that the aetiological factor was concerned with the coming on deck of men who had got overheated below and exposing themselves, inadequately clothed, to the cooler atmosphere. He was not very successful, however, in showing good correlation in the times of the two outbreaks.

The question of the food-handlers was raised once more in June 1944 by the senior medical officer of a wholly Royal Air Force transport, who requested guidance as to whether he should be notified of results of the examinations of crews by the Government medical officer. An epidemic of diarrhoea involving 500 cases having recently occurred in another ship wholly administered by the Royal Air Force, the senior medical

officer felt that he would like to be assured that none of the ship's crew on his ship were carriers of intestinal disease.

In January 1944, gastro-enteritis became endemic on board the *Nieu Amsterdam*, a ship staffed by Royal Air Force personnel. The history of the outbreaks of gastro-enteritis was interesting. The *Nieu Amsterdam* was the finest vessel of the Holland America line, and was engaged before the war on the North Atlantic. During the war she was manned by the Cunard White Star Line. The ship was used for trooping in the Pacific, with its Dutch crew, and Goanese natives assisting in the galley, from 1941 to 1943, during which time occasional small outbreaks of diarrhoea, mainly affecting the officers, occurred on board. The outbreaks were mild and were like those which are not unusual among unseasoned individuals under tropical conditions. The ship left the Pacific on January 5, 1944, sailing from San Francisco for New Zealand with a full complement of troops, and gastro-enteritis appeared soon after leaving port and remained endemic from that time. On the occasion of the first epidemic in January 1944, routine rectal swabs were taken from each of the ninety-six food-handlers on board. These were examined at San Francisco and a Dutch baker working in the galley was found to be a *salmonella* carrier. He was immediately removed from the galley, but the outbreaks continued sporadically.

HEALTH

GENERAL CONSIDERATIONS

The variety of difficulties and adverse conditions affecting the maintenance of medical establishments on troopships unfortunately prevented the keeping of accurate statistical records. These factors included the employment on medical duties of officers of all three Services some of whom were unfamiliar with R.A.F. statistical procedure, the carriage of invalids who were liable in any circumstances to relapse and the behaviour of the troops themselves, who would sometimes fail to report what they considered to be minor illness and attempt instead to carry out their own treatment.

With three exceptions the incidence of morbidity among Service personnel in transit by sea during the war was about comparable with that met with on land. The three exceptions were dysentery and gastro-enteritis, which have already been considered, heatstroke, and malaria, which are further discussed below.

HEAT EFFECTS

The conditions of troopship travel during the war, involving as they did the necessity for personnel to live in crowded mess-decks permanently blacked out and often below the ship's water-line, were responsible for a fairly high incidence of heat exhaustion among men voyaging

in tropical and sub-tropical waters. The probability of this had been foreseen and all possible precautions were taken to avoid it, including the continued efforts of the Service authorities to ensure the maximum ventilation of living-quarters, lectures to troops on all aspects of the condition and the importance of personal hygiene in its prevention, and the liberal addition of salt to the diet. Because of these precautions the number of serious cases which occurred was small and fatalities were negligible. Treatment was conducted along orthodox lines but many medical officers noted the effectiveness of enemata in the production of reflex sweating in hyperpyrexial patients on whom other, more obvious, methods had failed. Constipation was a fairly constant aetiological factor in the history of all cases.

MALARIA

Treatment with suppressive mepacrine on board troopships was first introduced in the latter part of 1942, the idea being that men would reach their destinations with a sufficient blood-mepacrine level to prevent their becoming infected during the first days of sojourn in a malarious area. In the first instance aircrew personnel were exempt from this rule and they, owing to a mistaken belief as to certain side effects of mepacrine, were given quinine instead. It took some time for full agreement to be reached by the medical branches of the three Services, at home and overseas, as to the correct dosage system to be adopted for its administration, but finally it was decided, in early 1944, that all personnel were to be obliged to take mepacrine for at least fourteen days before entering a malarious area during the malaria season, that the dosage was to be 0·05 g. daily for the first week followed by 0·1 g. daily during the second, that the drug was to be taken after a meal and followed by a copious non-alcoholic drink. Officers Commanding Troops were made responsible for seeing that the men took the drug, S.M.Os. acting merely as medical advisers.

This routine was satisfactory for dealing with those *en route* for the Far East and helped to protect personnel in ships which lay-to at or off Freetown in West Africa. When, however, in late 1944 it became possible for ships to reach West Africa in eight days' voyage from the United Kingdom, the system proved inadequate for men who were landing there. Their treatment had therefore to begin at the Personnel Despatch Centres before embarkation. On homeward voyages, mepacrine was continued for twenty-eight (later forty-two) days after leaving the malarious area, at the rate of 0·1 g. per day.

The disease itself, of course, did not occur on board except when unprotected troops were bitten by infected mosquitoes while ships were lying in malarious ports or when previously infected persons had relapses. Treatment was always carried out along orthodox lines.

TROOPING ARRANGEMENTS FOR W.A.A.F.

LIVING ACCOMMODATION

Some members of the Women's Services, apart from individuals who had received special appointments, had begun to be transported by sea in 1943. By the end of 1943, it had become necessary to make arrangements on a more extensive scale for the trooping of airwomen with their officers to the Middle East and North Africa. A conference was held in December of that year to discuss the modifications and trooping standards which would be necessary to secure a reasonable degree of comfort and privacy for airwomen. Operational expediency made necessary the accommodation of women in troop decks, as it was not possible to provide cabin accommodation from this country to such destinations as the Middle East. This voyage, which took eleven to thirteen days, was in fact then the only one under consideration. The sleeping accommodation decided upon was in tier-berth sections, consisting of three berths each instead of the usual four or five for men. This secured for the airwomen the advantage of separate messing. It was expected that not more than 25 per cent. of passengers would be women, but that despite this the recreational facilities would have to be shared by men and women. It was thought impossible to set up cabin sections with their lavatories and ablutions in the gutted mess decks, but it would be possible to provide lavatories and ablutions adjacent to the sleeping accommodation.

Some members of the Auxiliary Territorial Service had already travelled and the Air Ministry Director of Movements' suggestions were largely based upon the arrangements which had been made for these women, although the W.A.A.F. representative did not feel entirely convinced that conditions would be suitable. An inter-Services meeting dealing with this matter was held in February 1944, and after general discussions the decisions outlined below were taken:

(*a*) No troopship was to carry more than 250 members of the Women's Services, apart from those normally entitled to cabin accommodation.

(*b*) Ships were to be examined by the Ministry of War Transport to see whether suitable troop deck accommodation might be made available for women. This was to entail the fitting of the deck with tier-berths of three, racks to store kit and curtaining to divide off the sections to be provided, although these alterations would probably mean a reduction in the carrying capacity of that part of the ship by 50 per cent. and would allow 20 square feet per person.

(*c*) A portion of the troop deck was to be made available for recreation and the women were to be messed in the warrant officers' mess at later sittings.

These decisions were accepted by all concerned for voyages through the Mediterranean as far as Suez; east of Suez it was decided that cabins

should be allotted and that the numbers of women should be adjusted to ensure that no officer of the Army, Navy or Air Force above the rank of captain or the equivalent would have to be accommodated in troop decks. On all voyages the minimum of 8 per cent. lavatories and 4 per cent. baths and showers combined was to be provided and both were to be adjacent to sleeping accommodation. A twenty-four hour guard was to be mounted whenever necessary to ensure privacy of the women's quarters and the warrant officers' mess was to be available for recreational purposes, after the last meal of the day had been served.

Additional provision was agreed to by the Ministry of War Transport, as follows:

(*a*) Step-ladders for tier-berths.
(*b*) Sheets, pillow cases and mattresses.
(*c*) Mirrors.
(*d*) Ironing facilities.
(*e*) A few folding chairs.
(*f*) Polishing and cleansing of the existing zinc basins.
(*g*) One bin for every twenty women, and the necessary incinerator.

Living space for airwomen on troopships was assessed at 96 cu. ft. per woman, a larger space than the minimum allotment for men (72 cu. ft.). This was achieved by employing tier-berth sections, where each tier normally consisted of four berths, and using one berth for baggage only.

HOSPITAL ACCOMMODATION

It was decided that a separate portion of the ship's hospital accommodation must be provided for airwomen, and outgoing nursing sisters should travel on ships carrying women. Commands overseas were warned that nursing sisters must accompany drafts of airwomen homeward bound. The provision of women medical personnel had been agreed upon in December 1943, when it was decided that one nursing sister, and one corporal and three aircraftwomen W.A.A.F. nursing orderlies should be provided on each troopship on which Service women passengers were being carried.

DIFFICULTIES

These provisions were not thought to be as good in practice as they appeared in theory, and a senior officer of the W.A.A.F. Directorate visited No. 3 Embarkation Unit, Liverpool, in February 1944 to see conditions for herself. She pointed out that the 4 per cent. of baths included showers which provided cold salt water only, that cold fresh water at the basins was only available for two to three hours daily and that the supply of hot fresh water was turned on only at varying intervals. The washing of garments too would be difficult, because the garments of four persons had to be washed in the trough below the washbasins

which then contained the water which had been used for personal washing by four people.The difficulty of drying was also mentioned. Recreation was thought to provide a further problem as, since all airwomen could not be accommodated in the small recreation space provided, they would have to spend some of their time in vacant corners of the stairs or deck, or lying on a berth without room to read, sew or write. Perhaps the greatest criticism made of the arrangements was that there would be a lack of privacy which could prove a hardship.

However, operational necessity prevented any substantial betterment of the arrangements already decided upon, and it was pointed out by the Director of Hygiene that these uncomfortable circumstances would only prevail for a short time, that is between eleven and thirteen days at the longest.

In practice the women who travelled on troopships, with a few exceptions, realised very well that there was an urgent need for them in the commands overseas to which they were posted and that any complaint which was not of an important nature could only be regarded as frivolous in such circumstances. The knowledge that they were needed and that their jobs were important was quite enough to prevent any serious criticism of their living conditions on board, apart from criticisms of day-to-day circumstances which could easily be adjusted at the time.

CHAPTER 13

PRISONERS-OF-WAR

An official document published by His Majesty's Stationery Office in June 1946 gives the following statistics in respect of prisoners-of-war during the War of 1939–45:

Total number of Prisoners-of-war of the Armed Forces of the United Kingdom captured by the Enemy as reported to February 28, 1946.

Captured by Germany and Italy	*Totals*	*Royal Navy*	*Army*	*Royal Air Force*
Total reported captured	142,319	5,629	126,811	9,879
Killed or died in captivity	7,310	111	7,047	152
Captured by Japan				
Total reported captured	50,016	2,304	42,610	5,102
Killed or died in captivity	12,433	421	10,298	1,714

As the numbers of Royal Air Force personnel represent only a fraction of the total involved, it is not proposed, in the narrative which follows, to describe conditions within the prisoner-of-war camps at length, since these matters will no doubt be discussed elsewhere in this history.* An attempt will be made, however, by brief reference to these conditions, to indicate the state of health of R.A.F. personnel on their liberation. The various schemes for the exchanges of prisoners will also be outlined, but the greater portion of the account will be devoted to a description of the arrangements made for the reception in the United Kingdom of R.A.F. prisoners-of-war and for their resettlement either in the R.A.F. or in civilian life.

ATTITUDE OF THE ENEMY TO THE GENEVA CONVENTION

On September 30, 1939, it was agreed by the British and German Governments, the International Red Cross acting as intermediary, that central agencies for the collection and distribution of information concerning prisoners-of-war should be set up immediately. The United States Government, through its Embassy in Berlin, acted as 'Protecting Power' until the end of 1941 and from early 1942 until the end of hostilities the International Red Cross, under the protection of the Swiss Government, very ably discharged the task. All liaison with the Axis Powers in respect of the Geneva Convention was maintained by the Swiss Government at Berne.

* Chapter 25 of the Volume on Surgery deals with Prisoner-of-War Camp Surgery. *See* also Army Medical Services (Administration, Volume II), and Royal Naval Medical Services, Volume II.

On October 4, 1939, the British and German Red Cross organisations were authorised by their respective governments to co-operate with the Medical Corps of the respective Armed Forces and centrally with the International Red Cross. On October 14, 1939, the German Foreign Office, through the United States Embassy in Berlin, notified the British Foreign Office that Germany was prepared to stand by the terms of the Geneva Convention in matters affecting the treatment of prisoners-of-war.

The International Red Cross, on behalf of the Allied authorities, investigated many reported breaches of the Convention, among them the 'shackling' of British prisoners-of-war which took place as a reprisal for orders said to have been issued by the Allies to those taking part in the Dieppe raid in 1942. Deviation from the terms of the Convention varied during the course of the war. In the early stages, when the Axis was victorious, clauses which did not suit them were ignored, but greater adherence to the correct procedure was noted as the tide of war turned against the Axis. The supervisory authority of the Protecting Power over conditions in the camps was undermined in certain instances by deliberate Axis obstruction in the arrangements for visits. The supply of Red Cross parcels was fairly regular and mail services, although they varied with the changing circumstances of war, were also regular and well maintained.

The attitude of the Japanese towards the Convention was less satisfactory. During the attacks on Singapore and the Dutch East Indies they respected the Red Cross emblems on the ground and allowed a ship to proceed from the port of Batavia through the Sunda Straits when they were under Japanese control, but this attitude changed completely when the Japanese were victorious. Many Red Cross parcels are known to have arrived, but they seldom reached the prisoners; and in one particular area, at least, the only distribution was part of one parcel at Christmas 1944.

Although some recognition was accorded to medical officers in prison camps in Java, they were not recognised in Japan as doctors, in accordance with the terms of the Convention. The Japanese authorities maintained that they had applied to Geneva for confirmation that all prisoner-of-war doctors were qualified and that until such confirmation arrived, they could not permit them to practise. It appeared that such confirmation did not arrive. All sick personnel were seen by Japanese medical orderlies, whose knowledge of first aid was below even elementary standards; the aim of every Japanese camp commander was to get every available prisoner out to work and the Japanese orderly co-operated to the fullest possible extent, with little or no regard for the condition of the prisoner.

CONDITIONS IN THE PRISONER-OF-WAR CAMPS

EUROPEAN CAMPS

Forty thousand British prisoners-of-war were trapped at the fall of France in 1940. Of these less than 1,000 were R.A.F. personnel, but by the end of the war in Europe the number of R.A.F. prisoners had risen to 9,879. The majority were aircrew who had to bale out over Axis territory and they were often injured or burnt while doing so, thus starting captivity at a great disadvantage. The period of imprisonment ranged from a few months to five years and the health of personnel on their release varied considerably as a result of the differing conditions to which they had been subjected in the camps. These were widely dispersed, from sites in the bitterly cold areas of the extreme north to camps in the hot deserts of North Africa. Camps situated near the Baltic were naturally intensely cold in winter and were more closely guarded than most, in view of the possibility of escape by sea. Camps in Silesia, close to the Russian border, suffered from shortage of rations and overcrowding, which was aggravated by the influx of Russian prisoners. In North Africa the desert location of many of the camps was a source of great discomfort and the frequent moves during the ebb and flow of battle resulted in disrupted communications and ultimately in the ill-temper of an Army in retreat. In camps situated near military targets there was much mental suffering, in addition to disrupted communications which caused shortages of German rations and Red Cross parcels.

Apart from the varying climatic and strategic conditions, the camps themselves differed in type. In Germany, for example, the *Oflags*, or officers' camps, and the *Stalags-Luft*, which were for aircrew only, were usually well organised and there was no hard work, but in the *Stalags*, or working camps, the food calorie value was generally inadequate for the work which had to be done and greater reliance had to be placed upon the regular receipt of the Red Cross food parcels. The *Lazarats*, or hospital camps, bad to begin with, improved as the war progressed. The worst camps were the *Dulags*, or transit camps, where, due to the shifting population, there was little or no organisation. The personal characteristics and outlook of the German Camp Commandants were a great influence for good or evil; and in this connexion most prisoners-of-war found a great difference between the German officials on the one hand and the Austrian and Bavarian authorities on the other. The latter were found generally more humane. The amount of help and co-operation given by the Medical Corps of the German Army to the sick and wounded and prisoner-of-war medical officers varied between camps.

The camps were placed under the control of the most senior General Duties officer, with an advisory committee of other senior officers. N.C.O. camps were controlled by a camp leader, who was elected by popular vote and whose responsibility it was to maintain discipline, make

official representations to the camp authorities on behalf of the prisoners and to look after the general welfare of the men in his charge. Each hut had a hut leader, similarly elected by popular vote, who was responsible for the cleanliness and discipline of his own hut and acted in an advisory capacity to the camp leader. Generally speaking, discipline was good and the men co-operated well; criticism was very free and openly expressed.

The majority of the camps were dismal, consisting chiefly of unpainted, single-storey wooden or brick buildings, surrounded by sand or dirt compounds which were devoid of grass or trees. The buildings themselves were dirty inside due to the lack of cleaning utensils such as brooms, soap and scrubbing-brushes; lighting, ventilation and sanitation were generally bad and overcrowding was rife. The sleeping accommodation consisted of two or three-tier bunks with bed boards and wood-wool palliasses. Bed bugs were prevalent and in some cases lice also, and the shortage of fuel made washing of clothes difficult.

On arrival the prisoners were issued with two blankets, a tin bowl, a fork and spoon and a mug. Cooking utensils were made of flattened Red Cross tins. The total calorie value of the German prisoner-of-war ration was estimated at 1,390 and that of the Italian at 1,290, the amount of meat issued, usually horseflesh, being negligible. A typical ration scale in *Stalag-Luft* 1 in January 1945, consisted of:

Potatoes . . .	250 g. (Official issue 400 g., but about 50 per cent. were inedible)
Bread	300 g.
Barley	50 g.
Margarine . . .	A small piece
Swede, turnip, cabbage .	Two or three times weekly
Sausage . . .	A little occasionally

These rations, until the autumn of 1944, had been supplemented by a Red Cross parcel per man per week. The following scale, drawn up by the Red Cross Organisation in April 1945, is based on information from a reliable source:

Nutritive Values

	Optimum requirements	*Axis rations*		*Red Cross parcels*		*Total*
Germany	3,000 calories	1,390	+	1,601	=	2,991
Italy	3,000 calories	1,290	+	1,551	=	2,841

Due to the difficulties of transport, it was necessary to have twenty-nine parcels per head in actual transit, in order to maintain a regular supply of weekly parcels at the camp. As long as these arrived regularly the diet was adequate for personnel in most of the camps. The absence of severe malnutrition in these prisoners on repatriation, is evidence of the regularity with which these parcels were received.

JAPANESE CAMPS

Conditions in the Far East camps were uniformly bad, and the flagrant disregard of the Japanese for the provisions of the Geneva Convention resulted in much suffering and a severe degree of malnutrition. The following brief description of life in the numerous camps which spread from Nagasaki to Moji in the south island of Kyushu is illustrative of the camps in general. In the latter part of 1944, when the tide of war was beginning to turn against the Japanese, all the general duties officers in these camps were evacuated to Manchuria, leaving in charge of the remaining personnel the medical and dental officers and a few fighting officers who were considered too weak to travel. By this time the health of the prisoners, as a result of the conditions under which they were living, was extremely poor. The long hours of work and the completely inadequate rations had reduced their morale to such an extent that their only concern was to keep themselves alive. It was agreed by most of the medical officers who were present in the camps when Japan capitulated, that another winter in captivity would have caused a great many more deaths.

The work done by the prisoners varied in different camps but the large majority worked in open-cast mines, which was considered the hardest form of work. Others worked in shipyards, steel works and similar installations. Prisoners who arrived in Japan without being torpedoed had a certain amount of their own clothing; others were entirely dependent on the issue made to them by the Japanese, which consisted of old Japanese uniforms and shirts, which were too small. All these items were in a very dilapidated, louse-contaminated condition and no boots were issued. The prisoners suffered great privation by this lack of adequate clothing and it was not until the late winter of 1944 that their discomfort was to a certain extent alleviated by an issue of British Army greatcoats.

The rations consisted mainly of poor-quality rice mixed with millet and sweet potatoes or pickled vegetables. Hot water was the only beverage. In winter this meagre diet was supplemented by a vegetable stew made of cabbage tops and beans, but at all times the total caloric intake per day was well below that required to support a sedentary life. The medical officers were asked to compile lists of all prisoners who were suffering from phthisis or other severe illnesses, so that the Japanese could give them extra rations. When the lists were supplied, the Japanese erased the names from the ration strengths, maintaining that since they were going to die in any case, it was useless to feed them. A medical officer with personal experience of these camps has recalled the desperate efforts which were made by the prisoners to provide some form of nourishment for the seriously ill among them. The husks of the unpolished rice which was issued as a ration were full of small worms, *Canhandra granaria* (the rice weevil) and other small insects. When the

rice was soaked these floated to the top, were skimmed off and boiled in clean water. The resulting liquid was strained and given to the sick as a kind of *ersatz* beef tea. The supply of medicines and drugs was negligible; five aspirin tablets, one bandage and ten vitamin tablets were issued daily for a camp of 450 prisoners-of-war. An American shaving cream known as 'Barbisol' which the Japanese issued for Christmas 1944, became the principal dressing for wounds and sores, which were bandaged, for the most part, with paper* and pieces of rag.

All officers and sick personnel, with the exception of those lying in bed, who were mostly dying, were kept fully occupied. Two hours were spent every morning in emptying into barrels the maggot-ridden latrine contents, subsequently used as manure, and other tasks consisted of scrubbing the floors, transporting the dead two miles for cremation and returning with the ashes, collecting the rations in hand-carts and unloading them, building stores and fences and, towards the end of the war, constructing air-raid shelters.

Inevitably the health and morale of the prisoners deteriorated. The chief physical disabilities from which they suffered were severe weight loss, oedema, right heart enlargement, retrobulbar neuritis and various types of avitaminosis dermatitis. Very few letters reached prisoners in the hands of the Japanese and it was considered that this, in some ways, was better from a psychological point of view, since the effect on those who did receive any mail made it obvious that personal reminders of home were, in the circumstances, detrimental to morale. Some of the prisoners had no inhibitions left and were resolved, should they ever get away from the camps, to make up for lost time as quickly as possible, an outlook which sometimes ended in subsequent disaster. Others became over-inhibited and began to worry over the smallest detail which might prevent them reaching home in full possession of their faculties.

EXCHANGE OF PRISONERS-OF-WAR, 1943–5

Negotiations for the exchange of prisoners-of-war commenced at a very early stage of the war. Between June 1940 and August 1940, in accordance with Article 68 of the Geneva Convention, the British and German Governments, through the Swiss Government and the International Red Cross Organisation, agreed upon the establishment of Mixed Medical Commissions, which were to include two Swiss medical officers as neutral observers. Prisoners-of-war recommended by the respective governments and later by camp medical officers, were examined by officers of the Commission to determine their suitability for repatriation on medical grounds.

Various proposals for exchange and hospitalisation in neutral territory failed, chiefly due to the disparity in the numbers recommended at this

* Paper bandages were an official issue to Japanese Medical Units.

early stage of the war, when the Germans held innumerably more prisoners. By October 1941, definite arrangements had been made and hospital ships carrying prisoners-of-war were assembled at the ports of Newhaven and Dieppe, but at the last moment the arrangements were cancelled. Early in 1943, when as a result of the North African campaign the British held many more prisoners, negotiations were reopened. As far as the R.A.F. and the German Air Force were concerned it was considered that only those unfit for further service should be exchanged, since a head for head exchange at that stage of the war would have been a great advantage to the Germans, who were getting short of trained aircrew. Agreement was finally reached and on September 21, 1943, the ships *Atlantis*, *Empress of Russia* and *Drottingholm* left Gothenburg for Liverpool with a total of 4,149 British and 13 American prisoners-of-war, 178 less than the agreed number. The ships *Fairea* and *Cuba* left Barcelona for Alexandria on October 28, 1943, with a total of 1,036 British prisoners-of-war on board, 47 less than the agreed number. The second exchange of sick and wounded prisoners-of-war took place in May 1944, when the M.S. *Gripsholm* left Barcelona for Liverpool with 814 British, 18 Americans and 67 civilians (American and British) on board. The third exchange repatriated 2,000 British prisoners-of-war and 600 British civilians from Gothenburg and the final exchange took place from Marseilles to the United Kingdom in 1945.

In all these exchanges the total numbers of R.A.F. personnel involved were comparatively small, so that large-scale preparations for their reception in this country were unnecessary. The following account of the procedure adopted at one Royal Air Force Hospital which acted as a reception centre, illustrates the typical routine which was followed. Each government had agreed to provide nominal rolls of the patients in each of three categories, stretcher, sitting and mental cases. Although in practice the actual prisoners-of-war repatriated did not correspond with the nominal rolls previously supplied by the Germans, the rolls did give an approximate indication of the numbers and types of cases which might be expected. Hospitals selected to receive R.A.F. prisoners were given three weeks' notice of their impending arrival together with some indication of their probable condition. Complete nominal rolls with instructions were received three days before arrival, when ward allocations were decided upon. On their arrival the prisoners-of-war were conducted to their appropriate wards accompanied by light luggage and the following medical forms were completed:

(*a*) Form 41 (Headed 'Repatriated P.O.W.'). Hospital case sheet.
(*b*) Form 2042A. The address of the next-of-kin was filled in by the patient, the form was collected, signed by the Senior Medical Officer and posted forthwith.
(*c*) Form 827. Medical Board on entry for officers and aircrew. This was completed by various specialists and the sister in charge of the ward.

(*d*) Clearance certificates. These indicated the departments to which the patient had to report and were annotated as and when he had been seen by these particular departments.

At this stage the repatriated prisoners spent only forty-eight hours at the hospital; and during this period they were issued with complete sets of uniform and other clothing, were given pay advances of £20 each and an opportunity to exchange any foreign currency and were issued with railway warrants and identity and ration cards. On arrival a double issue of cigarette and chocolate ration, paid for by the P.S.I. Fund, was made, while the ration cards which were issued entitled the holder to double rations and extra milk for the twenty-eight day period of leave. Representatives of Air Ministry (P.5.) and Welfare Officers were available to discuss preliminary problems of rehabilitation and resettlement. Arrangements were made with R.A.F. Movement Control to meet the patients proceeding on leave and make reservations on trains and boats. Telegrams were dispatched to home addresses giving the approximate times of arrival and patients unfit to travel by train were transported by motor ambulance.

It was arranged that all ex-prisoners-of-war should return to the same hospital twenty-eight days from the date of proceeding on leave. Many applications for extensions of the leave period were received, but, with the exception of a few compassionate cases, all were refused in order to implement the planned policy of mass re-examination and medical boarding. The following list of cases admitted to the hospital referred to above is typical of the types of cases repatriated in the various exchanges. The majority were orthopaedic (amputations) cases and many of the medical cases were suffering from tuberculosis:

Medical	Officers	11
	Airmen	15
Surgical	Officers	8
	Airmen	3
Orthopaedic	Officers	8
	Airmen	56
E.N.T.	Officers	2
	Airmen	2
Observation neuroses	Officers	13
Total		118

As one result of the experience gained from treating these cases, certain recommendations were made by one of the senior medical officers concerned. He considered that the number of such patients admitted to any one hospital, irrespective of size, should not exceed 100 and that in the case of hospitals inexperienced in this type of work, the

numbers should be restricted to thirty. Furthermore, he recommended that repatriates in need of continued hospital treatment should be dispersed to other centres after medical boarding, bearing in mind that these patients had been herded together, in some cases for years, and were naturally anxious to forget their experiences. Finally, he considered that some relaxation of normal hospital discipline was necessary for this type of patient and was an added reason for limiting the intake to 100.

EVENTS ON THE CESSATION OF HOSTILITIES IN THE FAR EAST

There was little delay in repatriating prisoners-of-war from the European theatre, who were rapidly evacuated by air, but owing to the greater distances involved and to certain other factors it was some time before the Far East prisoners reached the United Kingdom and the waiting period which elapsed had some bearing on their physical condition on arrival. The Japanese Government capitulated on August 15, 1945, but because of typhoons and the heavily mined coastal waters, it was not until approximately September 15, that the American forces were able to land in any strength. The task of caring for the prisoners during this interim period was an extremely difficult one for the medical officers.

The United States Air Force dropped advisers by parachute and after all the camps had been clearly marked with a large P.W. on the roof to indicate their position from the air, U.S. aircraft dropped supplies of food, clothing and medicine. (See Appendix A.) The general deficiency of such things as proteins, fats, vitamins, the continued overwork and the gradual and almost complete loss of hope had produced patients whom it was extremely difficult to assist. The men were tired and hungry and heedless of discipline or advice, unless it suited them. They ate what they wanted, when they wanted. Included in the supplies dropped by air were large quantities of sweets and chocolates which the men ate avidly and this initial consumption of an excess of carbohydrates resulted in oedema in the majority of prisoners. Despite requests and warnings by the medical officers, the prisoners-of-war began to explore the countryside, bringing back with them local food in the form of fowl, pigs and fresh eggs. Many of them also ignored warnings concerning the local Sake, an almost pure wood alcohol, named after the Japanese rice wine. Numerous cases of blindness and peripheral neuritis, extending to paralysis, resulted from excessive consumption of this liquid.

Despite these initial excesses, however, the health of the prisoners generally improved in a remarkably rapid manner and, the normal appetites satisfied, the sex appetites began to reappear. This led to a certain amount of venereal disease, mainly gonorrhoea, and the medical officers in the camps used penicillin for the first time, with satisfactory results.

EVACUATION OF THE PRISONERS-OF-WAR IN FAR EAST CAMPS

JAPANESE CAMPS

The most severely ill prisoners in the Japanese mainland were transferred at once to nearby Japanese hospitals and it was arranged that the American forces in Okinawa would send a fleet of aeroplanes to nearby airfields to convey the sick to the five general hospitals in Okinawa, which had been set up in preparation for the invasion of Japan. As the road communications in many parts of the country were very poor, the Japanese railway authorities were instructed to arrange for hospital trains to convey the sick to pre-arranged airfields, whence they were flown to Okinawa. Those prisoners who remained in the camp were examined by the prisoner-of-war medical officers and given various courses of treatment and diets appropriate to their particular cases.

The general evacuation of prisoners from Japan proper was arranged from Nagasaki and Yokohama by American Naval forces. On arrival at the ports of embarkation all personnel were stripped, given hot showers with plenty of carbolic soap, dried and completely dusted with D.D.T. powder. All clothing was taken from them and destroyed, but they were allowed to retain personal possessions such as souvenirs provided that they had been thoroughly disinfected. Each man was then examined by an American Army doctor and his medical history was recorded. In this task the Americans were assisted by the prisoner-of-war doctors. The prisoners were divided into three categories:

(*a*) Those who required immediate hospital treatment.
(*b*) Those who required continued treatment and observation.
(*c*) Those who were fit to proceed on ordinary naval vessels.

Those in categories (*a*) and (*b*) were taken on board American hospital ships and the rest embarked for Okinawa, where they landed and were flown a few days later to Manila.

The British prisoners-of-war were sent to a large camp about eleven miles from Manila, to await transportation to the United Kingdom ***via*** the United States and Canada. This camp, administered by the Australian Army authorities, was well run, but the majority of the men found the three- to four-weeks' delay very frustrating, particularly as it was extremely difficult, due to heavy traffic, to get replies to cables sent to the United Kingdom. One prisoner received his first delivery of twenty-two cables on board the *Queen Mary*, one day out from New York.

The four-weeks' journey across the Pacific in R.N. aircraft carriers and American troop transports was, to many of the prisoners, a very beneficial convalescent period. Many of the original (*b*) cases were fit enough to join the (*c*) group at Manila and shared the advantage of the long sea voyage. The Red Cross (American, Canadian and British) did

everything they could to make this journey comfortable. Clothing, sweets, fruit, cigarettes and similar commodities were distributed at every port of call. The shortage of money, due to the restrictions of the dollar allowance, was in some ways an advantage, as it curbed a tendency to excessive consumption of alcohol. The generosity which was encountered everywhere *en route* more than compensated for any financial difficulties.

MALAYA AND THE DUTCH EAST INDIES

On the re-occupation of Singapore Island it was found that the prisoners-of-war were free on the island and in many cases camps were partially deserted, the prisoners-of-war living with Chinese or in empty houses. It was not clear until the last moment whether or not the Japanese would oppose the landing, consequently the occupying forces had to give high priority to operational commitments and few definite arrangements could be made beforehand for the evacuation of the prisoners-of-war. The problems which confronted the Service authorities when planning the evacuation of prisoners were accentuated by the presence on the island of large numbers of civilian internees, men, women, and children of many nationalities, all in need of assistance. Food and medical supplies from existing stocks were made available to both prisoners and internees, although it was found that the majority of the former were wandering all over Singapore Island obtaining what they needed from natives or Allied troops.

The medical authorities made rapid arrangements for the more seriously ill prisoners-of-war to receive attention in civilian or Service medical establishments, though the number needing immediate attention was fortunately small. A little later, with the reoccupation of the Dutch East Indies, considerable numbers of prisoners-of-war and internees from these islands were flown in by Dakota planes to Singapore. These included numbers of Gurkhas and Indians, who showed signs of gross undernourishment and ill-treatment at the hands of the Indonesian guards and required immediate hospital treatment.

All prisoners-of-war and internees, wherever possible, were given the opportunity to return to their native country by air or by sea. Transport difficulties were aggravated by the presence among them of numbers of Dutch and Indian personnel. As transport by air was naturally limited, the majority travelled by sea. Initially a number of hospital ships of the occupying forces were available to convey the more seriously ill and the remainder travelled by transport, with a high priority. The decision to return the majority of prisoners by sea proved to be a wise one, since the long sea voyage with plenty of good food, rest and sunshine resulted in their arrival in the United Kingdom in a greatly improved condition.

ARRANGEMENTS FOR THE RECEPTION OF PRISONERS ON REPATRIATION

It was originally planned that No. 106 Personnel Reception Centre (P.R.C.) which had been established at Royal Air Force Station, Cosford, should undertake the complete repatriation arrangements for R.A.F. and Allied Air Forces personnel. The rapid evacuation by air from the Continent, however, resulting in an influx of large numbers of prisoners-of-war over a short period, made it impossible to adhere strictly to the original plan, and initial reception centres were hurriedly set up at the various reception airfields in the country. Many prisoners-of-war were dealt with and sent directly on twenty-eight days' repatriation leave, with instructions to report to No. 106 P.R.C., Cosford, at the end of that period. The following is a list of airfields used to disemplane prisoners-of-war from the Continent:

Airfield	*Number received*	*Number sent to hospital*
R.A.F. Wing (Bucks)	32,864	534
,, Brighton	1,402	87
,, Bournemouth	2,466 (Canadian)	68
,, Seaford	1,299	160
,, Hixon	210	25

In making arrangements for the reception of personnel at these centres, the experience gained at R.A.F. Hospitals during the exchanges of prisoners and that of the R.A.M.C. after the War of 1914–18, helped to form a general basis for planning. The arrangements at R.A.F. Wing were typical.

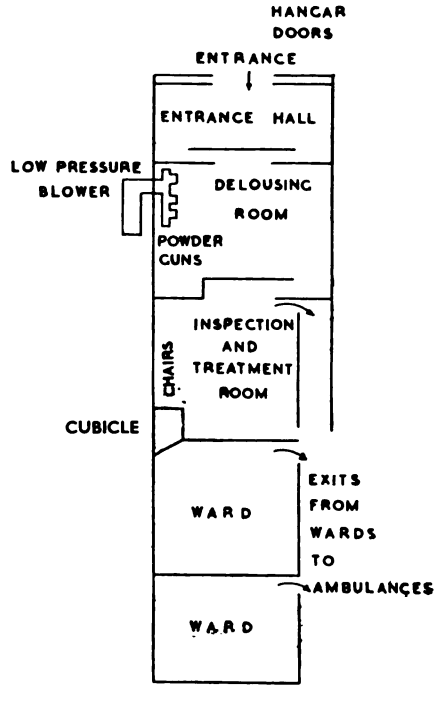
A complete hangar was assigned to the medical section and was used for delousing, inspection and ward facilities while the patients were awaiting transfer to hospital. The hangar was sectioned off on one side by 6 ft. hessian-covered screens and the floor was covered with coconut matting. Heating was by Valor oil stoves and delousing was done by means of four powder guns, charged with A.L. 63 Mark III and powered by a low-pressure blower, installed outside the hangar to reduce noise. (See plan overleaf.)

The inspection and treatment room was large and the area near the entrance was kept clear to facilitate the rapid passage of the prisoners-of-war. The cubicle was fitted with an examination couch and was used for the more intimate examinations and dressings. Canvas chairs were arranged along the walls for the patients. Hot water was obtained from a number of sterilisers plugged in round the inspection and treatment room. The wards were fitted with beds, mattresses and blankets impregnated with A.L. 63, and were connected by doorways to the hangar, where ambulances could be driven up to transfer the sick.

The staff consisted of three R.A.F. medical officers, R.A.F. and W.A.A.F. nursing orderlies, nurses from the Red Cross and St. John Organisation and general duties officers, who assisted the medical staff

by writing down the answers to three questions which were asked of each prisoner-of-war:

(*a*) Did they require medical treatment?
(*b*) Had they any sickness or diarrhoea?
(*c*) Had they any wounds or sores requiring dressing?



Those personnel not requiring treatment proceeded into the hangar by a side entrance. After delousing and medical examination various forms were completed. Delousing certificates were prepared in duplicate and one copy was given to the prisoner-of-war. Forms 41 were completed for each ward case, one copy accompanying the patient on transfer. In this connexion the clinical notes from the prisoner-of-war camps proved very useful. Transfer from Wing by road to Cosford, a distance of 120 miles, was found to be difficult so that local E.M.S. hospitals were used for immediate treatment, the patients being transferred later by air to Cosford.

The total number dealt with at R.A.F. Wing was 32,864, representing a daily average of 1,027 for thirty-two working days. Twenty days were lost due to bad flying weather. It is estimated that 10 to 15 per cent. needed hospital treatment. Enteritis was the commonest diagnosis covering all forms of diarrhoea. Ten per cent. suffered from malnutrition but no gross cases were seen.

REPATRIATION (COSFORD) SCHEME

In March 1945, it was decided that all R.A.F. repatriated prisoners-of-war should pass through No. 106 P.R.C. at Cosford. Cosford was chosen because there was adequate accommodation there for the high proportion of officers included among the personnel to be repatriated. By returning the aircraft apprentices stationed at Cosford to R.A.F. Station, Halton, it was possible to accommodate 3,600 ex-prisoners and it was planned that any surplus should be transferred to R.A.F. Hednesford.

The medical section at Cosford was to be responsible for two main functions, firstly the initial reception of the prisoners-of-war and examination to determine their fitness to proceed on leave and secondly their medical boarding and disposal on return from leave. Only an approximate estimate could be obtained of the numbers likely to be received and planning was therefore based on the maximum number which could be handled per day, having regard to the limitations of available staff and accommodation. The P.R.C. guaranteed to receive 60 cases per hour for ten hours per day for seven days a week. These numbers were capable of expansion and, in fact, were exceeded on several occasions, notably during one three-day period, when approximately 900 cases per day were dealt with.

Initial Reception. It has already been seen that, due to the unexpectedly rapid repatriation of prisoners from the Continent, initial reception centres were set up at the airfields at which they were disemplaned. The original plans for Cosford were of necessity modified. Big rushes of personnel were followed by long periods of waiting, due to delayed trains and bad flying weather, and considerable improvisation was needed in order to provide the facilities which were required. Reception was divided into two phases as follows:

(*a*) Actual reception, bathing, disinfestation, segregation of those requiring urgent hospital treatment, feeding and sleeping.
(*b*) Medical examination to determine the fitness of personnel to proceed on leave.

These two phases were carried out concurrently in respect of personnel arriving during daylight hours. The prisoners-of-war were divided into groups of twenty-five, each under the care of a sergeant guide and in these groups they visited the various sections, pay, clothing, medical and others, which have already been described in the Section on the exchange of prisoners-of-war.

On arrival at the medical section the prisoners-of-war were directed to the dressing-room, where they stripped to the waist, put on a tunic and proceeded to the waiting-room for completion of a *pro forma* designed to record the condition of the prisoner on arrival. The form included questions concerning any illnesses or injuries suffered during

captivity or at the time of arrival. The bottom half was completed by the medical officer and was printed as follows:

Medical officers only

Weight ..... lb. Pulse..... F.F.I.....
Heart ..... Abdomen .....
Mass X-ray report..... Will / Will not } require large film....
Remarks .....
.....
Medical officer's comments .....
.....

On completion of this *pro forma*, each man was given a chit, clearing him from the medical section. Every effort was made to develop and read each man's X-ray film as quickly as possible, so that a large film, if necessary, could be taken before the prisoner-of-war proceeded on leave.

It was found that of the first 100 arrivals from R.A.F. Wing many were suffering from diarrhoea of a severe nature and that all showed a degree of emaciation which rendered Phase 2 of the procedure redundant for the time being. Two nutritional experts, who were sent to Cosford immediately, reported that the clinical evidence of malnutrition was confirmed by emaciation, paraesthesia, nutritional oedema and skin changes. The chief complaints were of loss of libido, diarrhoea, general weakness and sore tongue. It was recommended that each man should have four pints of fresh milk and three eggs per day, a liberal supply of oranges and compound vitamin tablets at the rate of two per day. All these extra commodities were to continue during the twenty-eight days' leave period, except for the eggs, which were to be issued at a minimum rate of three weekly. These extras were in addition to the normal double rations to which each man was entitled during the leave period and on their return from leave it was found that nearly all the prisoners-of-war had been able to obtain these additional supplies.

Readmission and Medical Boards. By the end of June 1945, most of the prisoners-of-war from European camps, including a large group which had been held by the Russians, had passed through No. 106 P.R.C. By this time the arrangements for their medical boarding had been reviewed, additional equipment had been obtained and existing accommodation modified, so that rooms were available for ophthalmic and E.N.T. examinations. A pathological laboratory and a separate urine laboratory were set up. It had been decided that the number of boards to be conducted daily would be 250.

R.A.F. Forms 827 were used to record the findings of the Medical Boards and were completed by the general medical officer, the ophthalmic and E.N.T. specialists and, where necessary, by the orthopaedic

specialist and the dermatologist. The reverse of the form was used for recording the following details:

(*a*) Date of capture.
(*b*) Any injury at time of capture. Nature. Treatment.
(*c*) Any illness or injury during imprisonment or repatriation.
(*d*) Date of release.
(*e*) Present condition.

Much of the information required to complete these forms was obtained by a separate interviewing section, whose work did much to facilitate rapid progress of the boards. After assessment by the Board, disposal of the ex-prisoners-of-war was as follows:

(*a*) Fit —To Disposal Board, which consisted of executive personnel who decided the question of retention or non-retention in the R.A.F. Personnel electing for release from the Service proceeded to release medical sections, where Form 2561 (Medical Inspection prior to Release) was completed from existing documents thus avoiding a further medical examination.

(*b*) Unfit—To No. 4 Medical Rehabilitation Unit at Cosford or to hospital.

Staff of Medical Boards. The staff employed on the Medical Boards was as follows:

(*a*) Interviewing Room – 4 medical officers. Later 4 general duties officers were trained to assist.
(*b*) E.N.T. Section – 4 medical officers, two of whom had to be E.N.T. specialists.
(*c*) Ophthalmic Section – 3 medical officers, two of them ophthalmic specialists.
(*d*) General Medical Section – 10 medical officers, each with a separate cubicle.
(*e*) President's Section – 1 senior president and 4 presidents. Cases of doubt or difficulty in assessment were referred to the senior president.
(*f*) Release Section – 2 medical officers.
(*g*) Pathology Section – 1 medical officer, who also supervised urine testing.
(*h*) Administrative Section – 1 medical adjutant and staff.

The hours of work were from 0830 hours until 1230 hours and from 1330 hours until all work for the day was finished. There was no intake on Sundays, so that all members of the staff had one free day each week.

Work of the Boards. The weekly average aimed at was 1,500 boards and this number was not only maintained but exceeded on several occasions. During one week in July 1945, 1,758 prisoners were medically

boarded, an average of 293 per day for six days. Included in these figures were a number of patients who had returned from No. 4 M.R.U., Cosford. All patients invalided by the Boards were sent to R.A.F. Hospital, Cosford for invaliding procedure. The following summarises the work done and the causes of invaliding:

Disposal	To No. 106 P.R.C. for disposal . .	8,269
	To No. 4 M.R.U.	1,379
	To R.A.F. Hospital, Cosford . . .	555
		10,203
	Add cases from No. 4 M.R.U. previously 'temporarily unfit all duties' . . .	800
		11,003

Causes of invaliding		
	Medical	228
	Surgical	215
	Neurological	23
	E.N.T.	65
	Ophthalmic	12
	Skin	12
	Total	555

SPECIAL MEDICAL PROBLEMS*

PRISONERS-OF-WAR RETURNED FROM EUROPEAN CAPTIVITY

The majority of R.A.F. prisoners returning from European captivity were aircrew and therefore the first consideration borne in mind by the staffs of the medical boards was the fitness of these personnel for aircrew category. The following is a list of the principal diseases in the various systems which were found in aircrew and ground crew combined and were causes for either rejection from aircrew or invaliding:

(*a*) E.N.T.	Active otitis media with perforation. Old otitis media with scarring. Nerve deafness.
(*b*) Ophthalmic	Hypermetropia and myopia which had progressed in captivity to a standard below that required for aircrew.
(*c*) Psychiatric	135 cases were referred for neuropsychiatric opinion. They were divided as follows: i. 58 cases of organic disease, largely neurological cases. ii. 6 cases of psychotic illness, consisting of 2 paranoiacs and 4 schizophrenics.

* *See* also Chapter 5 of the Volume on Medical Research.

iii. 61 cases of psychological disorder, including anxiety depression and obsessional and hysterical states. The clinical picture was fairly uniform, showing lack of self-confidence, desire for solitude, fear of the future and reluctance to face it.

iv. 10 cases in which no abnormality could be found.

(*d*) Medical — Malnutrition syndrome, characterised by weight loss, diarrhoea with flatulence, dry sallow skin and in some cases oedema of legs. No abnormalities in other systems were detected, except for low blood pressure, slight tachycardia and slight anaemia.

(*e*) Chest disorders — A total of 11,003 X-rays were taken and the findings were as follows:

Total active T.B. with sputum +	17
Total active T.B. with sputum —	21
Total inactive T.B. with calcified glands	200
Total other chest abnormalities	5

(*f*) Orthopaedic — The most severe cases were found among the prisoners-of-war repatriated in the various exchanges during the war years, who had been admitted to R.A.F. Hospital, Cosford. 800 patients were seen by orthopaedic specialists at No. 106 P.R.C. The majority had received treatment on orthodox lines during captivity and many good results had been obtained. Amputation cases were on the whole well done and many prisoners returned with accurate typed case history sheets and X-ray reports. Several cases of malunion, especially in bad compound fractures, were seen. German surgery was of a higher standard than the Italian.

PRISONERS-OF-WAR FROM JAPAN

The following medical conditions were encountered among prisoners-of-war from the Far East:

Retrobulbar neuritis. Nutritional deficiencies caused a certain number of these cases, which varied in degree from defective vision to complete blindness. The latter cases were due to optic atrophy and rehabilitation was carried out at St. Dunstan's (*vide* Red Cross account, Chapter 6). The waiting period between the end of hostilities and embarkation from Japan was utilised in some of the camps to examine and treat the retrobulbar cases among the personnel. On examination they were divided into two main types, those with central scotoma and those showing vascular changes. Pyrexia therapy was used, the patients being injected

with 0·25 c.c. of T.A.B. vaccine intravenously at weekly intervals. At the same time they were given a balanced diet containing frequent small amounts of protein, fat and carbohydrates and it was found that a predominance of fat over protein produced the best results. The cases showing vessel changes only responded very well, but the central scotoma not at all. The majority of the former group made a complete recovery; a certain number needed spectacles to bring their visual standards up to normal but it is not known how many of these cases were due to normal visual deterioration.

Bacillary dysentery. Due to inadequate treatment a chronic form of this type of dysentery was met with in a large number of the prisoners-of-war, particularly those who had been captured in the Dutch East Indies and Malaya. Palpable thickened descending colons, frequent stools and occasional fevers were the commonest signs and symptoms. Isolation of dysentery bacilli was difficult in most cases. The clinical picture and diagnosis was often made more difficult by the presence of various nematodes. The prisoners-of-war who returned with chronic bacillary dysentery had a difficult time regaining their health.

Amoebic dysentery. Lack of symptoms and negative findings at sigmoidoscopy camouflaged a number of cases, which were consequently not diagnosed until some time later when symptoms did appear. A further difficulty encountered was that all prisoners-of-war without exception, had suffered from some form of diarrhoea during captivity, the cause of which, though rarely known, was invariably attributed to dysentery; furthermore, those who had received treatment rarely possessed case histories of any kind to indicate type or severity of the dysentery from which they had suffered.

Avitaminosis

B1 (*Beriberi*). Most of the cases were of the dry beriberi type, which caused much muscular wasting and weakness and left many with slight to moderate degrees of cardiac impairment due to previous right-sided dilatations of the heart. The treatment of these cases entailed considerable care and patience. Aneurin therapy, careful nursing and dieting, with rest in bed and physiotherapy restored many to a fairly good physical condition.

B1 and B2 (*Pellagra*). The involvement of skin, alimentary and nervous systems showed considerable variation. A large number of the cases showed only the skin manifestations by the time they reached R.A.F. Cosford, because the vitamin tablets packed in the American Air Force food parcels dropped to the prisoner-of-war camps had cleared up the alimentary and nervous symptoms of pellagra. Mental symptoms encountered in the prisoners-of-war were not thought to be associated with pellagra, as these symptoms were regarded as functional and tended

Sickness among returned prisoners-of-war 1945, 1946

Number of cases

	Ex Germany							
	1945				1946			
	Deaths	Invalids	Others	Totals	Deaths	Invalids	Others	Totals
Blood, blood forming organs, etc.	1	—	10	11	—	—	—	—
Endocrine system	—	1	—	1	—	—	—	—
Deficiency	—	—	—	—	—	—	1	1
Cysts and tumours	1	1	—	2	—	—	—	—
Debility	1	—	160	161	—	—	1	1
Infections	—	—	110	110	—	—	7	7
Pulmonary T.B.	1	23	20	44	—	29	12	41
Other T.B.	—	1	—	1	—	—	—	—
Alimentary	—	10	110	120	—	—	3	3
Circulatory	1	1	20	22	—	—	—	—
Respiratory	—	—	30	30	—	1	2	3
Urinary and generative systems	—	3	30	33	—	2	1	3
Locomotor	—	20	60	80	—	39	10	49
Mental diseases and nervous system	—	22	40	62	—	10	7	17
Eyes	—	—	10	10	—	—	—	—
E.N.T.	—	3	70	73	—	2	2	4
Skin	—	—	60	60	—	1	2	3
Injuries	1	20	210	231	—	1	3	4
Others and unallocated	—	10	210	220	—	11	15	26
Totals	6	115	1,150	1,271	—	96	66	162

	Ex Italy							
Blood, blood forming organs, etc.	—	—	—	—	—	—	—	—
Endocrine system	—	—	—	—	—	—	—	—
Deficiency	—	—	—	—	—	—	—	—
Cysts and tumours	—	—	—	—	—	—	—	—
Debility	—	—	—	—	—	—	—	—
Infections	—	—	—	—	—	—	—	—
Pulmonary T.B.	—	—	—	—	—	2	—	2
Other T.B.	—	—	—	—	—	—	—	—
Alimentary	—	—	—	—	—	1	—	1
Circulatory	—	—	—	—	—	—	—	—
Respiratory	—	—	—	—	—	—	—	—
Urinary and generative systems	—	—	—	—	—	—	—	—
Locomotor	—	1	—	1	—	3	1	4
Mental diseases and nervous system	—	—	—	—	—	—	—	—
Eyes	—	—	—	—	—	—	—	—
E.N.T.	—	—	10	10	—	—	—	—
Skin	—	—	—	—	—	—	—	—
Injuries	—	1	10	11	—	—	—	—
Others and unallocated	—	1	—	1	—	—	—	—
Totals	—	3	20	23	—	6	1	7

Sickness among returned prisoners-of-war 1945, 1946

Number of cases (Continued)

	Ex Japan							
	1945				1946			
	Deaths	Invalids	Others	Totals	Deaths	Invalids	Others	Totals
Blood, blood forming organs, etc.	—	—	—	—	—	—	—	—
Endocrine system	—	—	10	10	—	—	2	2
Deficiency	1	—	160	161	—	71	32	103
Cysts and tumours	—	—	—	—	—	—	4	4
Debility	1	—	100	101	—	—	7	7
Infections	1	—	210	211	—	—	84	84
Pulmonary T.B.	1	—	70	71	—	19	14	33
Other T.B.	—	—	—	—	—	—	—	—
Alimentary	—	—	50	50	—	5	20	25
Circulatory	1	—	20	21	—	2	11	13
Respiratory	—	—	20	20	—	4	5	9
Urinary and generative systems	—	—	—	—	—	3	7	10
Locomotor	—	—	10	10	—	6	13	19
Mental diseases and nervous system	—	—	30	30	—	12	15	27
Eyes	—	—	20	20	—	3	9	12
E.N.T.	—	—	10	10	—	1	8	9
Skin	—	—	20	20	—	—	9	9
Injuries	—	—	—	—	—	1	9	10
Others and unallocated	—	—	100	100	—	2	24	26
Totals	5	—	830	835	—	129	273	402

Notes:

1. In 1945 all cases, except those resulting in death or invaliding, were calculated from a 10 per cent. random sample. This was achieved by coding every case for personnel whose service number ended in '0'. Although this method proved very accurate in the Force as a whole, it can only give very approximate results in small groups as those above.
2. In 1946 all cases were coded in full.
3. Cases shown are those treated during the year and not those discovered during the year. They therefore include all cases remaining from previous year.

to disappear rapidly on treatment. The skin symptoms, which were the first to appear in the prisoner-of-war camps, were the last to disappear in this country.

Vitamin C (Anti-scorbutic). A surprising feature was the lack of scurvy among the prisoners-of-war. Although the diet provided did not apparently contain vitamin C in the accepted quantities, it must undoubtedly have been present in sufficient degree, in view of the few recorded cases of scurvy.

Vitamin A (Anti-infective). The absence of this vitamin in the diet was more obvious in the prisoner-of-war camps at which inclement conditions produced large numbers of cases of upper respiratory infections. One result of the deficiency of this vitamin, which was commoner

than was realised at the time, was nyctalopia, a disability which, in many cases, has persisted after other effects have disappeared.

Malaria. Recurrent benign types were common among those prisoners-of-war who had spent a period of captivity in the Dutch East Indies or Malaya. The prisoners-of-war from Japan itself were relatively free from malaria. Many of the cases had had innumerable recurrences during their captivity and gave negative blood smears when examined at R.A.F. Cosford. With rigid therapeutic action and general physical recovery the majority of cases are now free of their attacks.

Helminths. Many of the prisoners-of-war suffered from this infection. The cause was attributed to unwashed or improperly washed food, particularly vegetable leaves. Faecal tests on arrival at Cosford confirmed the presence of ova, although the patients themselves were asymptomatic. Hookworms were found predominantly among those prisoners-of-war who had been confined in Japan proper. Most cases were symptomless. Some had the typical microcytic, hypochromic anaemia associated with eosinophilia. The treatment of this type of infestation proved most difficult. Other helminth infections were met with to a lesser degree.

The foregoing tables give an indication of the causes of morbidity among returned prisoners-of-war from various theatres of the war.

OTHER PROBLEMS

The problems of the returned prisoners-of-war, in particular those from the Far East, were unfortunately not confined to their physical condition. The privations that they had suffered had produced in many of them a diversity of mental symptoms which made it very difficult for them to adjust themselves to normal everyday life. Many of them were extremely reticent about their experiences and relatives remarked that they displayed considerable reluctance to discuss matters in any way related to their sojourn in the camps. Many of them could talk of these things only to fellow prisoners, and it is possible that this introverted outlook was responsible for the nightmares from which so many of them suffered.

To add to their difficulties, some of them on returning to their homes found themselves involved in domestic strife. Wives who had not seen or heard from their husbands for three and a half years had, in some cases, presumed them dead and formed other attachments. Although the R.A.F. welfare authorities did their best to assist such cases, it was usually too late for effective reconciliation. Many of the unmarried prisoners-of-war contracted hasty marriages which not surprisingly frequently resulted in disaster.

The blinded prisoners-of-war had their own particular problems and were given every possible assistance by the extremely efficient organisation which existed at St. Dunstan's. The following outstanding

example illustrates the tenacity of both the patient and the organisation. An airman, a member of a party clearing up a mine-field for the Japanese in Java in 1942, was seriously injured by an exploding mine. He lost the sight of both eyes, both his hands at the wrists and his left foot at the ankle. Despite these infirmities he managed to survive three and a half years' of captivity and on his repatriation was placed in the care of St. Dunstan's. Special mechanical hands were fitted, he was re-educated and trained and now runs his own motor-coach business in a big Midland city, being exempt from nationalisation by special permission of the Ministry of Transport.

REHABILITATION AND RESETTLEMENT OF PRISONERS-OF-WAR

In June 1944 a conference, attended by representatives of the three Services and the Ministries of Labour and Pensions, was held at the Ministry of Pensions to discuss problems of rehabilitation and resettlement. The preliminary conclusions of this conference were as follows:

(*a*) Separate and special arrangements distinct from those made for the ex-Service community as a whole, would be necessary only for selected cases, mainly those unable to take their places immediately in civilian life.

(*b*) Those cases requiring 'toning up' as distinct from hospital treatment should be retained in the Services for a maximum period of three months or for any lesser period required to complete the ' toning up' process. After expiry of the three month period, any further rehabilitation would be undertaken by the Ministries of Labour and Pensions.

(*c*) Those not requiring either hospital or 'toning up' treatment should, on invaliding or discharge, be granted a longer period of leave than that normally given.

(*d*) Medical follow-up should be arranged by a suitable voluntary organisation such as the Red Cross or the British Legion, after notification by the Service departments.

(*e*) Resettlement follow-up should be the responsibility of the Ministry of Labour, which had already inaugurated a special Resettlement Advice and Information Bureau.

(*f*) Medical examinations of Army personnel to be done by either Army or Ministry of Pensions Boards, those of Naval and R.A.F. personnel to be conducted by their own medical authorities.

In January 1945 the R.A.F. authorities issued a memorandum dealing with resettlement training of R.A.F. prisoners-of-war. It was decided to adopt the title 'Resettlement Training' in place of 'Rehabilitation' or 'Rehabilitative Treatment'. The aim of the training, which was not to be compulsory for those being released to civilian life, was to efface the mental and physical handicaps induced by long confinement in prison camps. The known numbers of R.A.F. prisoners at that time were 2,166 officers and 6,336 airmen, 90 per cent. of these personnel being

aircrew. It was estimated that 10 per cent. of the total would require hospital treatment followed by subsequent invaliding and that 50 per cent., approximately 4,000, would wish to leave the Service.

It was decided that all those prisoners-of-war who were remaining in the R.A.F. or were not due for immediate release should receive a refresher course of four weeks' duration. Resettlement Training Courses were to be available for all personnel leaving the Service, the qualification for such training being a minimum period of sixty days in captivity. Attendance at these courses would be voluntary but any prisoner-of-war who left without having had a course would be entitled to claim one subsequently, provided that he applied within six months of leaving the R.A.F.

The courses were to be conducted at R.A.F. stations situated in the country, near to large towns, so that close touch could be maintained with the Ministry of Labour Offices. Careful consideration was given to the type of accommodation and staff to be provided and it was considered that, generally speaking, accommodation should be above the normal R.A.F. standards, with separate messes for officers and airmen and communal libraries, workshops and cinemas. It was planned that the medical officers should be psychiatrists, that W.A.A.F. officers should be posted for social welfare work and that ex-prisoners-of-war should be included among the staff wherever possible.

REFRESHER COURSES

When planning the 'Refresher Centres', the repatriation of the Far East prisoners-of-war at a later date was taken into consideration. These personnel were mostly ground staff, to whom the 'Resettlement Centres' would be of more importance, although there were among them a fairly large number of regular officers and airmen who, subject to medical fitness, intended to remain in the R.A.F.

Various proposals concerning the type of course to be provided were considered by the Air Ministry. The problem to be dealt with was one of 'adult re-education'. The prisoner-of-war was not a child and it was considered that direct instruction or formal teaching would have little effect on mental habits which had become, or were becoming, habitual. Overt compulsion should be reduced to a minimum and every opportunity given for individual effort, bearing in mind that when a man is encouraged to work for himself, the development of new ideas and the habit of making adjustments will be more swiftly and effectively acquired. It was suggested, therefore, that the chief aim of the course should be that by the end of it a man should be able to perform a full day's work on his own initiative and like it.

In order to achieve this object it would be necessary to make full use of all the local training facilities on the stations and to provide instructors

fully qualified to assist the prisoners-of-war to re-orientate themselves to life in the Service. The provision of first-class Education Officers, half of them 'Arts' and the other half 'Science' men, visiting civilian instructors and lecturers, and Physical Fitness Officers of all-round ability and broad outlook was considered essential; and it was suggested that all events should be graded into weekly stages to enable the prisoners-of-war to progress gradually along the path to complete rehabilitation. The main incentive for those remaining in the Service would probably be the knowledge that conduct and progress during the course would affect assessment and recommendations for postings and these personnel would, by their example, help those not remaining in the Service. As a further incentive to the latter, it was planned that at the end of the course, each man should be required to show some result of the time spent. Thus, for example, a man with post-war interest in automobile engineering or garage work might be required to prepare a paper on a subject such as 'The future of the combustion engine', or to lead a debate on a similar subject.

During the period May–June 1945 four refresher centres, the administration and organisation of which incorporated many of the suggestions made at the various preliminary conferences, were set up by the Air Ministry. These were:

No. 109 Personnel Centre (Refresher), Wittering. Formed May 17, 1945.

No. 110 Personnel Centre (Refresher), Wittering. Formed May 24, 1945.

No. 111 Personnel Centre (Refresher), West Malling. Formed June 15, 1945.

No. 112 Personnel Centre (Refresher), Church Fenton. Formed May 10, 1945.

Although it had originally been proposed that each centre should accommodate 120 prisoners-of-war in three flights of forty men, the size of each centre was ultimately increased to 250 men, with six flights per centre.

The Flight Commanders interviewed each man shortly after arrival and discussed the programme of work, modifying it to meet the needs of the individual. They kept progress notes for each man, based on observations of general behaviour and subsequent interviews. At the end of the course they prepared a case history and draft recommendations for discussion by a panel set up for the purpose of making a final assessment for submission to the Air Ministry.

The needs of the men naturally varied considerably and the programme was therefore flexible. It included lectures on R.A.F. and civilian development, R.A.F. technical lectures and visits to neighbouring R.A.F. stations, factories and municipal organisations. Documentary

films and re-issues of past newsreels were shown, as well as a selection of the best feature films of the war years. Time for private study was included in the programme. There was a parade each day to inculcate the fact that the men were back in the Service, but physical training was kept at a minimum and all facilities were provided for recreational sport, with the proper equipment. Arrangements were made, wherever possible, for shooting, riding, sailing, rowing and dancing, both on and off the station. Outside hospitality was also provided, plenty of bicycles were made available and, for use in bad weather, there were ample supplies of indoor games and playing cards.

No. 112 Centre at Church Fenton possessed the great advantage of being on an operational station, where full flying activity was taking place amid normal station activities. Many of the ex-prisoners were naturally keenly interested and expressed a strong desire for flying refresher courses, although they appreciated the difficulties which would be encountered in arranging them. It was felt by some of the responsible authorities that a certain amount of flying would materially assist the prisoners, some of whom were suffering from a feeling of frustration and the need to prove themselves. Many, it was felt, once given the opportunity to fly, would be better prepared to take on other work and be more fitted to do so. After sympathetic consideration of these proposals, however, it was found impracticable, for various reasons, to include flying training during the refresher courses. The amount of flying in the Service had naturally decreased considerably with the cessation of hostilities in Europe and adequate facilities could not be provided. Pilot refresher courses were arranged for the prisoners-of-war after leaving the centres.

On arrival, ex-prisoners-of-war had little or no knowledge of the purpose of the centres and were inclined to be resentful that they were being specially treated. Many arrived with a feeling that they were wasting their time, but before the end of their stay, the majority agreed that the centres were of value, particularly in respect of the work of assessment to determine future allocation. In general, those who continued to criticise were those who remained unsettled with no clear ideas as to their future.

All the prisoners-of-war received at the centres had previously passed the medical boards at Cosford and although a few were unsettled, the majority were very fit. So far as the prisoners-of-war from Europe were concerned, some of the pessimistic forecasts of the extent to which rehabilitation would be required were quite erroneous. The difficulties in settling down were, for the most part, only temporary and were connected predominantly with problems of future employment. The resettlement of prisoners-of-war from the Far East proved more difficult for several reasons. The courses had been devised to a large extent with

aircrew in mind and the majority of the Far East prisoners did not fall into this category. They had, furthermore, almost all spent three and a half years in captivity and most of them had been completely cut off from home and home news due to lack of mail. In consequence, their general mental condition, together with their poor physical state, precluded for the time being, at any rate, any very definite plans for the future. A large majority of these ex-prisoners had no intention of remaining in the Service. Their chief desire was to get away from regimentation, crowds and discipline; they were restless, prone to change their minds frequently and anxious to make up for lost time. The Service held little attraction for them at this stage, although, after about twelve months, numbers of them, having tried civilian life and found it wanting, returned to the R.A.F.

RESETTLEMENT TRAINING FOR THOSE NOT REMAINING IN THE ROYAL AIR FORCE

In March 1945 a directive was issued by the Director of Training, outlining the aims of the resettlement centres, which were being established to assist the ex-prisoners-of-war to adjust themselves to normal life and as far as possible improve their qualifications for entry into civilian life. The principal object of these centres was to bring the prisoners-of-war up to date with events which had occurred at home and abroad during their absence and to provide them with some general educational and practical training of a useful nature.

The setting up of separate resettlement centres was at first considered, but it was later decided to expand No. 4 M.R.U. at Cosford and to send any overflow to one of the refresher centres. The factors which influenced the decision to utilise the existing facilities at Cosford were the amount of space available, the presence of well-equipped technical workshops and ready access to factories and other industrial concerns in the neighbouring manufacturing towns of Wolverhampton and Birmingham. Furthermore, experienced officers from the Personnel Reception Centre at Cosford were available for advice and guidance when necessary and the welfare officers of this centre were particularly helpful, being instrumental, in co-operation with the Ministry of Labour officers, in placing many of the ex-prisoners-of-war in civilian employment.

In accordance with pre-arranged plans, the period of attendance at this centre did not exceed three months and further rehabilitation at the end of this period was undertaken by the Ministries of Labour and Pensions. Proof of the value of the work of this Centre is best given by the fact that the large majority of those who attended did not have to complete the full three months and that an average time of 5–6 weeks sufficed to re-orientate them to civilian life.

FOLLOW-UP OF PRISONERS-OF-WAR

The majority of the ex-prisoners who remained in the R.A.F. settled down very well. Although this was due in large part to the assistance which was given them by the Service authorities, it must also be remembered that a large number of those personnel were regular officers and airmen before being captured and by reason of their earlier training and respect for discipline withstood the ordeal of captivity better, on the whole, than their non-regular fellows. Continuance in the Service meant also the resumption of their earlier careers and their approach to rehabilitation, re-socialisation and general re-orientation to normal life was made easier by their natural wish to pick up the threads of the Service life they had chosen, with the minimum of delay.

Those who returned to civilian life fell into two very definite groups. Those who succeeded in finding suitable and rewarding employment within their capacity and were fortunate enough to enjoy a congenial home atmosphere were able to put the past behind them and remember it only as a bad dream. There were, however, many who were unable, for some considerable time, to adjust themselves to normal life or to forget what they had seen or experienced. Many who obtained employment from people who were sympathetic found themselves unable to retain those jobs, because of their unsettled mental states and their inability to concentrate. This resulted in frequent changes of occupation and location and in the average case of this type the restlessness persisted for periods ranging from twelve to eighteen months after repatriation. One ex-prisoner-of-war who had spent three and a half years in a Japanese camp successfully appealed in 1951 against his recall to military service. Since receiving his notice of recall he had relived his experiences and suffered repeated nightmares. He found himself quite unable to face the possibility of a repetition of those experiences. It is probable that there are many similar cases.

CONCLUSIONS

From the foregoing narrative it will have been seen that the arrangements made by the R.A.F. for the reception and resettlement of prisoners-of-war were in the main satisfactory, particularly when it is remembered that the R.A.F. had never before undertaken a similar operation, so that the planning was based largely on supposition. In reviewing the events it becomes clear that the essence of the organisation must be flexibility in its broadest sense and the following points appear to be of the most importance:

(*a*) The possibility of sudden unheralded arrivals of prisoners-of-war in large numbers must be envisaged. Staff must be available who are capable of dealing with the prisoners from all aspects. These will

include medical problems of great diversity, social problems, documentation and unforeseen difficulties, all of which must be handled as expeditiously as possible.

(*b*) Spacious and well-equipped accommodation for reception, medical treatment and holding purposes must be provided and should be suitably sited so that transport by air, road and rail may be rapid and easy.

(*c*) Complete liaison between Service and civilian authorities is essential. Many of the problems concern both.

(*d*) Careful selection of staff for all units dealing with returned prisoners-of-war. The prisoners-of-war tended to resent authority, and tactless handling could easily result in an un-co-operative attitude, harmful both to the prisoner himself and to the staff of the organisation.

APPENDICES

APPENDIX A

A copy of a leaflet dropped on prisoner-of-war camps by the U.S. Air Force shortly after the Japanese surrender.

APPENDIX B

A copy of a message issued to the prisoners by the Commander of the Fukuoka prisoner-of-war camps.

APPENDIX C

Plates LXIII–LXVIII. Photographs taken in Stalag Luft III in Germany, and in the prisoner-of-war camps in Japan and Singapore.

APPENDIX A

ALLIED PRISONERS

The JAPANESE Government has surrendered. You will be evacuated by ALLIED NATIONS forces as soon as possible.

Until that time your present supplies will be augmented by air-drop of U.S. food, clothing and medicines. The first drop of these items will arrive within one (1) or two (2) hours.

Clothing will be dropped in standard packs for units of 50 or 500 men. Bundle markings, contents and allowances per man are as follows:

Bundle Markings				*Bundle Markings*			
50 Man Pack	*500 Man Pack*	*Contents*	*Allowances per Man*	*50 Man Pack*	*500 Man Pack*	*Contents*	*Allowances per Man*
A	3	Drawers	2	B	10	Laces, shoe	1
A	1–2	Undershirt	2	A	11	Kit, sewing	1
B	22	Socks (pr.)	2	C	31	Soap, toilet	1
A	4–6	Shirt	1	C	4–6	Razor	1
A	7–9	Trousers	1	C	4–6	Blades, razor	10
C	23–30	Jacket, field	1	C	10	Brush, tooth	1
A	10	Belt, web, waist	1	B	31	Paste, tooth	1
A	11	Capt. H.B.T.	1	C	10	Comb	1
B	12–21	Shoes (pr.)	1	B	32	Shaving cream	1
A	1–2	Handkerchiefs	3	C	12–21	Powder (insecticide)	1
C	32–34	Towel	1				

There will be instructions with the food and medicine for their use and distribution.

CAUTION

DO NOT OVEREAT OR OVERMEDICATE FOLLOW DIRECTIONS

INSTRUCTIONS FOR FEEDING 100 MEN

To feed 100 men for the first three (3) days, the following blocks (individual bundles dropped) will be assembled:—

3 *Blocks No.* 1 (each contains)	1 *Block No.* 5 (each contains)	1 *Block No.* 3 (each contains)
2 Cases soup, can	1 Case soup, dehd.	1 Case candy
1 Case fruit juice	1 Case veg. puree	1 Case gum
1 Case accessory pack	1 Case bouillon	1 Case cigarettes
	1 Case hospital supplies	1 Case matches
	1 Case vitamin tablets	
3 *Blocks No.* 2 (each contains)	1 *Block No.* 7 (each contains)	1 *Block No.* 10 (each contains)
3 Cases 'C' rations	1 Case Nescafé	3 Cases fruit
1 Case hospital supplies	1 Sack sugar	2 Cases juice
2 Cases fruit	1 Case milk	
	1 Case cocoa	

Message from the Commander of the Fukuoka Prisoners of War Camps.

Aug. 22nd 1945.

I am pleased to inform you that we were instructed by the Military Authorities that hostilities ceased on Aug. 15th.

During your long stay in Japan as prisoners of War you must, I fear, have endured many hardships. Having survived these difficult times, however your dream of repatriation is soon to be realised. Your hearts must be full of joy at the thought of greeting your loved ones, parents, wives, children and friends.

I offer to you my sincere congratulation and at the same time express my regret for those who have passed away as a result of disease or some other unfortunate mischance, without ever having the joy of greeting this happy day.

Obeying instructions, the Camp Staffs and I, have done all in our power to help and protect you, but owing to the difficult interal War conditions, we regret we were not able to do half as much as we wished. Nevertheless I trust that you will understand the predicament in which we found ourselves.

Several days ago at one camp the prisoners presented the Camp Staff and factory foremen with part of their valuable relief foodstuffs and peronal belongings, while at others camps prisoners have asked for permission to help civilian War sufferers with their personal belongings. This is an example of your generous and understanding spirit and gentlemanliness. For all this we, the Camp Staffs and I, express our deepest gratitude.

Until you are transferred to Allied hands at the port which will be designated later you must wait at your respective Camps.

Therefore I sincerely hope that you will wait quietly taking care of your health and still obeying the rules of your camp as before, thus maintaining the honour and dignity of your great Nations.

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PLATE LXIII. Stalag Luft III. October 1942. A typical barrack block hut.

PLATE LXIV. Shakesperian production by British prisoners-of-war. Costumes were hired from German costumiers. Behind the backcloth lived the celebrated 'Wooden Horse'.

PLATE LXV.—British prisoners-of-war in a Japanese camp awaiting repatriation one month after the cessation of hostilities.

PLATE LXVI. More seriously ill prisoners being removed by ambulance. Note the 'Basha' huts in the background.

PLATE LXVII. Group of prisoners in a Japanese prison camp shortly after the cessation of hostilities.

PLATE LXVIII. Loading stretcher cases on to hospital ships at Singapore.

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