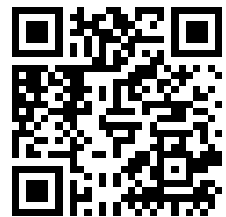


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**HISTORY OF  
THE SECOND WORLD WAR  
UNITED KINGDOM MILITARY SERIES**

**Edited by SIR JAMES BUTLER**

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Marshal of the Royal Air Force Sir Arthur Harris, G.C.B., O.B.E., A.F.C., Air Officer Commanding-in-Chief, Bomber Command, from February 1942.

**THE  
STRATEGIC AIR OFFENSIVE  
AGAINST GERMANY  
1939-1945**

**Volume II: Endeavour**

**Part 4**

**BY**

**SIR CHARLES WEBSTER**

**K.C.M.G., F.B.A., D.LITT.**

**AND**

**NOBLE FRANKLAND**

**D.F.C., M.A., D.PHIL.**

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PART IV

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The Combined Bomber Offensive:  
The Role of Bomber Command  
January 1943—March 1944



## INTRODUCTION

**I**N December 1942 the first *Oboe*-equipped Mosquitoes went into action with Bomber Command. In January 1943, *H2S* was operationally introduced, and in the same month the Pathfinder Force dropped its first target indicator bombs. These three devices all had limitations and disadvantages but, in combination, they were, nevertheless, the basis of the great advance in the technique of night area bombing which took place in 1943 and which was signalled by the Battles of the Ruhr, of Hamburg and of Berlin. They were also, though in less direct ways, important contributory factors in the development of night precision-bombing techniques.

The enormous destruction caused in the area offensive of this period could not, however, have been achieved had it not been for another and an equally important factor, namely, the great quantitative and qualitative improvement in the operationally available front-line strength of Bomber Command. At the beginning of the year, it will be remembered, the daily average of aircraft available with crews for operations was still only just over five hundred. Moreover, though this force did include more than a hundred and seventy operational Lancasters, it also included over a hundred and twenty obsolescent Wellingtons. In addition, it contained an average of eighty-two Bostons and Venturas in 2 Group which, from the point of view of the strategic air offensive, were of scarcely any value.

In the course of 1943 this situation was rapidly and drastically improved, and, by March 1944, it had been transformed. In that month the daily average of aircraft available with crews for operations had risen to 974 and the force, by that time, included an average of 594 operational Lancasters and fifty-eight operational Mosquitoes. It no longer included any of the light bombers of 2 Group, which in May 1943 had been detached from Bomber Command. No Wellingtons were left in the front line and all the other operational bombers were Stirlings and Halifaxes. Thus, the aim of an 'all heavy' force tempered only by a small and highly valuable Mosquito element, was at last achieved, and in this heavy force, though the Stirlings and Halifaxes were unsatisfactory, the Lancaster was predominant.<sup>1</sup>

In addition to the wide open spaces of the Empire which were so effectively employed in the Empire Air Training Scheme, the Dominions of Canada, Australia and New Zealand contributed large numbers of splendid aircrews to Bomber Command. An all-Canadian Group (No. 6) was formed in Bomber Command on 1st January

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<sup>1</sup> Bomber Cmd. Orders of Battle.



1943. From that time until the end of the war in Europe No. 6 (R.C.A.F.) Group contributed no less than 14·5 per cent of the total bomb tonnage dropped by Bomber Command. The Canadian effort was not, however, confined to this Group, and many Canadian airmen continued to serve in other Groups. On 1st January 1943 some thirty-seven per cent of the pilots in Bomber Command were Canadians, Australians or New Zealanders. About sixty per cent of these were Canadians. By 1st January 1945, no less than forty-six per cent of Bomber Command's pilots came from these Dominions and fifty-five per cent of these were Canadians.<sup>1</sup> It should never be forgotten that many Australians were serving in Bomber Command throughout the time that their own country was closely menaced by the Japanese. South Africa contributed much space for Royal Air Force training, but did not send its own men to England. Nevertheless, South Africans did not fail to distinguish themselves in Bomber Command. Squadron Leader Nettleton, who was awarded the Victoria Cross after leading the daylight attack on Augsburg, was a South African.

Bomber Command, by this time, was a truly Commonwealth force. In 1943, however, the strategic offensive against Germany no longer involved only Bomber Command. At the end of January the United States Eighth Air Force also began to take part in it and, as had long been planned by its commanders, this intervention took place in daylight in pursuit of a plan for precision attack upon selected target systems which were believed to represent key points in the German war economy. The plan, however, did not work and, as Sir Charles Portal had predicted in 1942, the unescorted American bombers, when they embarked upon deep penetrations of Germany, could not withstand the onslaught of the German day fighter force. But, though the reverses which they suffered compelled them to curtail and at times almost to cease their operations, the Americans were not deflected from their ultimate purpose. In terms of the physical destruction of targets, the Eighth Air Force operations had relatively little effect in 1943, especially by comparison with what was achieved at night by Bomber Command, but in terms of the great strategic decisions of the combined bomber offensive which are examined in the first of the chapters which follow, they had a profound and in some respects even a decisive effect.

The decision to mount a combined bomber offensive was officially promulgated at the Casablanca Conference in January 1943, and its role in preparing the way for a later allied military invasion of the Continent was defined there. In order to co-ordinate the action of the two bombing forces, the strategic direction of both of them was con-

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<sup>1</sup> *Harris Despatch.*

ferred upon the British Chief of the Air Staff, Sir Charles Portal, but the fact remained that the two commanders in the field, Sir Arthur Harris and General Eaker, in whom a great measure of tactical autonomy was vested, had quite different views from each other not only of the operational but also of the strategic prospects.

The issue did not concern simply the operational distinction between day precision and night area bombing, though that was to some extent involved. It arose from the strategic difference between selective and general attack. Selective bombing was based upon the principle that 'it is better to cause a high degree of destruction in a few really essential industries than to cause a small degree of destruction in many industries.'<sup>1</sup> It could be pursued by precision bombing, which would strike at individual factories and plants in the particular key industries which had been selected, and by area bombing, which would strike at particular towns associated with those industries. The principle of general attack was based upon the belief that there really were no key points in the German war economy whose destruction could not be remedied by dispersal, the use of stocks or the provision of substitute materials. It postulated the theory that the only effective policy was that which, by cumulative results, produced such a general degree of devastation in all the major towns that organised industrial activity would cease owing to a combination of material and moral effects.

The strategy of the Eighth Air Force was based entirely upon the selective principle, but Sir Arthur Harris had become the chief protagonist of both the theory and the practice of general area attack. Those who believed in specially sensitive points were dismissed by him as 'panacea mongers'. If, therefore, the bombing offensive was to be truly combined, then clearly one school of thought had to give ground to the other. But the plan for the Combined Bomber Offensive, or, as it soon came to be called, *Pointblank*, did not overcome this problem and for most of 1943 there was no combined offensive, but, on the contrary, a bombing competition. When, however, in the autumn, it became apparent that the Eighth Air Force was failing, this problem became a crisis.

The crisis was primarily concerned with the question of air superiority. It had long been obvious that the Eighth Air Force would be incapable of maintaining daylight precision attacks against distant targets unless its bombers could successfully resist or in some other way overcome the German day fighter force. For that reason the American bombers were heavily armoured and armed and operated in tight mutually supporting formations. For that reason also German fighter aircraft production and its supporting industries had

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<sup>1</sup> This is quoted as one of the mottoes for Chapter XI below.

become the prime objective of the Eighth Air Force. But the American formations proved to be so vulnerable to fighter attack that they could not sustain their offensive against these targets. Thus, the German air force in being was able to preserve the German air force in production.

Sir Arthur Harris believed that the solution lay in a change of American policy. He wanted the Eighth Air Force to join with Bomber Command in the general area offensive and notably in the Battle of Berlin which was about to begin just when the American precision campaign appeared to have broken down as a result of the disastrous attack on the ball-bearings factories at Schweinfurt in the middle of October. Sir Arthur Harris' strategic argument had behind it the monumental achievements of Bomber Command in the great Battles of the Ruhr and Hamburg which, with the other operations of the period, are described in the second of the following chapters. At the very least, Sir Arthur Harris saw no reason to change the policy which had carried Bomber Command into these battles.

Though a successful attack on the *Luftwaffe* would obviously bring immeasurable advantages not only to the day bombers of the Eighth Air Force but also to Bomber Command, it appeared that the night bombers, especially when they were supported by a more vigorous radio counter-measures campaign, might successfully continue to evade the German night fighters and, therefore, contribute to the defeat of Germany in spite of and not, as had to be the case of the day bombers, in the face of her defending air force.

The Air Staff, however, took a different view. They regarded Bomber Command as being committed to the support of the Eighth Air Force in gaining what had become the primary *Pointblank* object, namely the reduction of German fighter strength. They recognised that command of the air was fundamental to the American daylight bombing plan. They knew that it would be equally important in the conduct of operation *Overlord* which was to be the supreme campaign of 1944. They also began to suspect that it might be vital to the night bombers as well. In addition, they were beginning to have some doubts about the efficacy of the general area offensive.

The Air Staff did not ask Sir Arthur Harris to undertake precision bombing which, except for small and specialised elements of the Command, was still operationally impossible. They did not ask him to abandon the general area offensive, but what they did require was that a larger proportion of the Bomber Command effort should be devoted to towns specifically associated with aircraft and aircraft-component production. A Bomber Command area attack on Schweinfurt was made into the equivalent of a test case. Eventually, in February 1944, it took place. But, in the meantime the Eighth Air Force was being supplied with the means of grappling successfully

with the German air force in being. Effective long-range fighters were coming into service. The result was that by February 1944 the American bombers were able to play a prominent part in what was really the beginning of the Combined Bomber Offensive. Soon after the Bomber Command assault on Schweinfurt there was an Eighth Air Force attack on Berlin.

The development of area bombing, as will be seen in the second of the chapters which follow, was the principal feature of Bomber Command's operational history in this period. But it was not the only feature. There was also, though only on a small scale, a remarkable development in the technique of night precision bombing, which is dealt with in Section 4 of the same chapter. This resulted in some of the most remarkable operations of the entire war and notably in the unrivalled feats of 617 Squadron against the Möhne and Eder dams, but it also laid the operational foundations of the new bombing policies which were pursued after March 1944. This latter consequence was of much greater significance than the actual results of the precision attacks in 1943 and early 1944.

The question of what were these results and also those of the much greater area offensive in this period as well as the appraisal of them at the time is considered in Chapter XI. The air attack on Germany in 1943 increased so much in weight and efficiency that it became something quite different from anything that had preceded it. But the hopes that still existed in some places in Britain that the Germans would be so affected by heavy bombing that they would cease to offer resistance proved to be completely abortive. It is also true that, whatever the effects of the bombing, the production of armaments increased by leaps and bounds during this period under the skilful direction of Albert Speer. Something was done to destroy the cushion of non-essential goods and services which had been able to absorb without strain such destruction as had hitherto occurred. There was also considerable destruction of armament production and economic potential, though a comparatively small amount when compared with the spectacular rise which was proceeding at the same time. The precision attacks in this period and the bombing of a selected target system accomplished on the whole less than area bombing in spite of the success of the final attack on the fighter aircraft production after the battle for air supremacy had begun to turn against the Germans.

The Combined Bomber Offensive was based on the strategic principle that its first object should be to destroy the opposing air forces by concentrating the attack on factories which constructed the aircraft and their components. But it was the advice of the economists and technicians that to a considerable extent determined how this object was to be attained. A short account is given therefore in Section 1 of Chapter XI of the methods by which this was done and of

the arguments which determined the advice given by the United States and British organisations which dealt with this aspect of the plan. Since its comparative failure cannot be understood without taking into consideration the nature of the process which was going on in Germany and the manner in which the German industrialists and workers reacted to the attack, some account is given of them in general terms in the second section. It is, perhaps, easier to appraise the results of the specific attacks of the United States Air Forces than the more general effects of the area bombing of Bomber Command, though the effect on aircraft production and the ball-bearing industry raise some controversial problems which are discussed in Section 4. But Bomber Command also engaged in selective area bombing and in precision attacks. Their contribution, in particular, the effect of the attack on the ball-bearing industry and the result of the destruction of the Möhne and Eder dams, is also discussed in that section. The precision attacks of the Eighth Air Force on the German aircraft industry only continued for about half the period under review. But the area offensive of Bomber Command persisted throughout the whole period and, since in previous years the attack of Bomber Command was too limited to produce much effect, and in the subsequent period area and selective attack merge into one, it is in this period that the effect of a general area offensive can best be measured. An attempt to do this has been made in Section 3.

CHAPTER IX

THE  
COMBINED BOMBER OFFENSIVE:  
THE CONFLICT IN  
STRATEGIC POLICY  
January 1943–February 1944

1. The Casablanca directive and its interpretation, January to May 1943
2. The *Pointblank* plan and the German air force, June to September 1943
3. The crisis of *Pointblank*: Schweinfurt and Berlin, October to December 1943
4. The approach to *Overlord* and the beginning of a Combined Bomber Offensive, December 1943 to February 1944
5. The approach to *Overlord* and the revival of United States strategic air power, December 1943 to February 1944

‘. . . if it had been tactically possible to concentrate one quarter of our total bombs dropped on Germany upon any one of several classes of target, e.g. oil, ball bearing, aero-engines or air frame factories, and possibly many others, the war would by now have been won.’

SIR CHARLES PORTAL, 23rd December 1943

‘We can wreck Berlin from end to end if the U.S.A.A.F. will come in on it. It will cost between us 400–500 aircraft. It will cost Germany the war.’

SIR ARTHUR HARRIS, 3rd November 1943

## 1. The Casablanca directive and its interpretation January–May 1943

1942 had seen the collapse of Hitler's *Blitzkrieg* theory. For a time the tide of Axis victory had flowed again, but by the end of the year it had ebbed for good. When President Roosevelt and Mr. Churchill met with their Combined Chiefs of Staff at Casablanca in January 1943 the initiative in the war had passed to the United Nations. On the Russian front great German armies were facing catastrophic disaster. On the Mediterranean front the Axis forces already had only the choice between flight and destruction. German offensive air operations had practically ceased and, though the U-boats were yet to strike heavy blows in the Atlantic, Germany was soon to show signs of losing that battle too.

The Grand Alliance now dominated the scene and already, in the East and the South, the outposts of Hitler's empire had been breached. It remained for the allies to decide how and when to break into its heart, but this was a task which was neither easy nor obvious. Hitler still commanded a powerful nation at arms which was to prove as resolute in defence as it had been ruthless in attack. His armies were still astride of Europe from the Volga to the Bay of Biscay and from the Baltic to the Mediterranean. His submarines still ranged across the Atlantic and allied military operations were as yet distantly remote from the frontiers of Germany herself. At the beginning of 1943 it was still only the Royal Air Force Bomber Command which could engage the heart of the enemy.

There were those, as we have seen, who believed that this air offensive, which was about to be reinforced by the active participation of the American Eighth Air Force, could, of itself, play the lead in bringing about the downfall of Germany. Those at the highest level of authority, however, found it prudent not to assume that this would happen, and as Sir Charles Portal said at the Casablanca Conference, it was necessary to exert 'the maximum pressure on Germany by land operations; air bombardment alone,' he added, 'was not sufficient.'<sup>1</sup>

This continued insistence on the need for land operations against Germany, which had always been the principal element of the major strategy of the Grand Alliance, confirmed the role of the bombing offensive in a secondary place. Nevertheless, despite the conviction of General Marshall that the invasion of northern France could and should be undertaken in 1943, it became clear, as Sir Alan Brooke so

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<sup>1</sup> C.C.S. Mtg., 16th Jan. 1943.

strongly insisted, that no decisive engagement with the German army could be sought until 'visible cracks' began to appear in the armed structure of Germany. Thus, 1943 was unlikely to be the decisive year and more likely to be the time in which Germany would be sapped of her strength in preparation for the *coup de grace* in 1944. To this end the allies at Casablanca concerted plans for sustaining the Russian armies in the field, for initiating operations of their own on the Mediterranean flank and for intensifying the strategic bombing offensive against Germany herself.<sup>1</sup>

Thus, the role of the bombing offensive as the preparation for, and essential prerequisite to, the ultimate invasion was made clear. To this extent the conclusion reached at the end of 1942 by the British Chiefs of Staff was confirmed. Though it might not be agreeable to the supreme advocates of air power like Lord Trenchard and Sir Arthur Harris, this was a conclusion which had been inevitable since the potential means of effective military operations had existed. To rely upon the air offensive alone to win the war had always been a gamble, and to continue to do this while the Russian armies were in the field and the Americans were mobilising on a gigantic scale would also have been an unnecessary gamble. It would have been directly contrary to the strategic plans already accepted in 1942 by Britain and the United States. Yet the conclusion that the bombing offensive was to be a preparation for a military assault did not have much meaning until some more precise definitions of ways and means were added.

These definitions had eluded the British Chiefs of Staff throughout their discussions during the autumn and winter of 1942. Now the Casablanca Conference was confronted with the problem, for as Sir Charles Portal observed at the outset, 'one of the most pressing questions was how we should accomplish our air attack against Germany.'<sup>2</sup> This was an urgent problem because the United States Eighth Air Force was now about to join the Royal Air Force Bomber Command in the assault on Germany. If the resulting joint offensive was also to be a combined offensive, it was necessary to find a common purpose which could be pursued by the two different forces. It was not enough merely to state that the aim of the operations was to sap the strength of Germany in preparation for the invasion, for almost any form of attack could be said to be necessary for this purpose. The question was, however, not only pressing but it was also highly complicated because of the intractable divergences of opinion which existed. Within the Royal Air Force there was a growing dispute about the ultimate value of area attack on cities and towns. At

<sup>1</sup> Record of Casablanca Conference.

<sup>2</sup> C.C.S. Mtg., 14th Jan. 1943.



Bomber Command Headquarters this form of attack was regarded not only as the inevitable, but also as the most profitable, policy. Within the Air Staff the view that area bombing could lead to selective and precise night attack, which would be more effective, was gaining ground. The American Air Staff were resolved to persevere with their plan for daylight precision attack, but the British, and in particular the Prime Minister, had grave misgivings about its prospects. Moreover, there was still the naval argument to be taken into account, and Sir Dudley Pound and Admiral King alike continued to insist that the bombers should intensify their contribution to the Battle of the Atlantic upon the issue of which, they rightly emphasised, all else depended.

The divergences of opinion within the Royal Air Force and between the Royal Air Force and the United States Army Air Forces arose basically from different views of operational possibilities and to some extent from the differences in design of the heavy bombers of the two countries. The continuing argument between, on the one hand, the American and British Air Staffs and, on the other, the American and British Naval Staffs owed something to a difference of strategic concept, but it too depended to a considerable extent upon opposing views of operational possibility. In the exchanges at Casablanca, for example, Sir Charles Portal was not concerned to dispute with Admiral King or Sir Dudley Pound the desirability of destroying submarine pens and construction yards. He did, however, show that he doubted if it was possible.<sup>1</sup>

All these matters, and particularly those which rested on operational considerations, were not easily adjusted at the high level of an inter-allied Conference. Indeed, it may be surmised that if a solution had been too rigorously pursued the Conference would have failed to produce any bombing directive at all. In these circumstances it is, perhaps, not surprising to find that the document which was accepted by the Conference sought to make no distinctions between, or to pass any judgment upon, the various and at least partly conflicting views which had contributed to the debate. It simply included them all.

This directive, ostensibly supposed to 'govern the operations of the British and United States Bomber Commands in the United Kingdom', opened with a statement of the general aim. 'Your primary object', it said, 'will be the progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened'. The directive then stated that 'within that general concept, your primary objectives,

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<sup>1</sup> C.C.S. Mtg., 14th Jan. 1943.

subject to the exigencies of weather and of tactical feasibility, will for the present be in the following order of priority:

- (a) German submarine construction yards.
- (b) The German aircraft industry.
- (c) Transportation.
- (d) Oil plants.
- (e) Other targets in enemy war industry'.

This order of priority, the directive went on to explain, might be varied from time to time 'according to developments in the strategical situation'. There were also, it was observed, 'other objectives of great importance', and the two mentioned were the submarine bases on the Biscay coast and Berlin. After referring to the need for attacks on northern Italy and on units of the German Fleet in harbour, the directive said, 'you should take every opportunity to attack Germany by day, to destroy objectives that are unsuitable for night attack, to sustain continuous pressure on German morale, to impose heavy losses on the German day fighter force and to contain German fighter strength away from the Russian and Mediterranean theatres of war'. Finally, when the allied armies invaded the Continent, the directive said, 'you will afford all possible support in the manner most effective.'<sup>1</sup>

The 'pressing' question of how the air offensive was to be conducted was thus left unsolved and everything depended upon how the directive was interpreted. Sir Charles Portal had been charged with the 'strategical direction' of British and American bomber operations from the United Kingdom and, in theory at least, the responsibility for the interpretation of the Casablanca directive might have been supposed to be his. The term 'strategical direction' did not, however, include the power of decision in matters of tactics or technique. In the case of the American Eighth Air Force this decision was specifically allotted to the Commanding General, Lieutenant-General Ira Eaker.<sup>2</sup> In the case of the Royal Air Force Bomber Command, it had generally been accepted that it should belong to the Commander-in-Chief. Yet, as we have seen, it was usually the tactical decision which controlled the 'strategical direction' and a division of the responsibility for the two had, as we have also seen, tended to make the bombing directives of the past vague, unrealistic and ineffective. In the resulting confusion, Sir Arthur Harris had often been led to intervene in the strategic debate and the Air Staff had, with equal frequency, interfered with tactical decisions. The question of attacking Schweinfurt and the introduction of the Pathfinder Force are but two instances of the chronic struggle between divided power.

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<sup>1</sup> Casablanca Dir., 21st Jan. 1943, App. 8 (xxviii).

<sup>2</sup> C.O.S. to J.S.M., 24th Jan. 1943.

The Casablanca directive, however, contained even less clarity than the earlier instructions which had been prepared for the Royal Air Force Bomber Command alone. The Eighth Air Force had not yet crossed the German frontier and its operational capacities remained the subject of varied speculation. In these circumstances the phrase 'subject to the exigencies of weather and of tactical feasibility' assumed a particular significance. The same phrase might also suggest to some minds that the only 'primary objectives' allotted to the Royal Air Force Bomber Command were 'other targets in enemy war industry'. Thus, the power to interpret largely devolved upon the two Commanders in the field, Sir Arthur Harris and General Eaker.

Sir Arthur Harris was already growing somewhat sceptical about the directives which he had received. He considered that they revealed 'the absence of any continuity of plan', but in the Casablanca directive, which was sent to him on 4th February 1943, he was able to discover a mandate for pursuing the policy upon which he was in any case resolved. In his letter to the Air Ministry of 6th March 1943, Sir Arthur Harris said that 'for more than a year the agreed view of the Combined Chiefs of Staff had been that our main enemy, Germany, can be defeated only by increasing the pressure of the combined British and American Air Attack until internal disintegration is produced and an allied invasion of Germany itself is thereby rendered possible. That this view still holds the field', he continued, 'is shown by paragraph 1 of the [Casablanca] Directive . . . which', he said, 'states categorically that the "primary objective of Bomber Command will be the progressive destruction and dislocation of the German military, industrial and economic system aimed at undermining the morale of the German people to a point where their capacity for armed resistance is fatally weakened"'.<sup>1</sup>

Sir Arthur Harris put what he said the directive had 'categorically' stated in inverted commas, thus implying that these were the words of the Combined Chiefs of Staff. This, however, was not the case, and though the modifications which Sir Arthur Harris had made were small in appearance, they were large in effect. By altering the phrase 'progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people . . .' to 'progressive destruction and dislocation of the German military, industrial and economic system aimed at undermining the morale of the German people . . .', he changed the meaning of the directive. The undermining of German morale became the supreme object. Also by changing the words 'your primary object' to 'the primary objective of Bomber Command', Sir

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<sup>1</sup> Letter Harris to Air Min., 6th March 1943.

Arthur Harris showed that he took this part of the directive to be his own particular preserve. By implication it might be inferred that those parts of the directive which dealt with naval and air force and other selective targets referred to the Eighth Air Force.

However this may have been, Sir Arthur Harris did not mention the remainder of the directive, but merely said that a 'laudable desire to satisfy everyone and attack all possible targets' should not be allowed to distract his offensive from its 'primary object' in definition of which he had already misquoted the Combined Chiefs of Staff.<sup>1</sup>

These misquotations, which do not seem to have engaged the attention of the Air Staff, showed clearly how Sir Arthur Harris intended to interpret the Casablanca directive. They showed that he regarded it simply as a reaffirmation of that part of the directive of February 1942 which had referred to the area destruction of major German cities. As such, he took it as his mandate for the Battle of the Ruhr, the attacks on the 'central complex' and the Battle of Berlin. It cannot be said that this was contrary to the Casablanca directive, for even without misquotation it was not an unreasonable interpretation. It is also doubtful whether at this stage there was any other policy which could be effectively pursued by Bomber Command which still lacked the means of carrying out precision attacks at night. The Air Staff did not, however, entirely share Sir Arthur Harris' claim that this steam-roller action would be the best way of helping to win the war.

Meanwhile, the American Air Staff also saw no reason to change their plans which were, nevertheless, quite different. The American conception of the bombing offensive began with the assumption that 'it is better to cause a high degree of destruction in a few really essential industries than to cause a small degree of destruction in many industries'. With this principle in mind six groups of targets, or target systems, were selected whose destruction, it was believed, would 'fatally weaken' the capacity of the German people for armed resistance'. These six systems were: submarine construction yards and bases, the aircraft industry, the ball-bearings industry, oil production, and, as secondary groups, the production of synthetic rubber and military transport vehicles. These systems comprised some seventy-six targets and, to quote the words of the American plan, 'their destruction is directed against the three major elements of the German Military Machine: its submarine fleet, its air force, and its ground forces, and certain industries vital to their support'.<sup>2</sup>

The principle of this selective offensive was similar to that with which the Royal Air Force had entered the war, and though the

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<sup>1</sup> Letter Harris to Air Min., 6th March 1943.

<sup>2</sup> The Combined Bomber Offensive from the United Kingdom, 12th April 1943, and its annexes. This became known as the 'Eaker Plan'.

six-target systems did not always coincide with the earlier Western Air Plans, they did approximately correspond to them. Bomber Command had found it impossible to carry out this kind of offensive because in daylight it could not resist the onslaught of the German defences and at night it could not achieve an adequate degree of bombing accuracy. The force at its disposal had also been too small. Naturally the Americans had observed this outcome, but they had not been unduly depressed by it.

Sir Charles Portal had, as will be remembered, experienced much difficulty in believing that the American Air Force would succeed in carrying out long-range precision attacks against Germany in daylight. He knew well the eccentricities of the European climate and he respected the strength of the German defences. Nevertheless, the Americans had been determined to persevere, and the plan which they now put forward was based on the absolute assumption that 'it is possible to conduct precision pattern bombing operations against selected precision targets from altitudes of 20,000 feet to 30,000 feet in the face of anti-aircraft artillery and fighter defenses'. This was regarded as 'definitely' proved by the daylight operations which had been carried out by the Eighth Air Force in the first three months of 1943. On the same basis it was 'definitely accepted' that a hundred bombers despatched on each successful mission would result in 'entirely satisfactory destructive effect of that part of the target area within 1000 feet of the aiming point; and that two-thirds of the missions despatched each month will be successful to this extent'.<sup>1</sup>

In its first attack against a German target on 27th January 1943 the Eighth Air Force had been able to put up only ninety-one bombers. For the stiffer proposition of deeper penetrations, it was realised that such a force would be completely inadequate in size and, 'considering the number of German fighters which can be concentrated laterally to meet our bombers on penetration and again on withdrawal', it was estimated that '300 heavy bombers is the minimum operating force necessary to make deep penetrations'. It was further calculated, on the basis of experience, that 'at least 800 airplanes must be in the Theater to dispatch 300 bombers on operations'. In order to achieve the destruction of the six selected target systems substantial reinforcement of the Eighth Air Force was, therefore, demanded and the minimum requirement was stated to be 944 heavy bombers in the United Kingdom by the end of phase one on 1st July 1943, 1,192 by the end of phase two on 1st October 1943, 1,746 by the end of phase three on

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<sup>1</sup> C.B.O. Plan, 12th April 1943. 'Effectiveness of Eighth Air Force', Tab. D. Eighth Air Force operational experience at this time was largely confined to fringe targets, but it included the first shallow penetrations of Germany. The earliest of these was against Wilhelmshaven on 27th January 1943. See *The Army Air Forces in World War II* edited by W. F. Craven and J. L. Cate, Vol. II, (Chicago, 1949), Appendix *Eighth Air Force Heavy Bomber Missions*.

1st January 1944 and 2,702 by the end of phase four on 1st April 1944.<sup>1</sup>

If these forces could be mustered, the plan confidently asserted that submarine construction could be reduced by eighty-nine per cent, that forty-three per cent of the German fighter and sixty-five per cent of the bomber production capacity could be destroyed, that seventy-six per cent of ball-bearing production could be eliminated, that German oil supplies could, if some other force dealt with Ploesti, be disrupted, that fifty per cent of synthetic-rubber production could be destroyed and that serious damage could be done to the German army by the depletion of its vehicle production.

'The capacity for German industrial destruction by heavy bombers', General Eaker wrote in his summary of the plan, 'is based on the actual results accomplished by the small force of U.S. bombers which have been active in this theater during the past six months. It is, therefore,' he continued, 'conservative, and can be absolutely relied upon.'<sup>2</sup>

One of the motives behind the plan had been to give the Eighth Air Force 'a definite program of operations' and thereby to strengthen General Arnold's hand in his attempts to secure reinforcements and reduce diversions.<sup>3</sup> This consideration, no doubt, had helped to produce the confident optimism which characterised the estimates of what could be achieved by the plan. Nevertheless, it did represent a way in which the Casablanca directive could be executed, and though General Eaker did not claim that the proposed air offensive could alone win the war, he did suggest that it was the appropriate preliminary to a continental invasion and that, without it, no such invasion could be accomplished. The only requirement for success was, he asserted, the necessary reinforcement of his command, and he pointed out that lesser numbers of bombers could not be expected to achieve proportionate results.<sup>4</sup>

The success of the plan depended primarily upon precision bombing by the Eighth Air Force, but it was entitled the 'Combined Bomber Offensive' and it had not failed to take account of 'the tremendous and ever increasing striking power of the R.A.F. bombing' which, it recognised, was designed to 'so destroy German material facilities as to undermine the willingness and ability of the German worker to continue the war'. This power, it was thought, could be integrated with the American effort. 'There is', the Eaker plan stated, 'great flexibility in the ability of the R.A.F. to direct its

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<sup>1</sup> C.B.O. Plan, 12th April 1943, 'General Plan of operations and Forces required'. Tab. E. Medium Bomber strength was to rise from 200 in phase one to 800 in phase two.

<sup>2</sup> Memo. Eaker to C.G., E.T.O.U.S.A., 13th April 1943.

<sup>3</sup> Letter Arnold to Portal, 24th March 1943. Letter Eaker to Portal, 2nd April 1943.

<sup>4</sup> Memo. Eaker to C.G., E.T.O.U.S.A., 13th April 1943.

material destruction against those objectives which are closely related to the U.S. bombing effort, which is directed towards the destruction of specific essential industrial targets. It is considered', the plan continued, 'that the most effective results from strategic bombing will be obtained by directing the combined day and night effort of the U.S. and British bomber forces to all-out attacks against targets which are mutually complementary in undermining a limited number of selected objective systems. All-out attacks', it was further explained, 'imply precision bombing of related targets by day and night where tactical conditions permit, and area bombing by night against the cities associated with these targets'.<sup>1</sup>

Thus, the so-called 'Eaker Plan' was something more than a programme of operations for the Eighth Air Force. It was a proposal for a combined bomber offensive and, if it was accepted, it would become the concern of Sir Arthur Harris as much as of General Eaker. Whether it was able to carry out precision attacks or not, and the plan hinted at the possibility of this, Bomber Command would be harnessed to the principle of selective attack on key industries, which followed from the belief that 'it is better to cause a high degree of destruction in a few really essential industries than to cause a small degree of destruction in many industries'.

Sir Arthur Harris, as has been noticed, did not believe in the selective application of bombing whether it was carried out by area attack on 'associated' towns or by precision attack on particular targets. He had already shown his reluctance to attack Schweinfurt and he had revealed that his opposition to what he described as the 'panacea mongers' proceeded as much from strategic objections as from tactical difficulties. We shall see how, in the course of 1943, his opposition to selective policies became yet stronger and more vociferous. All the same, acceptance of the 'Eaker Plan' would mean acceptance of the selective principle. To this extent it represented a crucial stage in the development of British bombing policy. If it was accepted, it was, for example, certain that Bomber Command would be required to attack Schweinfurt.

Sir Arthur Harris did not overlook these possibilities and, though he told General Eaker on 15th April 1943 that he was 'in complete agreement with the policy recommended', he pointed out that he felt that 'the Plan as it stands may prove somewhat inelastic in the event. In practice, it could and would be modified as necessary to meet developments in the general situation and to accord with new information as to the effect of past attacks on different types of objective.' He thought it necessary to make this 'absolutely clear' in order to avoid the 'possibility of later misunderstanding.' Whatever his real

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<sup>1</sup> C.B.O. Plan.

feelings on the subject of the policy recommended were, Sir Arthur Harris was naturally eager to see the Eighth Air Force vigorously reinforced and actively engaged over Germany.<sup>1</sup> This enthusiasm was fully shared by Sir Charles Portal and had, as will be recalled, led him to change his mind about the prospects of daylight precision bombing.

On 15th April 1943, Sir Charles Portal wrote to inform General Arnold that the plan had been completed. He observed that it was based 'on our combined resources in the matter of intelligence and operational data', and that it had been drawn up in close consultation with the British Ministry of Economic Warfare. He told General Arnold that he believed it to be 'entirely sound' and he assured him that it had his 'full support'. Sir Arthur Harris was also, he added, 'convinced of its soundness and importance.'<sup>2</sup>

Sir Charles Portal knew that the proposal to build up the Eighth Air Force would encounter 'varied and purposeful opposition' in Washington, and, as he explained to the Royal Air Force Delegation there, it was important that the standpoint of the British Air Staff 'should be made plain. The immense advantages which would accrue if the Americans succeeded with their plan for precision bombing by daylight have', he said, 'never been doubted. The plan', he continued, 'opened up the possibility of systematic destruction of vital targets in Germany coupled with the ability to inflict heavy attrition on the German fighters.' It was, he pointed out, 'the perfect complement of our own night bombing operations, as the two forces in combination would tend to exhaust the German fighter defence and spread the attacks over the full 24 hours. The only doubt', he admitted, 'was whether the Americans could achieve the necessary penetration and maintain the accuracy of daylight attacks in the face of intense flak and fighter defences. Sufficient experience,' Sir Charles Portal, however, said, 'has now been accumulated to show that the Americans have proved their case. They have', he continued, 'carried out heavy and accurate attacks against strongly defended targets in the occupied territories and in Germany and they have returned without undue loss. They have destroyed German fighters on a scale which', Sir Charles Portal cautiously added, 'cannot be assessed with complete accuracy but is evidently impressive. All that they now lack are the numbers with which to exploit their success.'<sup>3</sup>

These comments, like the plan which they were intended to support, were optimistic and it was presently to be shown that the Americans were very far from having proved their case. They were

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<sup>1</sup> Letter Harris to Eaker, 15th April 1943.

<sup>2</sup> Letter Portal to Arnold, 15th April 1943.

<sup>3</sup> Letter Portal to MacNeece Foster (Washington), 15th April 1943.



still on the fringe of Germany and as yet they were only on the brink of a colossal and furious struggle with the German air force. It was to be a long time before the Americans and their British allies found the effective means of bringing that struggle to a decisive and a favourable conclusion.

The 'Eaker Plan' had, indeed, recognised that the achievement of air superiority was crucial to the daylight offensive. Day bombers could not expect to evade the opposing day fighters. They could only hope to overcome them and, as was said in the 'Eaker Plan', 'if the growth of the German fighter strength is not arrested quickly, it may become literally impossible to carry out the destruction planned'. The ulterior, or strategic, object of destroying selected segments of German industry was seen to be dependent 'upon a prior (or simultaneous) offensive against the German fighter strength', which was, therefore, designated as an 'intermediate objective second to none in priority.'<sup>1</sup>

The American Air Staff did not, however, have any new ideas on how this air superiority might be achieved. Like the British, in the early days of the war, they reposed their trust in the self-defending bomber formation to meet and defeat the enemy fighters in the air. They hoped that these daylight formations would themselves succeed in disrupting those industries which produced the fighters and that by a combination of attrition in the air and destruction in the factories, the German fighter force would be gradually reduced in strength and effectiveness and finally completely overcome and air superiority won. The possibility that this was an optimistic hope had not been entirely overlooked and the earlier American plans had allowed for the prospect of day bomber formations which could not effectively defend themselves against fighter attack. As a precaution, the need for long-range fighters had been expressed.<sup>2</sup> Nevertheless, the American Air Force had failed to develop any fighters capable of deep penetration and now, on the eve of the American bomber offensive against Germany, Sir Charles Portal learnt from General Spaatz that 'the policy of escorting the bombers with fighters was being abandoned and the bombers would in future be responsible for their own defence on long distance raids'.<sup>3</sup>

<sup>1</sup> C.B.O. Plan.

<sup>2</sup> United States Air Warfare Plans Division paper. August 1941. A.W.P.D./1 cited in *The Army Air Forces in World War II*, Vol. I, (1948), pp. 148-149.

<sup>3</sup> Min. Portal to Bottomley, 26th Nov. 1942. During 1942 the Americans had been handing over Mustangs to the Royal Air Force in exchange for Spitfires. Letter Chaney to Portal and Portal to Arnold, 6th June 1942. A message from the R.A.F. Delegation in Washington to the Air Ministry dated 13th May 1942 had pointed out that all General Spaatz's plans envisaged day bombing with fighter escort against short-range targets, but that for deep penetrations the self-defending qualities of the Fortresses flying at 25,000 feet and in formation, each being equipped with ten 0.50 and one 0.30 guns, were to be relied upon.

It is true that the heavily armed Flying Fortress was a much more promising weapon for this task than the British Hampdens and Wellingtons and later Lancasters, Halifaxes and Stirlings had been. The Eighth Air Force crews were also more highly trained in formation tactics than the early Bomber Command crews had been. But in the meantime the development of German fighters, their equipment and their tactics had not been stationary. It remained to be seen whether the Americans could produce new results by the old methods or whether the same fate would overtake their formations which had already befallen their British predecessors.

However this might be, it was clear that the task of the combined bomber offensive, as indicated in the 'Eaker Plan', which was first in importance, was an attack upon the German fighter force. Upon the outcome of this would depend the American contribution to the combined, or, as it was soon to be called, the *Pointblank* offensive.

The contribution of Bomber Command had the appearance of being less dependent upon this issue, for already the British force, under the cover of darkness and by the tactics of evasion, was spreading vast devastation throughout the Ruhr and even, for the first time, in the prime target of Essen. If, as Sir Arthur Harris believed, this destruction was mounting towards decisive proportions, and if, as Sir Charles Portal had originally expected, the American daylight formations failed to protect themselves, it might well be argued that General Eaker would do well to follow the lead of Sir Arthur Harris. It might, in any case, be argued that it would be unwise to deflect Bomber Command from its programme of area attack on major German cities. These were possibilities which could already be perceived, and they offered the prospect that the *Pointblank* offensive might become not a combination but a competition.

## 2. The *Pointblank* plan and the German air force, June–September 1943

The 'Eaker Plan' was a proposal for a combined bomber offensive. It had been written on American initiative and its doctrine was more American than British. Nevertheless, the British had participated in its preparation and they had been consulted about the tactical and intelligence assumptions on which it rested. Sir Charles Portal had accepted it and he had assured General Arnold that it commanded his full support. Sir Arthur Harris had expressed no fundamental objections. Yet it was a plan which based itself upon the validity of selective attack, whether this was carried out by area or precision bombing, and it was a plan which, at any rate in so far as the day bombers were concerned, necessitated the achievement of air superiority.

As far as the policy which had largely governed the operations of Bomber Command in 1942 was concerned, this plan constituted a revolution, or more properly a reaction to the earlier conceptions. It was in close sympathy, it was true, with the ideas which had, for some time, been gaining ground with the British Air Staff. But to the policy indicated in the Cherwell minute of March 1942, a policy which Sir Arthur Harris had subsequently carried out on every possible occasion and which he deemed to have been confirmed by the Casablanca directive, it was a challenge. In place of the general attacks necessary to render the German industrial population homeless, spiritless and, as far as possible, dead, it proposed a series of selective thrusts at certain key segments of industry. It preferred the method of surgical operation to that of mass strangulation. It remained to be seen whether what was proposed was also possible and to what extent the night and day forces could co-operate in the prosecution of the plan.

It might appear, and it has often been suggested, that a great moral issue was involved in this situation, but the moral issue was not really an operative factor. The choice between precision and area bombing was not conditioned by abstract theories of right and wrong, nor by interpretations of international law. It was ruled by operational possibilities and strategic intentions. Though these matters have been much confused by propaganda, the Germans, the British and the Americans too, adopted the policy of area attack when they considered that precision bombing was either impossible or unprofitable. The 'Eaker Plan' assumed that precision bombing against Germany would be possible and effective. This did not, however, prevent the Eighth Air Force from carrying out a number of area attacks in Ger-

many, nor did it obstruct the American bomber forces in the Far East from adopting wholeheartedly the policy of area bombing against Japan which found an ultimate expression in the discharge of the atomic bomb. Moreover, the intention does not signify to the victim, and, in so far as the civilian population was concerned, it made little difference whether the target was, for example, Cologne railway station or Cologne cathedral. It may be a crime to attack a cathedral, but it is only war to miss a railway station. In the *Pointblank* plan both area and precision bombing were intended to contribute to 'the progressive destruction and dislocation of the German military, industrial and economic system and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened'.

All this had emerged since the Casablanca Conference which, from the point of view of the combined bomber offensive, had occurred too early. In May 1943, however, another meeting between Mr. Churchill and President Roosevelt took place, this time in Washington. It enabled the Combined Chiefs of Staff to review the *Pointblank* plan and to seek for it the high authority of the Prime Minister and the President. This time Sir Charles Portal and General Arnold came to argue a case about which they had agreed beforehand and which had been worked out in considerable detail. Mr. Churchill, who had consented to the American daylight plan at Casablanca only with reluctance and misgivings, now immediately said that it was not proposed to discuss either the U-boat war or the bombing of Germany because, except in detail, 'there were no differences of opinion on these subjects'.<sup>1</sup> The *Pointblank* plan was, therefore, adopted by the Combined Chiefs of Staff and approved by the Prime Minister and the President.<sup>2</sup>

Nevertheless, it is important to notice that the version of the *Pointblank* plan which was presented at the Washington Conference showed some important modifications by comparison with the original 'Eaker Plan'. These had the effect of making significant changes in the direction of the policies advocated by Sir Arthur Harris. The belief that 'it is better to cause a high degree of destruction in a few really essential industries than to cause a small degree of destruction in many industries' was not reproduced. A new paragraph was added to the section dealing with the contribution of Bomber Command. It said, 'This plan does not attempt to prescribe the major effort of the R.A.F. Bomber Command. It simply recognises the fact that when precision targets are bombed by the Eighth Air Force in daylight, the effort should be complemented and completed by R.A.F. bombing

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<sup>1</sup> Mins. of Mtg., 12th May 1943.

<sup>2</sup> C.C.S. Mtg., 18th May 1943. C.C.S. Memo., 25th May 1943.

attacks against the surrounding industrial area at night. Fortunately', this new paragraph added, 'the industrial areas to be attacked are in most cases identical with the industrial areas which the British Bomber Command has selected for mass destruction anyway'.<sup>1</sup>

This meant that Bomber Command was not harnessed to the selective principle so definitively as had been indicated in the original version of the plan. Its 'major effort' was no longer 'prescribed' and a considerable separation between the objects to be pursued by the two forces was permitted to survive. This was to have important and complicated consequences.

Meanwhile, however, insistence upon the need for a 'preliminary or simultaneous' assault on German fighter strength was undiminished and, indeed, reinforced. The original version of the plan had shown how the daylight operations of the Eighth Air Force were conditional upon the attainment of this 'intermediate' objective, but the Washington version showed how it might concern Bomber Command as well. 'The German fighter force', it said, 'is taking a toll of our forces both by day and by night, not only in terms of combat losses, but more especially in terms of reduced tactical effectiveness. If the German fighters are materially increased in number it is quite conceivable that they could make our daylight bombing unprofitable and perhaps our night bombing too'.

This was the first occasion on which the German night fighter had been authoritatively and officially recognised as a possible means of stopping the British night offensive. Perhaps even more significant than this was the simultaneous recognition of the opposing fighters as a means of reducing the 'tactical effectiveness' of bombing, even if they did not shoot down great numbers of the bombers. This suggested, in effect, that even if, as Mr. Baldwin had expected, the bombers did always get through, there might be an important difference between getting through and getting through to do effective damage. It was thus possible to foresee the relevance of the doctrine that 'air superiority is the pre-requisite to all war-winning operations, whether at sea, on land, or in the air'.<sup>2</sup>

Sir Arthur Harris, though he did from time to time urge the introduction of devices such as *Window* by which the effectiveness of the German air defences might be diminished, was not, however, immediately concerned with the relevance of these possible conclusions. He knew that his night bombers were able to destroy only insignificant numbers of German fighters in the air and he did not believe in any form of selective attack, least of all if it was aimed at such difficult

<sup>1</sup> C.B.O. Plan, 14th May 1943, as approved by the Combined Chiefs of Staff at Washington, App. 23.

<sup>2</sup> Cf. Marshal of the Royal Air Force The Lord Tedder: *Air Power in War. The Lees Knowles Lectures*, (1947), p. 32.

targets as the German aircraft and ball-bearings industry. He knew, as everyone else knew, that the German fighter force was steadily growing in size and effectiveness. All the same, he believed that he was in the midst of bombing operations which would presently and decisively bring the war to a favourable conclusion. So far as his own Command was concerned, Sir Arthur Harris believed that the 'intermediate objective' of attack upon the German fighter force and its supporting industry had little application. He was convinced that the ultimate object of reducing Germany to virtual impotence could be effectively pursued by direct means, and he believed that he had already made tremendous progress in that direction.

The introduction of two new radar aids known as *Oboe* and *H2S*, the development of new tactics and a considerable increase in the size of the force, notably in its Lancaster element, had made Bomber Command an incomparably more formidable weapon than it had been in 1942. The effect of these changes had, in the early part of 1943, been partially concealed from Germany by the diversion of a great part of the attack on to the submarine bases on the Biscay coast. These operations wrought vast destruction, but contributed little to the naval war. They afforded Germany herself some respite. These facts were recognised by the Air Staff in April and Bomber Command was released from one of its less fortunate commitments.<sup>1</sup> Sir Arthur Harris was then able to concentrate upon a campaign which had already begun in March and which was soon to become famous as the Battle of the Ruhr.

Science had now truly come to the aid of the bomber in the dark, and by the middle of May when the Combined Chiefs of Staff were reviewing the *Pointblank* plan in Washington, Sir Arthur Harris was, without exaggeration, able to describe the destruction which had been caused in the Ruhr as 'staggering'. Industrial haze no longer protected Essen, nor even the Krupp works within it, and targets all over the Ruhr Valley which, in many cases had escaped in 1942, now received the brunt of much heavier attacks. Sir Arthur Harris, like many responsible Germans, did not see how any nation could long survive such blows and, he told Sir Charles Portal on 15th May 1943, 'if we can keep this up it cannot fail to be lethal within a period of time which in my view will be surprisingly short'.<sup>2</sup>

What followed lent much substance to the view of the Commander-in-Chief. Scientific aids to night bombing did not end with the range of *Oboe* which did not extend beyond the Ruhr. The range of *H2S* was the same as that of the aircraft which carried it. During the summer Bomber Command was to plough a path of destruction across

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<sup>1</sup> Letter Bottomley to Harris, 6th April 1943.

<sup>2</sup> Harris to Portal (Washington), 15th May 1943.

Germany on the way to Berlin, and in the course of this campaign it was to fight the Battle of Hamburg which, in the view of Albert Speer, as in that of Sir Arthur Harris, seemed for a time to bring the end of the war within sight.

Moreover, Bomber Command was not only growing vastly more powerful. It was also becoming increasingly versatile. In May 1943 a small force of specially trained Bomber Command crews led by Wing Commander Gibson and flying by night in specially equipped Lancasters breached the Möhne and Eder dams. This achievement, which was certainly the most precise attack ever carried out by night or by day and, perhaps, among the greatest feats of arms ever performed in the air, opened a new epoch in the technique of bombing.

All this, and all that it portended, was carried out in the face of a German air defence which was constantly growing in strength and effectiveness. It was the product not of a 'prior (or simultaneous) offensive against the German fighter strength' but of a fruitful alliance between the Air Force and the scientists which enabled Bomber Command to evade the German air force and, with increasing accuracy, to find and hit its targets. From the point of view of Bomber Command the battle with the German fighter force was a battle of wits and not one of bullets nor of bombs. Once the night fighter had got the heavy night bomber in its sights the bomber had a small chance of survival. It was invariably outgunned, outranged and outpaced.

Thus, the Bomber Command offensive corresponded to the *guerre de course* of naval strategy. In the *guerre de course* cruisers or submarines sought to evade the opposing naval forces and to strike direct blows at the commerce or military communications of the enemy. In the night offensive, Bomber Command sought to evade the opposing fighters and to strike directly at German war industry and morale. If this could be done effectively and decisively, as seemed to be indicated by the Battles of the Ruhr and Hamburg, then it would appear that, so far from being the essential prerequisite to the strategic air offensive, the attack on the German fighter force would be no more than a diversion from it.

It was, however, possible that the tactics of evasion would exhaust themselves before the strategic operations became decisive. It was also possible that the tactics of evasion would themselves have an effect upon bombing policy which might prevent the strategic operations from ever becoming decisive. In other words, the German fighter force, even if it failed to inflict unbearable casualties upon Bomber Command, might all the same interpose such a difference between tactical feasibility and strategic desirability as to make Bomber Command's operations not impossible but unprofitable.

It was not yet clear whether the recognition of these possibilities for the night offensive could be regarded as pessimism or realism. Never-

theless, they were recognised in the *Pointblank* plan together with the much more obvious fact that sustained and long-range daylight operations could not be undertaken unless the German fighter force could be brought to battle on terms disadvantageous to itself. Indeed, the Eighth Air Force honeymoon over French and latterly German fringe targets was already coming to an end. On 17th April 1943 the Eighth Air Force despatched one hundred and fifteen bombers to the Focke-Wulf plant at Bremen. This was a target of shallow penetration but sixteen of the American bombers were destroyed and a further forty-four were damaged.<sup>1</sup>

Acceptance of the *Pointblank* plan had the logical consequence that the German fighter force should figure as the primary objective of the new combined bombing directive. That this should be so was shown in a draft directive submitted to Sir Arthur Harris on 3rd June 1943 by the British Air Staff which, under the leadership of Sir Charles Portal, was responsible for the 'strategical direction' of Bomber Command and the Eighth Air Force. This draft explained that since the time of the Casablanca directive there had been 'rapid developments in the strategical situation' which demanded a change in the target priorities then laid down. 'The increasing scale of destruction which', it said, 'is being inflicted by our night bomber forces and the development of the day bombing offensive by the Eighth Air Force has forced the enemy to deploy day and night fighters in increasing numbers on the Western Front. Unless this increase in fighter strength is checked,' the draft directive continued, 'we may find our bomber forces unable to fulfil the tasks allotted to them by the Combined Chiefs of Staff.' In these words the *Pointblank* expectation was reaffirmed.

The draft directive now proceeded to a definition of the *Pointblank* intention. 'In these circumstances,' it said, 'it has become essential to check the growth and to reduce the strength of the day and night fighter forces which the enemy can concentrate against us in this theatre. To this end,' it continued, 'the Combined Chiefs of Staff have decided that first priority in the operation of British and American bombers based in the United Kingdom shall be accorded to the attack of German fighter forces and the industry upon which they depend'.

The fact that the *Pointblank* plan was ultimately aimed at German industry and that the attack on the German fighter force was a means to that end was indicated in that part of the draft directive dealing with target priorities. The German fighter force was designated as the 'intermediate objective' while submarine yards and bases, the remainder of the aircraft industry, ball-bearings and, if Ploesti could be attacked from the Mediterranean theatre, oil, were enumerated as

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<sup>1</sup> B. Ops. 2(a) Monthly Analysis of Operations of VIII U.S. Bomber Cmd.



the 'primary objectives'. The 'secondary objectives' were synthetic rubber and tyres and military transport vehicles.

Nevertheless, the crucial importance of the 'intermediate objective' was emphasised and re-emphasised throughout the rest of the draft directive. In particular and 'in the immediate future,' Sir Arthur Harris and General Eaker were asked to direct their combined forces towards this objective. They were to seek the destruction of airframe, aero-engine, aircraft component and ball-bearing plants. They were to aim at the 'general disorganisation' of the industrial areas associated with these industries and they were to attack aircraft repair depots and storage parks. Finally, together with Fighter Command, they were to seek the destruction of enemy fighters in the air and on the ground.<sup>1</sup>

'It is emphasised', the draft directive continued, 'that the reduction of the German fighter force is essential to our progression to the attack of other sources of the enemy war potential and any delay in its prosecution will make the task progressively more difficult. In so far as is possible,' it said, 'targets should be chosen on the basis of the directness and immediacy of their contribution to the weakening of German fighter strength. A successful attack against major targets within any inter-dependent group of objectives will warrant a continuation of attacks against the remaining targets in that category even under conditions of increasing cost. This latter principle', it was asserted, 'applies in an outstanding manner to attacks directed against the ball-bearing industry upon which the German Air Force is critically dependent.'<sup>2</sup>

This was a most significant document. It conceded that the German fighter force not only threatened the American day offensive but the British night offensive as well. It made it abundantly clear that the attack upon the German fighter force was to be the most urgent aim not only of the Eighth Air Force but of Bomber Command as well. There was not a single mention of the general area attack upon German morale. It suggested that area bombing should be harnessed to the selective principle and that, in particular, and in the immediate future it should be devoted to the dislocation of those industrial areas associated with aircraft and ball-bearings production. It was not likely to be welcomed by Sir Arthur Harris who, as we have noticed, was already deeply engaged in the great Battle of the Ruhr.

The document was, however, only a draft and before it was put into final form Sir Arthur Harris and General Eaker were given the opportunity of commenting upon it. The final version, known as the *Pointblank* directive, which was issued on 10th June 1943, suggested

<sup>1</sup> The Eighth Air Force under General Eaker included a fighter component—the U.S. Eighth Fighter Command.

<sup>2</sup> Draft Dir. Bottomley to Harris, 3rd June 1943, App. 8 (xxxii).

that Sir Arthur Harris may have used this opportunity to considerable effect.<sup>1</sup>

This final version opened with the same words as the draft and used exactly the same phrases about the growth of the German fighter force and the need to check it if the combined bomber forces were to carry out the tasks allotted to them by the Combined Chiefs of Staff. It recorded the conclusion, still in the same words as had been used in the draft, that 'first priority in the operation of British and American bombers based in the United Kingdom shall be accorded to the attack of German fighter forces and the industry upon which they depend.' At this point the final version began to depart significantly from the form of the draft. Having said that the attack on the German fighter force and its supporting industry was the 'first priority' it continued immediately with this sentence: 'The primary object of the bomber forces remains as set out in the original directive issued by the Combined Chiefs of Staff (. . . dated 21st January 1943), i.e. "the progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened".'<sup>2</sup>

The 'intermediate objective' of German fighter strength, the four 'primary objectives' of submarines, the remainder of the aircraft industry, ball-bearings and oil, and the two 'secondary objectives' of synthetic rubber and military vehicles were now specifically allotted to the Eighth Air Force and to the Eighth Air Force alone. The separate function of Bomber Command was still further emphasised by the introduction of a sentence which had not appeared in the draft. This said, 'While the forces of the British Bomber Command will be employed in accordance with their main aim in the general disorganisation of German industry their action will be designed as far as practicable to be complementary to the operations of the Eighth Air Force.'

The reference in the draft to the need for selecting targets on the basis of 'the directness and immediacy of their contribution to the weakening of German fighter strength' was omitted in the final version. Moreover, the particular emphasis placed in the draft upon the importance of the ball-bearings industry was not reproduced in the final version.<sup>3</sup>

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<sup>1</sup> A conference to be attended by the Commanders-in-Chief Fighter and Bomber Command, the Commanding General Eighth Air Force, the Vice-Chief of the Air Staff and the Assistant Chief of the Air Staff (Operations) for the purpose of discussing the draft was arranged for 7th June 1943. It was subsequently postponed until 9th June. It is to be presumed that the conference was then held, but the authors have failed to trace any record of it.

<sup>2</sup> It is interesting to note that this sentence is heavily emphasised in green pencil on the Bomber Command copy of the directive. The passage here omitted contains only the numbered reference to the document.

<sup>3</sup> Dir. Bottomley to Harris, A.O.C.-in-C. Fighter Cmd. and C.G. Eighth Air Force,

It will be noticed that the differences between the draft and the final version of the *Pointblank* directive reflected the differences between the original 'Eaker Plan' and the final *Pointblank* plan as approved by the Combined Chiefs of Staff, the President and the Prime Minister at the Washington Conference in May 1943. For this reason it is apparent that the final version of the directive was closer to the official and declared intention of the supreme authorities than the draft had been. It is also clear that the final directive, like the revised version of the plan itself, made most important concessions to Sir Arthur Harris' views. Deeds spoke more powerfully than words and each Bomber Command success fortified Sir Arthur Harris' argument.

The division between the objects to be pursued on the one hand by Bomber Command and on the other by the Eighth Air Force was thus once more permitted to survive and even encouraged. The *Pointblank* directive was, in effect, an invitation to the Eighth Air Force to prove its own case and show that effective precision attacks in daylight were feasible operations of war by self-defending formations of heavily armed and high-flying bombers. At the same time it constituted a permission for Bomber Command to pursue the policy which had already carried it into the Battle of the Ruhr and which was presently to carry it across many great cities and to Berlin.

The directive was, nevertheless, a highly obscure document in which many of the paragraphs were mutually contradictory and in which curious distinctions between 'primary objects', 'main aims', 'primary objectives' and targets of the 'first priority' lay concealed or at least unexplained. This meant that when the *Pointblank* offensive encountered obstacles there was much scope for argument and, at times, recrimination. If the Eighth Air Force had, indeed, been able to prove its own case, it seems unlikely that any difficulties would have been encountered. The destruction of the German fighter force both in the air and in the factories would, to quote the words of Sir Arthur Harris, have given both the forces a 'clear run' after which they could have 'knocked Germany stiff'.<sup>1</sup>

It quickly became evident, however, that the Eighth Air Force was achieving much less than this. The reinforcements which had been demanded in the 'Eaker Plan' did not arrive. By 30th June 1943, when, according to the plan, the Eighth Air Force should have received 944 bombers, only 741 had been sent. The prospect was that by 30th September, when the figure was due to reach 1,192, only 850

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10th June 1943. Though it has been found necessary to quote extensively from this document here and also from the draft it is thought desirable to print them both in full, see App. 8 (xxx) and (xxxii).

<sup>1</sup> Harris to Portal (Quebec), 12th Aug. 1943.

would have arrived. This was a cause of equal anxiety to Sir Arthur Harris and General Eaker.<sup>1</sup>

Sir Charles Portal, who was now attending the third great allied conference of the year in Washington and Quebec, was also gravely concerned. In a paper which he laid before the conference on 15th August 1943 he sought to show that the whole *Pointblank* campaign was in the balance. He revealed his supposition that, since January, the German fighter force had increased by twenty-two per cent and that, in the same period, its strength on the Western front had been doubled. 'If we do not now strain every nerve to bring enough force to bear to win this battle during the next 2 or 3 months,' he said, 'but are content to see the 8th Bomber Command hampered by lack of reinforcements just as success is within its grasp, we may well miss the opportunity to win a decisive victory against the German Air Force which will have incalculable effects on all future operations and on the length of the war.'<sup>2</sup>

One of the 'future operations' which was now much in mind was the projected allied invasion of France already known as *Overlord*. It was obvious that, whatever effect it might have upon the strategic air offensive itself, the achievement of air superiority was of crucial, and probably of decisive, importance to this undertaking. The German air force had, therefore, become even more the cynosure of anxious attention and the American Chiefs of Staff had little difficulty in accepting Sir Charles Portal's argument. They expressed their accord with the view 'that the maximum reinforcement of "Pointblank", particularly over the period of intense combat with the German Fighter Air Force immediately ahead, is a subject of the most critical importance . . .'<sup>3</sup> Nevertheless, as autumn approached, the Eighth Air Force was still seriously behind its expansion schedule and the German fighter force was still increasing. The *Pointblank* offensive was in danger of foundering on its intermediate objective and so, at any rate to some minds, the whole future of the strategic air attack was jeopardised.

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<sup>1</sup> Harris to Portal (Quebec), 12th Aug. 1943.

<sup>2</sup> Memo. by Portal, 15th Aug. 1943. It is interesting and relevant to note that though Sir Charles Portal was anxious about the lack of progress which the Eighth Air Force was making with the attack on the *Luftwaffe*, he was still extremely hopeful about what Bomber Command might achieve in the pursuit of its 'main aim'. 'Without wishing to press Harris at all,' he cabled to the V.C.A.S. on 19th August 1943, 'I should be glad to have estimate of date by which he thinks heavy attacks on Berlin could begin. In present war situation,' he said, 'attacks on Berlin on anything like Hamburg scale must have enormous effect on Germany as a whole.' The Prime Minister had long showed a great desire that Berlin should be bombed. For example, Min. Churchill to Sinclair and Portal, 3rd Dec. 1942 and Min. Churchill to Portal, 6th Jan. 1943.

<sup>3</sup> C.C.S. Mtg., 16th Aug. 1943.

### 3. The crisis of *Pointblank*: Schweinfurt and Berlin, October–December 1943

The belief that Germany could be defeated by bombing alone, held, of course, only by a few and never officially adopted, had now been specifically rejected by the highest authorities. The role of the air offensive in the major strategy of the war was not to defeat Germany but to enable the assault by land, sea and air, known as *Overlord*, to do so. The length and intensity and, perhaps, also the outcome of the struggle which awaited the allied military forces on the Continent would clearly be determined to a large extent by the use of air power. To a lesser, but still important extent, it might even be predetermined by the outcome of the strategic air offensive, or, as it had now come to be called, *Pointblank*. Thus, *Pointblank*, though it was an independent exercise of strategic air power, was, nevertheless, intended to be the servant of *Overlord*. In particular, the major requirement of *Pointblank* was that it should provide a fair degree of allied air superiority before the launching of the invasion of France.

Sir Arthur Harris was not, however, entirely in sympathy with these fundamental ideas and, while he was convinced that without a successful bombing offensive the invasion would be impossible, he also thought that with it it might be unnecessary. He believed the bombing offensive was the ultimate and decisive campaign. He was convinced that it could be the prelude not to an invasion but to an occupation.<sup>1</sup>

Moreover, the vast scale of destruction caused by Bomber Command during the spring and summer of 1943 was a weighty factor in support of Sir Arthur Harris' convictions. The difficulty was that the issue was no longer, as it had been in 1942, merely academic. The two ideas now posited two different bombing policies and the more closely the date of the invasion approached the more difficult it became to exploit the advantages of both.

Yet this was what the *Pointblank* plan had sought to do. The Eighth Air Force was to carry out precision attacks upon key war industries whose destruction, it was calculated, would weaken the German armed forces and so improve the prospects of *Overlord*. The Eighth Air Force was also to attack the German fighter force in action and

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<sup>1</sup> For example, Harris to Portal, 15th May 1943, cit. above, page 25, Min. Harris to Churchill, 3rd Nov. 1943, cit. below page 47, and especially Letter Harris to Air Min., 7th Dec. 1943, cited below, pages 54–57. Nevertheless, in October 1943 he wrote in reply to a message of congratulation on the work of Bomber Command from the War Cabinet that both they and the Eighth Bomber Command knew 'that every bomb which leaves the racks makes smoother the path of the armies of the United Nations as they close in to the kill.' Harris to Churchill, 12th Oct. 1943.

in production. The state of air superiority which was expected to arise from the achievement of this, the 'intermediate objective', would not only give the bombers, as Sir Arthur Harris put it, 'a clear run',<sup>1</sup> but it would also, in itself, confer an immeasurable and probably decisive advantage upon the *Overlord* forces. Though Bomber Command was invited to complement this effort by making area attacks on towns associated with the American precision targets in so far as might be 'practicable', it was still to be employed in accordance with the 'main aim in the general disorganisation of German industry.'<sup>2</sup>

In the pursuit of this 'main aim' Sir Arthur Harris was, therefore, loyal not only to his own convictions but also to the directive which he had received under the authority of the Combined Chiefs of Staff. None could doubt that his selection of targets, first in the Ruhr, and then, as the nights lengthened, farther afield, was designed to bring about the 'general disorganisation of German industry.' Some of his targets were associated with particular American aims. Hamburg, for example, in addition to being a town of naval significance, was to some extent associated with aircraft production, but more often than not the 'main aim' of Bomber Command did not complement the 'intermediate objective' of the Eighth Air Force. In general, the night offensive was proceeding without much regard to the progress of the attack on the German air force. Bomber Command was practising more and more complex measures of evasion and deception upon the German fighter force. It was doing little to destroy it because it seemed there was little that it could do.

The Eighth Air Force was, however, doing little more, though in its case, the German fighter force was the objective of first priority. A few attacks, estimated to have been effective, had, it is true, been delivered, notably on the Me.109 factories at Regensburg and Wiener Neustadt, but they had not been 'as heavy and as numerous' as was expected in the *Pointblank* plan, nor had they been 'as experience shows, as heavy as is required for crippling the G.A.F. fighter force'. Intelligence estimates indicated that German fighter strength on the Western front was still increasing at a somewhat alarming pace. Between January and September 1943 it appeared that single-engined fighter strength there had mounted from 300 to 700 and twin-engined fighter strength from 370 to 590.<sup>3</sup>

This made the relative failure of the Eighth Air Force to grapple effectively with German fighter strength readily apparent. Certainly large segments of German air power were being contained in the

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<sup>1</sup> Harris to Portal, 12th Aug. 1943.

<sup>2</sup> Dir. Bottomley to Harris, A.O.C.-in-C. Fighter Cmd. and C.G. Eighth Air Force, 10th June 1943, App. 8 (xxxii).

<sup>3</sup> Air Staff Memo., 7th Oct. 1943. Here, of course, the operative figures are those accepted in the Air Ministry, and not the actual ones.

west, but air superiority was as far, or further, away than ever and the whole future of the American contribution to *Pointblank* was still in doubt. In this situation, the basic problem of a combined bomber offensive could no longer be evaded as it had been at Casablanca and again in Washington. One theory of strategic air power would ultimately have to give way to the other.

This issue, as we shall presently see, was to centre itself upon two of the most difficult targets in Germany: Schweinfurt and Berlin. Schweinfurt, as the principal centre of German ball-bearings production, was *par excellence* an example of what Sir Arthur Harris described as a 'panacea' target. In any selective attack upon the German air force, or anything else that moved, it was regarded as a prize without compare. Berlin, though it was by no means so much the centre of Germany as London was of England, did, nevertheless, lie geographically and logically at the end of the road which Sir Arthur Harris had been travelling through the Ruhr, Hamburg and central Germany.<sup>1</sup>

Both these targets presented formidable difficulties to the attacking forces and success, in either case, seemed to demand the united efforts of Bomber Command and the Eighth Air Force. The choice between them reflected the great issue which was now at stake.

The Deputy Chief of the Air Staff, Air Marshal Bottomley, had little doubt as to which was the vital issue. He felt that the winning of air superiority was the decisive battle not only for the Eighth Air Force but for Bomber Command too. 'At present', he told Sir Charles Portal on 25th September 1943, 'we are not progressing rapidly with measures to overcome the German night air defences, especially measures against their night fighters. The approved radio counter-measures', he said, 'may go a considerable way towards defeating them but the strength of the German night fighters continues to increase, and we feel', he added, 'that unless we can either stop their numbers increasing or else introduce some effective measure of combatting them, we may find that either we are unable to maintain the night offensive against Germany, or that the Germans can sustain the intensity of attack which we can develop.'<sup>2</sup>

These were words of greater wisdom than was readily apparent at the time when the temptation was certainly to believe that Germany could not long endure the scale of attack which Bomber Command had been bringing to bear since March 1943, and which Sir Arthur Harris was now preparing to crown with a mighty assault on Berlin.

The slow progress made by the Eighth Air Force with the plan of attack on the German air force was not, in Air Marshal Bottomley's

<sup>1</sup> And to which his attention had been specifically directed by Sir Charles Portal on 19th Aug. 1943, see above, p. 31 (fn. 2).

<sup>2</sup> Min. Bottomley to Portal, 25th Sept. 1943.

view, any argument for the abandonment of the plan. On the contrary, it indicated to him the need for a more vigorous prosecution of it and, in particular, he thought that Bomber Command should assume a more direct responsibility for it. He noted that Sir Arthur Harris had not attacked Leipzig, Kassel, Brunswick, Gotha, Augsburg or Bernburg. These were the six towns whose destruction, Sir Arthur Harris had been told, would be particularly valuable to the reduction of the German fighter industry.

Air Marshal Bottomley admitted that while the Battle of the Ruhr had been in progress and Bomber Command had been largely confined by the short nights to targets of about that range, Sir Arthur Harris had enjoyed 'few opportunities' of attacking towns associated with aircraft production. Now, however, when the nights were longer and Bomber Command was in any case reaching out to Berlin, he saw no further reason why they should not be attacked and, if necessary, independently of anything which the Americans might or might not have achieved against the actual factories.<sup>1</sup>

Thus, Air Marshal Bottomley was suggesting that the area offensive of Bomber Command should now be directly and primarily applied to the selective purpose of disrupting German fighter production and that this should be attempted regardless of the obstacles which might still hinder the precision attacks of the Eighth Air Force. This proposal indicated a policy for Bomber Command which had been suggested in the draft of the *Pointblank* directive but which had not been confirmed in the final and operative version. It was not, as Air Marshal Bottomley claimed, merely an invitation to Bomber Command to 'adhere to the combined plan'. It postulated a change of policy which had been suggested but not yet adopted.

The destruction of the German fighter force was an 'intermediate objective'. It was no more than a means to the end which Sir Arthur Harris believed was, in any case, already in sight. Moreover, the diversion of Bomber Command's principal effort to this 'intermediate objective' would certainly disrupt the programme of bombing by which Sir Arthur Harris believed he could achieve that end. Berlin, for example, would no longer hold pride of place and Schweinfurt would become one of the most important targets for total destruction. Thus, in effect, to accept Air Marshal Bottomley's proposal was to reject or at any rate seriously to restrict the policy which had guided Bomber Command since March 1942 and which had been put into effective operation since March 1943. It was clear that Bomber

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<sup>1</sup> Min. Bottomley to Portal, 25th Sept. 1943. It is noteworthy that at this time the Eighth Air Force had not attacked any of the fighter plants with which these towns were associated except in the single case of Kassel. The dates of the first attacks by the Eighth Air Force were: Brunswick 11th Jan. 1944, Bernburg 20th Feb. 1944, Kassel 28th July 1943, Gotha 20th Feb. 1944, Leipzig 20th Feb. 1944 and Augsburg 25th Feb. 1944. Eighth Air Force Target Summary 17th Aug. 1942-8th May 1945.



Command's 'main aim' could not be pursued at the same time as the 'intermediate objective'. It was, indeed, because the most important areas associated with the 'intermediate objective' had been by-passed in the pursuit of the 'main aim' that Air Marshal Bottomley had become concerned and had intervened.

The suggestion that Bomber Command should 'adhere to the combined plan', therefore, posed a complicated strategic problem which, as events were to show, was probably the most important of the war in the air. The crux was whether, as Sir Arthur Harris claimed, the Battles of the Ruhr, Hamburg and Berlin were parts of a decisive campaign which required only reinforcement and persistence or whether, as Air Marshal Bottomley now suggested, the German fighter force had interposed itself between the heavy bombers and any decisive action. If they had, then the assumption was that Germany could ride the storm and eventually, perhaps, defeat the whole offensive. In this case the struggle with the German fighter force, though only a preliminary, was clearly the decisive battle in the same sense as three years before the German struggle with Fighter Command had been decisive.

As in the Battle of Britain, so in this case, the issue was not confined to the subsequent operation of bombers. In both cases a military invasion was also at stake. Operations *Sea Lion* and *Overlord* had it in common that neither could be undertaken unless a reasonable degree of air superiority had been achieved. The British Air Staff was not blind to the possibility that the Germans had made a cardinal mistake when they switched their attacks from air force targets to the great industrial centres and particularly to London.<sup>1</sup> It might well be that to regard Berlin as a more important target than Schweinfurt would be to make a somewhat similar mistake.

This was, nevertheless, still to a large extent a matter of speculative opinion. The real results of Bomber Command's general area attack on Germany were, as Sir Arthur Harris pointed out, known only to the Germans.<sup>2</sup> Also the extent to which the German fighter force might be neutralised without being destroyed, was, as Air Marshal Bottomley admitted, a debatable point.<sup>3</sup> If, therefore, Bomber Command was diverted from its general assault to a particular attack upon the German fighter force, it could not be known what would be lost and what would be gained. It was even possible that the best means of achieving air superiority was not by direct attack upon the German air force.

That this might be so was certainly indicated by the tactical situation. The night bombers could not effectively engage the opposing

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<sup>1</sup> Min. Bufton to Portal, 12th Nov. 1943.

<sup>2</sup> Harris to Portal, 15th May 1943.

<sup>3</sup> Min. Bottomley to Portal, 25th Sept. 1943.

fighters in the air, nor could they pin-point the factories which produced them. They could hope only to devastate some of the surrounding areas. Moreover, it was becoming increasingly doubtful whether the day bombers could do any better, or even as well.

Indeed, the Eighth Air Force was already showing a tendency to sheer off from its original aim of precision attacks of deep penetration. This was understandable. The Flying Fortresses were driven by flak to operate at great heights and a bomb aimed in the sun but above the cloud enjoyed no advantages over a bomb aimed in the dark. Furthermore, the American formations were learning that accurate bombing in the face of severe and prolonged fighter attack was a very different proposition from what might be expected on the basis of training exercises or operations against fringe targets. A 'disturbing tendency' on the part of the Eighth Air Force to divert its attacks from aircraft plants either to area or to fringe targets was noted at the Air Ministry in October 1943. Cloudy weather was often the explanation, but on 10th October the Eighth Air Force despatched 274 bombers to Münster. The sky was clear but the target was the centre of the town.<sup>1</sup> There was, thus, for both the bomber forces, a serious gulf between what experience seemed to demark as the limit of operational possibility and what strategy demanded as the minimum of desirability.

This was the crisis of *Pointblank*. A dogged devotion to the strategic fixation was capable of producing for the bombers an irremediable disaster and for the *Luftwaffe* a possibly decisive victory. Such a disaster already closely threatened the Eighth Air Force. On the other hand, too narrow an obedience to the dictates of tactical experience might draw the bombers into a strategically indecisive role with consequences which might eventually be scarcely less grave. Such was the danger attending the Bomber Command offensive. Yet, from one direction or the other the gulf had to be closed.

Broadly speaking, British doctrine had tended to align Bomber Command on one side of this gulf whereas American doctrine inclined the Eighth Air Force to the other. After initial set-backs early in the war, British bombing policy had, on the whole, been framed on pragmatic lines. Abstract strategic theories had been rendered extremely sensitive to the ruling estimates of operational possibility. If these estimates had not always been realistic, they had usually been the operative factors in the decisions reached. The major developments of bombing policy had a clear dependence upon operational appreciations. Thus it was with the change from day to night attack

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<sup>1</sup> Air Staff Note, 11th Oct. 1943. The Eighth Air Force was already paying a heavy price for these experiences. In the Münster attack, for example, 274 bombers were despatched, 236 are recorded as having attacked and thirty were destroyed. *The Army Air Forces in World War II*, Vol. II, p. 850.

and thus it was with the abandonment of precision attack and the adoption of area bombing. The Air Staff directives had tended to become commentaries upon what was already being done rather than instructions about what ought to be attempted. They did little more than put a certain strategic gloss upon what was in any case regarded as tactically inevitable. Any departure from this principle met with short shrift at High Wycombe.

The American air force functioned in a somewhat different atmosphere. Its war experience was necessarily much shorter and less varied than that of Bomber Command. The Eighth Air Force first crossed the German frontier in January 1943. Bomber Command had done so constantly since September 1939. The supreme direction of the American air force was separated from the European seat of war by the Atlantic Ocean and General Arnold's staff in Washington had naturally not had the same opportunities for acquiring operational experience that had fallen to Sir Charles Portal's staff in London. General Arnold had never held an operational command in war. Sir Charles Portal had been Commander-in-Chief, Bomber Command in 1940 and by the autumn of 1943 he had three years' experience of war direction as the supreme officer of a fighting service. These differences were inevitable but none the less important.

By comparison with the British, the American Air Staff adopted a more inflexible view of its strategic object. It was less inclined to be distracted from this by the many and formidable operational obstacles which interposed themselves. British warnings, and, indeed, illustrations, of the fearful hazards which awaited daylight bombers over Germany had not deflected the Eighth Air Force from its purpose. Even the prevailing conditions of European weather had been somewhat discounted in the plan for high-altitude day precision bombing. Everything from the training of the crews and the design of the aircraft to the reputation of the staff had been committed to this aim and so, in the course of time, came to reinforce it. The Eighth Air Force had been prepared for a particular purpose. By the autumn of 1943 it was already too late to turn away from that purpose because American doctrine had not provided the insurance of flexibility.

Thus, while Bomber Command was operating in the light of experience and seeking to exploit opportunities as they arose, the Eighth Air Force was bound by a strategic theory which could hardly be changed in less than a period of years. The ultimate consequences of this highly dangerous situation were fortunate almost beyond estimation, but in the autumn of 1943 it seemed that they would be utterly disastrous. The tremendous victories of the German fighter force emulated those achieved three years earlier by Fighter Command. They more than confirmed the gloomy forecasts which Sir Charles Portal had made in the autumn of 1942. A less resolute force

than the Eighth Bomber Command would have broken down and a more versatile one would almost inevitably have followed the German and the British example of changing to night attack. In the event, the Eighth Air Force was cast by a combination of resolution and rigidity into headlong assault on the German fighter force. It was almost involved in tragic defeat, but the ultimate result was the downfall of the *Luftwaffe*.

The high tide of American tribulation was reached on 14th October 1943 when Schweinfurt was the target for a major daylight attack. Earlier experience, and notably that of the first attack on Schweinfurt carried out some two months earlier,<sup>1</sup> had amply demonstrated the probable fate of this force of 291 Flying Fortresses operating, as they had to in order to reach Schweinfurt, far beyond the range of their fighter escorts. The event was, however, worse than the expectation.

As soon as the Thunderbolt escort withdrew near Aachen, the German fighter force made its appearance and engaged the American bombers in fierce combat all the way to the target and then back as far as the Channel coast. The German reaction was, the American historian records, 'unprecedented in its magnitude, in the cleverness with which it was planned, and in the severity with which it was executed.' Wave after wave of German fighters approached the bomber formations. Single-engined machines closed in firing 20-mm. cannon and machine guns. These were followed by groups of twin-engined rocket-firing fighters. Meanwhile, the single-engined fighters, having refuelled, returned to the fray and attacked from all directions. By the time Schweinfurt was reached, the Fortresses had suffered a terrible mauling and several had already been destroyed. Nevertheless, an effective though by no means decisive attack was pressed home against the ball-bearing plants. Before it could regain its bases, the Eighth Air Force had suffered a crippling disaster. Sixty of its bombers were shot down, seventeen more were heavily damaged and a further 121 sustained somewhat less serious damage. Thus from the original force of 291 aircraft, no fewer than 198 had been destroyed or damaged.<sup>2</sup>

Yet this was only the climax of a terrible week. Within six days the Eighth Air Force had lost 148 bombers with their crews in four attempts to break through the German defences beyond the range of fighter escort.<sup>3</sup> Even if the contemporary claims of German fighters

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<sup>1</sup> On 17th Aug. 1943 when a 'double mission' of 376 Fortresses was despatched to Schweinfurt and Regensburg. In a tremendous air battle sixty American bombers were shot down, mostly by German fighters. These fatal battle casualties alone accounted for sixteen per cent of the original force and nineteen per cent of that reported to have reached the targets. *The Army Air Forces in World War II*, Vol. II, pp. 682-685.

<sup>2</sup> do. pp. 702-704.

<sup>3</sup> do. p. 705.

destroyed by the American formations were not discounted, it was now abundantly evident that the Eighth Air Force could no longer sustain the campaign.<sup>1</sup> Once again the superiority of the day fighter over the day bomber had been demonstrated and the theory of the self-defending bomber formation had, in the face of a properly organised and resolute fighter force, been shown to be a myth. The *Luftwaffe* had won a major victory. Certainly, damage had been done to Schweinfurt, but that damage could not be exploited, nor could it be extended to other vital targets upon which the *Luftwaffe* depended for its reinforcements. The Eighth Air Force had to retreat and for the rest of the year it was confined to targets at much closer range such as Düren, Wilhelmshaven, Gelsenkirchen, Münster, Wesel and Bremen.<sup>2</sup> The German air force in being had shown itself fully competent to protect the German air force in production.

The Schweinfurt action decisively demonstrated that the German air force was a target which would not yield to the action of bombers alone. The principal centres of production, repair and maintenance lay far beyond the range of *Oboe* and could not be accurately bombed at night. They also lay beyond the existing range of fighter escort and so, as was now seen, could scarcely be reached at all in daylight. A battle of attrition between bombers and fighters would, it now seemed, lead to the defeat of the bombers.

It was also clear that the German air force would not, or at least need not, succumb to the action of fighters alone. Germany was unlikely, and particularly so since she was now fighting a defensive war, to bring her vital squadrons into action unless they could engage the enemy on terms advantageous to themselves, or unless she was forced to do so by some real threat. Fighters alone could offer no such threat. Only severe and heavy bombing could bring the German air force into action.

The impasse which the Eighth Air Force had now reached in the execution of the *Pointblank* plan was, therefore, simply a question of fighter range. It was exactly the same impasse as had been reached by Bomber Command in its *Circus* operations of 1941. If the bombers were restricted to the range of their escort fighters the vital targets which the *Luftwaffe* was compelled to defend could not be reached and air actions would only occur when it suited the Germans to provoke them. If, on the other hand, the vital targets were sought, then the escort fighters had to be left behind, and, though the *Luftwaffe* was

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<sup>1</sup> In the Schweinfurt attack 186 enemy fighters were claimed as destroyed. These claims arose from the heat and confusion of battle and, like British and German claims in similar circumstances, were greatly exaggerated. More probable figures, based on German records, were thirty-eight destroyed and twenty damaged, to which five destroyed and eleven damaged in non-combatant circumstances might be added. *The Army Air Forces in World War II*, Vol. II, p. 704.

<sup>2</sup> do. p. 850.

compelled to fight, it was so compelled, as Schweinfurt had shown, on terms extremely advantageous to itself. The real implications of Mr. Churchill's warning were now apparent. Without long-range fighters, the Prime Minister had suggested to Sir Charles Portal in June 1941, 'You will be helpless in the West and beaten in the East'.<sup>1</sup> In the West, this was the position which now confronted the Eighth Air Force, for neither the Royal Air Force nor the United States Army Air Forces had any effective long-range fighter squadrons in service. The American escort on the Schweinfurt attack had not been able, it will be recalled, to penetrate beyond Aachen. It was after Aachen that the Fortress formations had been shot to pieces.

The problem of a long-range fighter was inherent in its title. The difficulty was to produce an aircraft with the range of a bomber and the performance of a fighter. To achieve the necessary range it would clearly have to carry much more fuel than the normal interceptor fighter of the Spitfire type. Yet, if it was large and heavy enough to do this, it was difficult to see how it was to out-pace and outmanoeuvre its short-range opponent. This was the problem which Sir Charles Portal had always believed to be insuperable and his belief was supported both by evidence and probability.<sup>2</sup> In the Battle of Britain, at any rate, German offensive and escort fighters had been a palpable failure. Moreover, British or American long-range fighters would need to operate at much greater distances from their bases than had ever been necessary for the Germans. The distance between St. Omer and London only just exceeds one hundred miles. The German frontier is nowhere less than two hundred miles from Harwich.

The problem of a long-range fighter was technically formidable and the function of Fighter Command had not been conducive to its solution. Basically, Fighter Command was a defensive force. Its aircraft, its tactics and its organisation had been designed for the air defence of Great Britain. Its fame and also the unimpeachable justification of its particular design arose from its victory in the Battle of Britain. A less parochial attitude on the part of those who prepared and directed Fighter Command might have produced a more versatile force, but it might also have resulted in Britain losing the first decisive battle of the war.

In the event, Fighter Command, which had perfected the technique of 'close defence' over Great Britain, was, when the crisis had passed, incapable of joining effectively in the air offensive against Germany. After desisting from the attack on England, the *Luftwaffe* could easily draw the Spitfire's sting by withdrawing beyond the range of that small fighter. Fighter Command was only effective over

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<sup>1</sup> Min. Churchill to Portal, 2nd June 1941.

<sup>2</sup> e.g. Min. Portal to Churchill, 3rd June 1941.

Britain and the nearer parts of France. During the years from 1940 to 1944 when there were no decisive operations in those parts, it had little value beyond that of an insurance policy which, to be effective, had to be kept in force.

General Arnold, not unnaturally, found this situation frustrating. He could not reconcile the helplessness of his own bombers with the relative inactivity of the 'thousands' of aircraft in Fighter Command.<sup>1</sup> The transition from defence to attack should, he suggested to Sir Charles Portal on the day of the Schweinfurt attack, 'surely carry with it the application of your large fighter force offensively'.<sup>2</sup>

The relative and mutual independence of the Royal Air Force Bomber and Fighter Commands was a source of anxiety to General Arnold and he clearly felt that their co-ordination left much to be desired. In theory, this co-ordination was provided for by the subjection of all the various elements of the Metropolitan Air Force to the overriding authority of the Chief of the Air Staff. Sir Charles Portal was, however, responsible for the general direction of the entire Royal Air Force at home and overseas. He was concerned with production, training, strategy and operations. He had the 'strategical' responsibility for the Eighth Air Force and he was also a member of the British Chiefs of Staff Committee. In these circumstances it was obviously impossible for him to exercise detailed operational control of Bomber and Fighter Commands. In practice, their co-ordination was, therefore, a matter of negotiation between the two Commanders-in-Chief who each had an equal status and a different point of view.

The Metropolitan Air Force was not a balanced force in the sense that characterised the German air fleets, the Mediterranean Allied Air Forces or the American Eighth Air Force. General Eaker, like Sir Arthur Harris, was an operational commander but, whereas Sir Arthur Harris commanded only a bomber force, General Eaker, like Sir Arthur Tedder in the Middle East, commanded an air force.

This situation seemed to General Arnold to be less than adequate if 'all of our numerical superiority in aircraft' was to be brought to bear against the *Luftwaffe* in one co-ordinated and mutually supporting attack. This attack, General Arnold believed, would demand not only the 'immediate scrapping of some outmoded tactical concepts' but also 'closer coordination between all elements of our commands, and more effective use of our combined resources.'<sup>3</sup>

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<sup>1</sup> He did not know the actual number, but put it 'anywhere between 1000 and 3000 in England.' Sir Charles Portal presently gave him the figure of 1,461 available with crews. Letter Arnold to Portal, 14th Oct. 1943 and letter Portal to Arnold, 24th Oct. 1943, cited below.

<sup>2</sup> Letter Arnold to Portal, 14th Oct. 1943.

<sup>3</sup> Arnold to Portal, 17th Oct. 1943.

Though he continued to pay lip service to the idea of self-defending formations and even professed 'concern' at General Eaker's tendency to divert his attacks from airforce targets to 'shipbuilding cities', the real source of General Arnold's disquiet was, of course, the failure of the day bombers to hold their own in combat with German fighters. He clearly recognised that the outcome of *Pointblank* and so also of *Overlord* turned upon the effective engagement of the German fighter force in the air, or, as he put it to Sir Charles Portal, upon the employment of 'our forces in adequate numbers against the German *Air Force in being* . . .' Not only did he want to see the Royal Air Force Spitfires committed to this battle but he also wanted to see the Mustangs, which had found their way into the Royal Air Force, employed in an offensive role.<sup>1</sup>

Sir Charles Portal agreed that the Mustang 'in the design of which we had so large a share' was 'pre-eminently suitable for long range penetration' and he told General Arnold that the British Air Staff was now considering the possibility of using all the Royal Air Force Mustangs equipped with Merlin engines for the support of Eighth Air Force heavy bombers. Apart from this offer, however, Sir Charles Portal could find little of constructive value in the criticisms offered by General Arnold. He agreed that the success of *Overlord* depended upon 'the extent to which, by the date of the operation, we have been able to achieve a reasonable reduction of the enemy fighter forces.' He also accepted the contention that 'the success of "Pointblank" equally depends on our ability to check the growth and reduce the strength of the day and night fighter forces which the enemy can concentrate against us in this theatre.' But, as Sir Charles Portal tried to show, it was one thing to express these necessities in directives and quite another to achieve them in operations.<sup>2</sup>

The effective participation of Fighter Command in the air offensive was not, at any rate directly, a question of directives or systems of command. It was a question of range. The force had been employed in an offensive role, Sir Charles Portal claimed, since the beginning of 1941, but the *Luftwaffe* had moved its bases back to the extreme limit of Spitfire range. Fighter Command efforts to 'goad' the Germans into battle were not, therefore, Sir Charles Portal admitted, 'always successful.' Though the fitting of droptanks to some of the Spitfires had increased their operational radius of action to

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<sup>1</sup> Letter Arnold to Portal, 14th Oct. 1943. During his visit to Britain in September 1943 General Arnold had suggested to Sir Arthur Harris that the Eighth Air Force and the R.A.F. Bomber Command should be placed under a single Commander. This suggestion was not well received, especially as it was clear that the 'supreme commander' would be an American. General Arnold observed that Sir Arthur Harris had 'virtual autonomy' in his operations and was 'permitted . . . to go directly to the Prime Minister and give him full details.' *Global Mission*, (1949), pp. 448-449.

<sup>2</sup> Letter Portal to Arnold, 24th Oct. 1943.



175 miles, this still left them on the wrong side of the German frontier. Further modifications were about to increase this range still more but there were, as Sir Charles Portal observed, severe limits to what could be expected from an aircraft like the Spitfire which had been designed as a high performance interceptor fighter for the defence of the British Isles.<sup>1</sup> However desirable it might be to bring Fighter Command into closer contact with the *Luftwaffe*, this was an eventuality which had always been and still remained under the control of the *Luftwaffe*.

Responsibility for the success of the *Pointblank* offensive, therefore, seemed to depend almost entirely upon the bombers. The progress of their attack on the sources of German air power had, Sir Charles Portal admitted, fallen far short of the programme envisaged in the *Pointblank* plan, but as far as the Eighth Air Force was concerned, he attributed this to the failure of the American reinforcement schedule. General Eaker, he told General Arnold, had never disposed more than about half of the effective strength which had been demanded as the irreducible minimum for the first phase of the *Pointblank* offensive. This, Sir Charles Portal said, had prevented the Eighth Air Force from exploiting the 'great tactical advantage, including the element of surprise' which it had enjoyed in the early days of its operations. The Germans had been able to 'handle' the small forces to which General Eaker had been initially confined and they had been afforded the opportunity of adapting their tactics to meet the heavier attacks which followed.

So far as Bomber Command was concerned, there had been, Sir Charles Portal said, 'the special need for concentrating on the Ruhr during the summer months because of the short nights, the short life expected of "Oboe" and because of the importance of these industrial targets. There has also', he added, 'been the difficulty of recognising and locating by night the distant smaller towns in which the fighter factories are located.'<sup>2</sup>

These arguments and explanations may, as Sir Archibald Sinclair suggested, have constituted a 'salutary drubbing' for General Arnold. They did not, as the Secretary of State for Air also implied, offer any solution to the crisis of *Pointblank*.<sup>3</sup> Sir Charles Portal had agreed that

<sup>1</sup> Sir Charles Portal did not express his view of the ultimate range limit of Spitfires in figures but he did suggest that they would never be able to go farther than the American Thunderbolts could already go. This, as the Schweinfurt attack had already shown, would not be nearly far enough.

General Arnold and Sir Charles Portal had a long-standing disagreement about potential Spitfire range. To demonstrate his point of view, General Arnold caused some Spitfires to be specially equipped and to fly the Atlantic. See *Global Mission*, p. 496. The problem of a long-range fighter is not, however, as we have already noticed, simply a question of range. To be able to get there is one thing and to be able to fight when there is another.

<sup>2</sup> Letter Portal to Arnold, 24th Oct. 1943.

<sup>3</sup> Min. Sinclair to Portal, 31st Oct. 1943.

an effective attack on the *Luftwaffe* was cardinal to the major strategy of the war. Yet, as far as the operation of that attack was concerned, his reaction to General Arnold's criticisms seemed to reveal an attitude of extreme pessimism. Indeed, it may well be inferred that at this moment Sir Charles Portal saw little prospect of the Eighth Air Force emerging from the state of virtual neutralisation to which it had been reduced by operations culminating in the attack on Schweinfurt. After all, this American position towards the end of 1943 was no worse than he had predicted towards the end of 1942.

Certainly, Sir Charles Portal saw no prospect of engaging the Royal Air Force Fighter Command effectively in the *Pointblank* campaign. He had never accepted the proposition of a long-range fighter which could effectively engage opposing short-range, or interceptor, fighters and, in any case, as he had now told General Arnold, he did not believe that Spitfire range could be extended much farther. This all amounted to a somewhat bleak prospect, for it seemed that the only force immediately able to sustain the offensive at long range was the Royal Air Force Bomber Command. The longer winter nights would, of course, facilitate the development of Bomber Command attacks farther to the east of Germany, but, quite apart from Sir Arthur Harris' increasing preoccupation with the Battle of Berlin, about which Sir Charles Portal had been so enthusiastic, they would not make it any easier for the night force to locate 'the distant smaller towns in which the fighter factories are located.' Still less would it be possible for Bomber Command to locate the fighter factories themselves. Thus, it seemed that the *Luftwaffe* had won a decisive victory in the struggle for control of the air over Germany. It might even be supposed that the history of the Battle of Britain had repeated itself, but in reverse, and with the singular difference that the German fighter force, unlike Fighter Command in 1940, was emerging from the engagement with ever-increasing strength.

This supposition received alarming confirmation when, at the beginning of November 1943, new intelligence estimates of German air strength were made. Though these estimates suggested that the total first-line strength of the *Luftwaffe* had declined from 5,200 on 1st July 1943 to 5,000 on 1st October 1943, they indicated that German air strength on the Western front had increased in the same period from 1,620 to 2,015. The greater part of this increase was accounted for in terms of fighters. On 1st July it seemed that there had been 740 single-engined and 470 twin-engined fighters on the Western front. On 1st October, these first-line strengths were respectively estimated to be 800 and 725. Despite the *Pointblank* offensive which, it was assumed, would continue, further increases were expected. By 1st December 1943, it was predicted, the Western front would be protected by 800 single-engined and 760 twin-engined fighters. By 1st

April 1944 it was thought that these numbers would have mounted to 880 and 830 respectively. By this time, and on the eve of the planned date of *Overlord*, it was expected that the total front-line strength of the *Luftwaffe* would be 5,450 and, of the fighter force, 2,865.<sup>1</sup>

When Sir Charles Portal saw these figures he was shocked. The *Pointblank* plan had aimed at reducing the front-line strength of the German fighter force to about 650 aircraft by 1st April 1944. To suggest that the actual strength on that date would amount to some 2,865 aircraft was, he thought, 'tantamount to throwing overboard the whole plan.'<sup>2</sup> Even allowing for the fact that the Eighth Air Force had fallen seriously behind its *Pointblank* schedule both as regards its expansion and its programme of operations,<sup>3</sup> there was now good reason to doubt whether the *Pointblank* plan had been well conceived and, in particular, whether an effective attack on the *Luftwaffe* was a feasible operation of war.

Though it might have been more reasonable to deduce that the attack on the *Luftwaffe* had not been tried rather than that it had failed, this would, as far as the Eighth Air Force was concerned, have been little more than a distinction without a meaning. Most of the sources of German air power lay towards the centre or the eastern side of Germany and they could no longer be reached by the Eighth Air Force except at the cost of casualties which could not long be sustained by any air force.

Bomber Command was more favourably placed because the cover of darkness coupled with the ingenuity of its tactical methods still

<sup>1</sup> Draft Memo. by Inglis (A.C.A.S.(I)), 3rd Nov. 1943. These estimates were necessarily tentative and were based upon many factors which could not be precisely measured or accurately predicted. They did, however, provide the best evidence about the *Luftwaffe* which could be obtained at the time and they were on this occasion of extraordinary accuracy. Though precise comparisons between the British estimates and the actual German strengths cannot be made owing to different systems of classification, the following comparisons provide a reliable indication of the accuracy of British estimates at this time.

	British Estimates	German Figures
<i>Total 1st Line strength</i>		
1st July 1943:	5,200	5,396
1st October 1943:	5,000	4,830
<i>On Western Front</i>		
1st July 1943:	1,620	1,687
1st October 1943:	2,015	2,097
<i>Fighters on Western Front</i>		
1st July 1943		
S.E.	740	810
T.E.	470	478
1st October 1943		
S.E.	800	964
T.E.	725	682

For the purposes of this comparison, night fighters, most of which were twin-engined, and twin-engined fighters have been put in the same category. The German figures are derived from returns made by Q.M.G. German Air Min.

<sup>2</sup> Min. Portal to Inglis, 4th Nov. 1943.

<sup>3</sup> Which Sir Charles Portal was well aware of though on this occasion did not seem to take fully into account.

enabled it to undertake long-range operations on an intensive and sustained scale. Nevertheless, it was highly questionable whether the night offensive could profitably be diverted towards the attainment of the *Pointblank* intermediate objective, especially if the effort was to be single-handed instead of complementary to that of the Eighth Air Force. Bomber Command was not, as will have been noticed, in a position to inflict serious damage upon the German air force *in being*, not did it possess the necessary precision to destroy pin-point targets especially when they lay beyond the range of *Oboe*. Moreover, and in addition to these negative considerations, there was, as will also have been noticed, the positive factor of what Bomber Command was achieving in the pursuit of its 'main aim' and, therefore, of what might be lost by any considerable diversion of its effort.

This was a factor which, ever since the Battle of the Ruhr was begun in March 1943, had been of increasing importance. The greater the success of the general area campaign, the more difficult it became to contemplate any substantial diversion from it. Particularly was this so when the diversion itself offered prospects of success which were at best extremely slender. November 1943 was the time at which the prospects of disrupting the German air force had reached their lowest ebb, but it was also the time at which the chances of decisive success for the general area offensive had acquired their most promising aspect.

It is, therefore, not surprising that Sir Arthur Harris found this the appropriate moment to intervene with a vigorous demand for the continued pursuit and the reinforced application of the bombing policy which he believed was alone capable of producing final victory. Approaching the Prime Minister directly on 3rd November 1943, he listed nineteen German towns which, he claimed, had been 'virtually destroyed'. By this term he meant to express a degree of devastation which made the town 'a liability to the total German war effort vastly in excess of any assets remaining' and in many cases approaching 'complete destruction'. Sir Arthur Harris listed a further nineteen German towns which he classified as 'seriously damaged'. This portended a percentage of destruction in each 'greater than anything which we have experienced.' Finally, he listed nine more German towns which he described as 'damaged'.<sup>1</sup>

As a further indication of what had been achieved, Sir Arthur

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<sup>1</sup> Min. Harris to Churchill, 3rd Nov. 1943. The towns listed were as follows:

1. 'Virtually destroyed'. Hamburg, Cologne, Essen, Dortmund, Düsseldorf, Hanover, Mannheim, Bochum, Mülheim, Köln Deutz, Barmen, Elberfeld, München Gladbach/Rheydt, Krefeld, Aachen, Rostock, Remscheid, Kassel, Emden.

2. 'Seriously damaged'. Frankfurt, Stuttgart, Duisburg, Bremen, Hagen, Munich, Nuremberg, Stettin, Kiel, Karlsruhe, Mainz, Wilhelmshaven, Lübeck, Saarbrücken, Osnaabrück, Münster, Rüsselsheim, Berlin, Oberhausen.

3. 'Damaged'. Brunswick, Darmstadt, Leverkusen, Flensburg, Jena, Augsburg, Leipzig, Friedrichshafen, Wismar.

Harris compared the condition of some of these German towns with that of Coventry. In Coventry a hundred out of 1,922 acres had been devastated. In Hamburg, the comparable figures were 6,200 out of 8,382 acres, and in Essen they were 1,030 out of 2,630 acres. All these claims, Sir Arthur Harris explained, were founded upon 'vertical' photographic reconnaissance. 'We claim,' he said, 'only what can be seen in the photographs. What actually occurs,' he added, 'is much more than can be seen in any photograph.'

The incidence and location of this damage, the majority of which had been achieved since March 1943 'when the Heavies came into full production and "Oboe", "H2S" and the Pathfinders served to concentrate the effort,' suggested to Sir Arthur Harris that the Ruhr was 'largely "out"', and that much progress had been made 'towards the elimination of the remaining essentials of German war power.' Many other towns, and principally Berlin, still remained to be attacked or attacked again, but Sir Arthur Harris felt 'certain that Germany must collapse before this programme which is more than half completed already, has proceeded much further.' For what he believed was the decisive attack on Berlin, he appealed for American support. 'We can wreck Berlin from end to end', he concluded, 'if the U.S.A.A.F. will come in on it. It will cost between 400-500 aircraft. It will cost Germany the war.'<sup>1</sup>

Thus, Sir Arthur Harris reaffirmed his confident belief in the ability of strategic air power to bring about the total defeat of Germany. His minute did not mention *Overlord*, nor, most significantly, did it refer to the German air force. It is true that several of the towns listed by Sir Arthur Harris for future attack were in fact those principally associated with German aircraft production. Schweinfurt was among them and so also were Leipzig, Gotha, Augsburg, Brunswick, Wiener Neustadt and others.<sup>2</sup> Nevertheless, it was clear that Sir Arthur Harris regarded Berlin as the target of first importance and that he had no intention of affording Schweinfurt or any of the other aircraft towns priority over it or, indeed, any particular priority at all. As he said, in any case, an order of priority could 'never be strictly observed owing to weather considerations, phases of the moon, tactical circumstances, etc.'<sup>3</sup> So far from intending to join in the selective attack on German aircraft production it was evident not only that Sir Arthur Harris proposed to push home his offensive against Berlin, but that he expected the Eighth Air Force to join him in this general assault.

<sup>1</sup> Min. Harris to Churchill, 3rd Nov. 1943.

<sup>2</sup> It will be noticed that four of the six towns accorded special attention in the *Point-blank* target list were thus included. The six towns were Leipzig, Gotha, Augsburg, Brunswick, Bernburg and Kassel.

<sup>3</sup> Min. Harris to Churchill, 3rd Nov. 1943.

So far as the official policy governing Bomber Command was concerned there was nothing revolutionary in what Sir Arthur Harris had said. What he said about his past actions and the indication of his future intentions both accorded with a reasonable interpretation of the directives he had received. Various proposals, and notably those contained in the draft of the *Pointblank* directive, as to how the policy of Bomber Command might be drawn more closely into contact with that of the Eighth Air Force and, indeed, with the grand strategy of the war, had not yet taken the form of official instructions. Nevertheless, as Sir Arthur Harris doubtless realised, the existing official instructions, which had undergone little radical change since July 1941, no longer fully reflected the beliefs and intentions of the British Air Staff. An authoritative reaffirmation of the old policy at this time of crisis and fluctuating opinion would, therefore, have represented a compelling and, perhaps, decisive victory for the school of thought to which Sir Arthur Harris was such a devoted and single-minded adherent.

The adoption of Sir Arthur Harris' minute as the basis of a new directive would, in effect, have meant the abandonment of the *Pointblank* intermediate objective. Sir Arthur Harris did not believe that this objective could be attained by direct means with the forces at his disposal. For so long as the Eighth Air Force continued to be neutralised or, on the other hand, for so long as it was employed with Bomber Command in the general area assault, the German fighter force would, therefore, be permitted to continue its expansion in the belief that Germany could be defeated in spite of it. The proposition was clearly expressed by the Assistant Chief of the Air Staff for Intelligence. 'Embroidered as we are with "Overlord" and consequently with the necessity of lowering German fighter strength and production, we are apt,' Air Vice-Marshal Inglis wrote, 'perhaps, to overlook the possibility that the war can be won in the face of or in spite of an increasing air defence.'<sup>1</sup>

This was the exact negation of the view shared by Air Marshal Bottomley, Sir Charles Portal and General Arnold which was, expressed in Sir Charles Portal's words, that the success of the strategic air offensive 'depends on our ability to check the growth and reduce the strength of the day and night fighter forces which the enemy can concentrate against us . . .'<sup>2</sup> It was, however, more than this, for it was also the negation of the major strategy of the war under which *Overlord* was recognised as the principal and decisive operation. It was generally agreed, as it was admitted by Air Vice-Marshal Inglis, that

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<sup>1</sup> Min. Inglis to Portal, 5th Nov. 1943.

<sup>2</sup> Letters Portal to Arnold, 24th Oct. 1943, Arnold to Portal, 14th Oct. 1943. Min. Bottomley to Portal, 25th Sept. 1943.

*Overlord* was likely to succeed only if a reasonable degree of air superiority could be attained. A bombing policy which sought absolute victory without reference to its contribution to the success of *Overlord* had for a long time been somewhat irrelevant, but a bombing policy which ignored the *Luftwaffe* and left it intact for an assault on the *Overlord* forces was no longer acceptable.

This was the ultimate and insurmountable objection to the policy advocated by Sir Arthur Harris, but there were also other objections which may have been taken into consideration. It was, for example, difficult to see how the Eighth Air Force could join Bomber Command in the Battle of Berlin. The Flying Fortresses were not likely to suffer less severely over Berlin than they already had done over Schweinfurt. Moreover, there was a creeping suspicion that the Bomber Command area assault on German cities was not actually proving as decisive as Sir Arthur Harris believed. Air Marshal Bottomley, at any rate, did not now believe that the attack on Berlin was likely to end the war, even if damage on the Hamburg scale was achieved.<sup>1</sup>

Furthermore, and even assuming that the evasive tactics and neutralisation techniques of Bomber Command continued to be reasonably effective counters to the growing strength of the German fighter force, the policy of opportunist bombing which they necessitated was becoming less appropriate to the general situation of the war. In particular, the special tasks which were likely to be required in connection with *Overlord* were scarcely likely to be effectively fulfilled if, as Sir Arthur Harris claimed, an order of priority could 'never be strictly observed owing to weather considerations, phases of the moon, tactical circumstances, etc.'<sup>2</sup> These factors would naturally always remain as obstacles to any definite bombing programmes, but the situation demanded that they, and particularly those arising from 'tactical circumstances', should be reduced to the minimum proportions.

All these considerations clearly pointed towards the paramount importance of air superiority, but none of them shed any fresh light upon how that desirable object might be achieved. The continuing conflict between what was indicated as necessary and what seemed to be possible made it likely that Sir Arthur Harris' advice would be neither accepted nor rejected. It accounted for the dilemma which confronted Sir Charles Portal when, at the Cairo and Tehran Conference in November and December 1943, he reported to his American and British colleagues on the progress of the combined bomber offensive.

<sup>1</sup> Min. Bottomley to Portal, 12th Nov. 1943.

<sup>2</sup> Min. Harris to Churchill, 3rd Nov. 1943.

This was not deemed to be a suitable occasion for a detailed diagnosis of the situation. Nevertheless, the general optimism which coloured both the report<sup>1</sup> and Sir Charles Portal's further comments upon it<sup>2</sup> did not wholly conceal the gravity of the situation. In his comments, Sir Charles Portal drew attention to the 'tremendous importance' of the Bomber Command area attacks. He pointed out that thirty-eight German towns had been 'more or less seriously attacked' and that, from their total built-up area of 133 square miles, some thirty-two and a half square miles had been devastated. Sir Charles Portal estimated that 'perhaps 6,000,000 people or more have been made homeless and have spread alarm and despondency in the areas into which they have gone'. The replacement of clothing and movable goods destroyed in these devastating attacks was, he believed, either impossible or 'can only be done at the direct expense of the war effort.'<sup>3</sup> He had 'no shadow of doubt' that German morale was 'at an extremely low ebb' and he believed that Bomber Command might be 'at least half-way along the road of industrial devastation towards the point where Germany will become unable to continue the war'.

To this extent, Sir Charles Portal lent his high authority to both the claims and the expectations which had been formed a month earlier by Sir Arthur Harris. Further than this he did not go and he observed that the 'essence' of the first stage of the *Pointblank* offensive was the 'progressive destruction of the German fighter force'. He drew attention to the continuing expansion of the *Luftwaffe* and ascribed this partly to the fact that 'the rate of increase of the German single-engined fighter strength had not been accurately appreciated' when the *Pointblank* plan was formulated, partly to the fact that Bomber Command had been able to make only a limited contribution owing first to the short nights and then to the difficulty of finding small towns at long range, and largely to the failure of the Eighth Air Force reinforcement programme.<sup>4</sup> 'The hard fact is,' Sir Charles Portal said, 'that we are almost exactly three months behind schedule

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<sup>1</sup> The Combined Bomber Offensive Progress Report, 4th Feb.-31st Oct. 1943, prepared by Sir Charles Portal and General Eaker.

<sup>2</sup> Note by Portal for C.C.S., 3rd Dec. 1943.

<sup>3</sup> On this point, which was of cardinal importance, Sir Charles Portal had been most incorrectly advised by the intelligence experts. For this and a full analysis of the actual position in Germany at this time, see below, Chapter XI.

<sup>4</sup> Sir Charles Portal calculated that the Eighth Air Force had received only the following percentages of its planned strength:

Phase 1 (ending 1 July 1943): 89 per cent  
 Phase 2 (ending 1 Oct. 1943): 76 per cent  
 Phase 3 (ending 1 Jan. 1944): 67 per cent (first half only)

With these forces, General Eaker had despatched ninety per cent of the scheduled sorties but, Sir Charles Portal said, 'it has not been possible for them all to be against targets in the Plan. Nevertheless,' he added, '58 per cent of the planned successful sorties have been flown against targets in the Plan, and 54 per cent against the G.A.F. targets in the Plan.'



and German fighter production and strength are both higher than the Plan contemplated.'

The dependence of *Overlord* on *Pointblank* forced Sir Charles Portal to the conclusion that the existing plan, which the Eighth Air Force had been attempting to carry out, could not be abandoned. The attack on the *Luftwaffe* must continue, and he advised the Combined Chiefs of Staff of the need for,

'(a) The greatest possible increase in the force at General Eaker's disposal in respect of both formed units and replacement aircraft and crews. I suggest it may be necessary to give the Eighth Air Force priority over the 15th Air Force in new groups until the Spring.<sup>1</sup>

(b) Subject to (a) above, General Eaker should be ordered to proceed with the present Plan up to the limit which can be achieved without seriously outrunning the supply of replacement aircraft and crews in prospect for the units which he has at any time.'

These recommendations, which were endorsed by the Combined Chiefs of Staff at Mena House on 3rd December 1943,<sup>2</sup> offered no radical solution of the *Pointblank* crisis. The future employment of Bomber Command in the attack on the *Luftwaffe* was not referred to, nor was any mention made of the need for long-range fighters. Sir Charles Portal merely hoped that General Eaker would be enabled to 'feel his way and perhaps to achieve more than we at present dare to expect'. This was a hope which, in unexpected ways, was to be more than realised both by the Eighth Air Force and Bomber Command, but while the allied Conference was sitting in November and December 1943 it still seemed somewhat forlorn. Nevertheless, the determination to persist with the attack on the *Luftwaffe* had been re-affirmed. In the circumstances, this was a courageous decision and, perhaps, one of the most important of the war.

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<sup>1</sup> The 15th Air Force was now being formed with its bases in Italy.

<sup>2</sup> C.C.S. Mtg., 3rd Dec. 1943.

#### 4. The approach to *Overlord* and the beginning of a Combined Bomber Offensive, December 1943–February 1944

The original meaning of the term *Pointblank* had been the strategic air attack on the sources of German power or, in the often repeated words of the Casablanca directive, 'the progressive destruction and dislocation of the German military, industrial and economic system and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened'. The *Pointblank* plan had thus provided a common object which could apparently be pursued by the different tactics of the two allied bomber forces being built up in England. Differences of opinion between the British and American Air Staffs as to how strategic air attacks should or could be accomplished had seemed to be less important than the general agreement that these attacks were integral and indispensable to the ultimate aim of victory over Germany. Moreover, the belief had existed that the British night area, and the United States day precision, attacks would become mutually complementary and that a 'round the clock' offensive would amount to a combined bomber offensive. This was the hope which had found expression in the Casablanca directive of January 1943, and which had been reaffirmed in the *Pointblank* plan itself. It was, however, a hope which foundered on the 'intermediate objective' of the plan.

The attack on the *Luftwaffe* had taken its place in the *Pointblank* plan mainly for the benefit of the United States Army Air Forces daylight bombers. As the term 'intermediate objective' implied, it was regarded as little more than a preliminary means to the principal end of daylight precision attacks upon selected key industries in Germany. As such it had seemed to be a task which could be largely fulfilled by Eighth Air Force bombers. The Royal Air Force Bomber Command could apparently render the necessary support without prejudice to the pursuit of its 'main aim' which was the general industrial dislocation of Germany. This, at any rate, was what the *Pointblank* directive of June 1943 had suggested.

The German fighter force had, however, proved to be a more effective weapon and the German aircraft industry an altogether more formidable target than expected. Moreover, the Eighth Air Force had not been reinforced and expanded in accordance with the minimum requirements stated by its Commanding General. Above all, the daylight formations of Eighth Air Force bombers, so far from showing themselves consistently capable of beating off enemy fighter

attacks, had suffered many heavy disasters. On a number of occasions, when beyond the friendly reach of fighter cover, these Fortress formations, like the Wellington formations of 1939, had seemed incapable of surviving in their own element. As 1943 came to an end, the German fighter force, instead of diminishing, seemed to be constantly increasing.

This fighter force had already driven the United States Eighth Air Force to break off its long-range daylight offensive. It constituted a grave and increasing threat to the Bomber Command assault by night and it hung like a spectre over all the plans and preparations for *Overlord*. To those who were alive to the potentialities of this situation, *Pointblank* had lost much of its original meaning, and the importance of an effective attack on the *Luftwaffe* had acquired a new and much wider significance.

It now appeared that a drastic reduction of German fighter strength was not only, as it always had been, the necessary concomitant of the American plan for daylight bombing but that it was also a requisite for the continuation of the Bomber Command night offensive and, above all, for the launching of the supreme operation, the invasion of Normandy.

So overwhelming were these considerations that Sir Charles Portal had been led to advocate a continued and vigorous attack on the *Luftwaffe* even after he had reached the stage of deep pessimism about how it was to be carried out.<sup>1</sup>

Sir Arthur Harris was, however, by no means overwhelmed and his confidence in the decisive nature of the general area assault upon the principal German cities now led him to make forecasts about the outcome of this offensive which exceeded anything he had previously claimed. Writing to the Air Ministry on 7th December 1943 the Commander-in-Chief suggested, in an official letter, that it was possible for the Lancaster element of his Command, alone and single-handed, to bring about the surrender of Germany by 1st April 1944. This letter is of such interest and importance that it is worth reproducing in full:

*7th December, 1943. Sir Arthur Harris to Air Ministry*

'Sir,

I have the honour to refer to the progress of the Bomber Offensive against Germany in connection with which I have had prepared the attached paper<sup>2</sup> to illustrate the achievements of this Command up to date.

2. This achievement is expressed in terms of acreage destroyed per tons of bombs dropped and of acreage destroyed in compari-

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<sup>1</sup> Note by Portal for C.C.S., 3rd Dec. 1943. Letter Portal to Arnold, 24th Oct. 1943.

<sup>2</sup> Not reproduced.

son with acreage attacked. The acreage dealt with refers throughout only to areas which are 40% or more built up where results can be accurately measured, and a true indication given of what has already been accomplished. The figures to the end of October show that 167,230 tons of bombs dropped on the 38 principal towns which had been attacked have destroyed 20,991 acres or about 25% of the 84,160 acres attacked. Of this total 18,641 acres or nearly 22% (out of the total of 25%) have been destroyed by the 102,000 tons dropped during the first 10 months of this year, a clear indication of the great advance in efficiency due to the use of navigational aids combined with the policy of heavy concentration raids. The acreage destroyed is judged from vertical photographs which, as is obvious, cannot and do not show the full extent of the actual damage.

3. It is not possible to dogmatise on the degree of destruction necessary to cause the enemy to capitulate but there can be little doubt that the necessary conditions would be brought about by the destruction of between 40% and 50% of the principal German towns.

4. By the 1st April 1944, the closing date of the C.B.O. Plan, we should have destroyed 35,750 acres out of a total target area of 89,000 acres (i.e. 40% of the built up areas) provided we are able to maintain our efficiency at the same rate as was attained during the last 5 months (June–October) and provided we are able to drop an average of 13,500 tons per month on the targets which is the same as the average dropped during the preceding 5 months.<sup>1</sup>

The population of the towns attacked would be over 75% of the total population of towns in Germany having a population of 50,000 inhabitants or over.

5. In October, 76% of the weight of bombs dropped was carried by Lancasters and in future due to the transfer of Stirlings to H.C.U.s.<sup>2</sup> and the increasing difficulty of finding suitable targets and conditions for the Halifaxes, this ratio will tend to rise. It becomes relevant therefore to consider what may be expected to be achieved by the Lancasters in the future.

Our expectations for the period December 1943–March 1944 inclusive are as follows:

*Lancasters only*

Average number of Operational  
Squadrons

40·25

<sup>1</sup> It is perhaps relevant to note that in the event, Bomber Command dropped the following bomb tonnages in area attacks on German towns: Dec. 1943—11,318, Jan. 1944—16,841, Feb. 1944—11,791 and Mar. 1944—19,710. This gives an average of 14,915 tons per month over the period. Monthly reports Portal to Churchill.

<sup>2</sup> Heavy Conversion Units which had been interposed between O.T.U's and the squadrons to train crews in the handling of four-engined aircraft. The O.T.U's were equipped with twin-engined Wellingtons.

## 56 COMBINED BOMBER OFFENSIVE: STRATEGY

At 85 sorties per month per  
Squadron

(S.D. 98 rate) <sup>1</sup>

3421  
sorties per month.

With a bomb load of 9730 lbs. per  
aircraft and allowing 7% for abortives  
(being the actual rates for Aug.-Nov.  
1943 inclusive)

13850  
tons per month.

Allowing a loss rate of 5% to sorties which is what we must expect bearing in mind the type of target we shall be attacking during the coming winter months, this would cost 171 Lancasters per month which compares with a planned new production of 212 Lancasters per month. This allows us no margin whatsoever after taking into account the requirements of the planned expansion.

6. From this it appears that the Lancaster force alone should be sufficient but only just sufficient to produce in Germany by April 1st 1944, a state of devastation in which surrender is inevitable. This, however, is a reasonable expectation only if the assumptions made above are fulfilled. It cannot be too strongly emphasised that even a minor change in any of the following factors would entirely alter the picture:

- (i) failure of Lancaster production to come up to schedule;
- (ii) increase in the ratio of our losses to sorties;
- (iii) failure in development or delivery of the navigational aids on which the rate of efficiency of our attacks largely depends.

The only insurance we have against disappointments in any of these matters is the help which the Halifaxes can give to the Lancasters during the period under consideration. This, however, cannot be rated very highly, and is most unlikely in practice to do more than offset diversions, e.g. Bodyline<sup>2</sup> targets, from the main bombing objectives.

7. It is therefore obvious that the success of the bombing offensive depends on the Lancasters and that their production and protection from avoidable loss are more important than anything else for the purpose of winning the war quickly. In view of this it is recommended that the following action be taken as a matter of the greatest urgency and on the highest priority:

- (i) that renewed efforts should be made to increase Lancaster production and C.R.O.<sup>3</sup> output during the next 4 months even if this necessitates falling off in production of other heavy bomber types and without regard to objections which may be raised by any interests adversely affected by it.

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<sup>1</sup> Secret Document laying down rate of attack.

<sup>2</sup> Code name for German V-weapon production.

<sup>3</sup> Civil Repair Organisation.

(ii) that overriding priority should be given to the formation and equipment of 100 (Counter-measures) Group.<sup>1</sup> These should not be held up as at present they seem likely to be by reluctance to cause inconvenience to the personnel of other Groups or by the failure of T.R.E.<sup>2</sup> to treat their side of the programme as of absolutely first rate importance.

(iii) that the radio aids required by Bomber Command should be given priority in labour and materials over all conflicting claims.

The Bomber Offensive should in fact now be accorded the same level of priority as was given to the defensive anti-U-boat campaign a year ago.

8. I regard the necessity of taking energetic action as indicated in para. 7 above as a condition precedent to the successful fulfilment of the Bomber Offensive. Time is an essential factor and if we are to fulfil our task by the 1st April 1944, or indeed at all, any delay in taking all measures possible to ensure the delivery of sufficient aircraft suitably equipped for their difficult task and adequately protected against the ever-increasing defences of the enemy is likely to prove fatal.'<sup>3</sup>

At the beginning of November 1943, it will be recalled, Sir Arthur Harris had told the Prime Minister that, if the Eighth Air Force could be drawn into the Battle of Berlin, the war could be brought to a victorious conclusion at a cost of between four and five hundred allied aircraft.<sup>4</sup> Now, scarcely more than a month later, he did not, in his letter to the Air Ministry, make any mention of the Eighth Air Force but he claimed that the same result could be achieved, though at slightly higher cost, by the Lancaster element of his Command alone. Furthermore, he asserted that this victory could be won by 1st April 1944 which was a month before the planned date for the launching of *Overlord*, an operation which he did not mention but which he obviously had in mind. Sir Arthur Harris thus made it abundantly clear that he was not concerned with an air offensive which would make *Overlord* possible but with one that would make it unnecessary. Moreover, if he was really as confident as he stated, that his Lancasters could win this single-handed victory, it was no more than logical that he should make no reference to the plight of the United States Eighth Air Force.

Nevertheless, Sir Arthur Harris had shown some anxiety about the increasing strength and efficiency of the German air defences and he had admitted that any further increase 'in the ratio of our losses to

<sup>1</sup> 100 Group was being prepared for the specific purpose of operating against the German air defences by means of Radio counter-measures.

<sup>2</sup> Telecommunications Research Establishment.

<sup>3</sup> The letter was circulated to P.S. to S. of S., P.S. to C.A.S., V.C.A.S. D.C.A.S., A.M.S.O., A.C.A.S.(P), A.C.A.S.(T.R.), D.B. Ops. and A.C.A.S.(O).

<sup>4</sup> Min. Harris to Churchill, 3rd Nov. 1943.

sorties' was one of the factors which might defeat his plans. He clearly understood that the scope for evasion open to the night bombers was limited and was likely to become more limited. He evidently believed, however, that this threat could be held in check by radio counter-measures and he strongly advocated the immediate formation of 100 Group for this purpose. Thus, though Sir Arthur Harris made no mention of the need to attack the German air force, he did urge more vigorous measures for its neutralisation.

The real force of Sir Arthur Harris' argument, however, depended upon the validity of his estimate of what was necessary to bring about the capitulation of Germany. He had admitted that it was not possible to 'dogmatise' about this, but he had, nevertheless, confidently asserted that the result could be achieved by the devastation of about half the acreage of the towns in which three-quarters of the German people who belonged to towns with a population of more than 50,000 lived. All the same, it could be inferred that Sir Arthur Harris was not entirely as confident about this as he claimed and it will have been noticed that he insisted that it was necessary for Bomber Command to emerge on 1st April 1944 with a front-line Lancaster force not only as large as but larger than that which it possessed on 1st December 1943. Moreover, Sir Arthur Harris, who never understated his case, may, on this occasion, have been led into overstating it by the prospect which was already clearly in view, of having his major effort diverted first towards the selective purposes of the Eighth Air Force in which he did not believe and then towards the direct preparations for and eventual support of *Overlord*.

However all this may have been, Sir Arthur Harris' letter was, nevertheless, a formal and official presentation of the case for persevering with the general area assault against the principal and most populous German towns. As such, it re-emphasised the 'main aim' of Bomber Command which, having been foreshadowed in the directive of July 1941, had been substantially adopted in that of February 1942, confirmed by the authority of the Combined Chiefs of Staff in the Casablanca directive of January 1943, and specifically not cancelled in the *Pointblank* directive of June 1943.<sup>1</sup> Though Sir Arthur Harris had, in his letter of 7th December 1943, as on earlier occasions, attached less significance to the various subsidiary and diversionary aims than had been indicated in these somewhat confusing directives, the policy implications of his latest recommendations were, as far as the 'main aim' was concerned, undoubtedly and demonstrably in full accord with the officially declared and officially confirmed policy

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<sup>1</sup> The first two of these directives were written before Sir Arthur Harris assumed command of Bomber Command. None of them was written, as is sometimes supposed, while Sir Arthur Harris was D.C.A.S. The directive of 9th July 1941 was sent under the auspices of Air Vice-Marshal Bottomley.

which was supposed to govern the conduct of Bomber Command. Sir Arthur Harris' letter of 7th December 1943 amounted, therefore, not to a demand that bombing policy should be changed but to one that it should be confirmed and that more effort should be devoted to the 'main aim' and less to the subsidiary activities which had for so long sapped its fulfilment.

The failure of the Eighth Air Force to grapple effectively with the *Luftwaffe*, which had become apparent only after the issue of the *Pointblank* directive, and the approach of *Overlord* had, however, combined to produce new currents of opinion in the Air Staff. Though Sir Charles Portal had shown at the Cairo and Tehran Conference that he still entertained the highest expectations of the general area offensive, he had pledged his full support to the selective plan of attack upon the industry nourishing the German fighter force. Even earlier, in September 1943, his deputy, Air Marshal Bottomley, had shown grave concern at the course of the Bomber Command offensive and, in particular, at the apparent indifference of Sir Arthur Harris to the task of checking the growth of the German fighter force by a selective application of the area bombing technique. Moreover, all those in the highest positions had now accepted the prospect of launching operation *Overlord* and had, therefore, recognised the necessity and urgency of attempting to secure at least a measure of air superiority.

In these circumstances the Air Staff was not likely to find Sir Arthur Harris' recommendations acceptable. 'You suggest', Air Marshal Bottomley told him on 23rd December 1943, 'that there can be little doubt that the destruction of between 40 and 50% of the fully built up areas (40% or more built up) of the principal towns which have been, or will be, subjected to attack, will cause the enemy to capitulate. While the 38 principal towns already attacked', Air Marshal Bottomley said, 'may contain 75% of the total population of the towns in Germany of 50,000 inhabitants or over, these towns in their entirety contain only about one third of Germany's total population. Thus, at the outside,' Air Marshal Bottomley continued, 'only some 11% of the total population would be de-housed. Moreover, the contribution to the German war effort, and the facilities for housing evacuated populations which are provided by cities in the Occupied Countries, including Vienna, Budapest, and those in Polish Silesia and Czechoslovakia, should not be overlooked. The grounds for assuming that the degree of destruction suggested would necessarily result in capitulation, are therefore', Air Marshal Bottomley concluded, 'not entirely clear . . .'

These doubts about the efficacy of the general area offensive, though they had been growing for some time, had never been officially expressed by the Air Staff since the initiation of the policy in 1941. Air Marshal Bottomley's words, therefore, had an extraordinary



significance which amounted to nothing less than the disavowal of the long established 'main aim' of Bomber Command. This disavowal was not, however, made without an alternative policy in mind. 'Your proposals', Air Marshal Bottomley proceeded to explain to Sir Arthur Harris, 'imply a continuation of area attack upon the largest and most densely populated centres, since this is clearly the method by which the greatest return in terms of acres destroyed for tons dropped is to be expected. The attack of small centres of population,' he said, 'which nevertheless contain vital industries, e.g. ball-bearing or fighter assembly plants, would, in terms of the policy implied in your memorandum, prove uneconomical targets. It is, however,' Air Marshal Bottomley continued, 'a principle of policy as directed by the Combined Chiefs of Staff that as far as is practicable your efforts should be co-ordinated with and complementary to those of the Eighth Air Force. The aim of this force,' he explained, 'is to concentrate primarily on the destruction of the German fighter aircraft industry and the ball-bearing industry. Success of this task,' Air Marshal Bottomley stated, 'is vital to the successful conduct of the combined bomber offensive; the neutralising of the German Fighter Force is certainly,' he added, 'a pre-requisite to the successful launching of "Overlord". It is essential therefore that the attempt to achieve within the time available the maximum destruction of the major built-up areas in Germany should not be allowed to prejudice the implementation of the Joint Anglo-American policy of employing the night bomber force whenever possible for the destruction of vital centres associated with the above mentioned industries; these industries have been accorded the highest priority in the combined bomber offensive plan.' This was a clear statement, but Air Marshal Bottomley now became even clearer.

'I am to emphasise the fact', he said, 'that your night bomber forces would make the greatest contribution by completely destroying those vital centres which can be reached by day only at heavy cost; examples are Schweinfurt, Leipzig and centres of twin-engined fighter industry.' Then, showing an even more resolved frame of mind, Air Marshal Bottomley quoted from an intelligence report, which, he said, 'is of particular interest in this connection.' The paragraph which he quoted said that 'whereas the German people feared the night attacks, Hitler and the German High Command feared the daylight precision attacks on individual factories. Hitler openly boasted', it said, 'that he could, by means of his party organisations, control the morale of the population for some considerable time—certainly over the critical year 1943.'<sup>1</sup>

Thus, in so far as policy was concerned, Air Marshal Bottomley,

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<sup>1</sup> Letter Bottomley to Harris, 23rd Dec. 1943.

speaking on behalf of the Air Staff, had indicated that the aim of general area assault on industrial or, at any rate, urban morale in Germany no longer entirely held the field. He had suggested that the success of the bombing offensive was not to be measured simply in terms of acreages devastated, but in those of vital industries affected. In particular, he had directed Sir Arthur Harris' attention to the need of harnessing the area offensive to the selective purpose of damaging the German fighter industry and the ball-bearing industry upon which it so closely depended. These views had an immediate application to the major strategy of the war.

As far as techniques were concerned, Air Marshal Bottomley had indicated his belief that, if it were possible, precision bombing was likely to be more effective than area attack. This view was presently to have an application, realised more clearly by the Air Staff than by Sir Arthur Harris, to the increasingly versatile capabilities of Bomber Command.<sup>1</sup>

Of most immediate significance, however, was the fact that Sir Arthur Harris had been asked, not so much to support the Eighth Air Force in the pursuit of the *Pointblank* 'intermediate objective', for the American bombers had at least temporarily broken off the engagement, but to attempt to achieve by selective area attack at night at least something of what the Eighth Air Force had seemingly failed to achieve by precision attacks in daylight. Thus, to take a particular example, Bomber Command was now invited to smash the ball-bearing plants at Schweinfurt by an area attack on that town.

Schweinfurt was the principal centre of German ball-bearings production and because of the very high proportion of total German, and, indeed, European, output for which it was thought to be responsible, this single industrial area had long been regarded by those who believed in selective bombing as one of the outstanding targets in Germany.

Nor did this advice fall on deaf ears. It fortified the intention of the United States Air Staff to carry out major attacks on Schweinfurt as soon as, and as events showed, before, the Eighth Air Force was strong enough to undertake the task. It also excited the interested attention of the British Air Staff who had, in the spring of 1942, urged Sir Arthur Harris to consider the possibility of a Bomber Command attack.<sup>2</sup> It will, however, be remembered how Sir Arthur Harris had brushed aside these suggestions on the ground that Schweinfurt was strategically a doubtful, and tactically a very difficult target.<sup>3</sup> By the

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<sup>1</sup> Nevertheless, Sir Arthur Harris, as will be seen below, played a vital part in creating these abilities. In particular, it was his decision which kept 617 Squadron in being after it seemed to have exhausted its immediate purpose. See below, p. 179.

<sup>2</sup> Letter Baker to Harris, 7th April 1942.

<sup>3</sup> Letter Harris to Baker, 11th April 1942. See above, Vol. I, pp. 347-348.

summer of 1942, the issue seemed to have fallen into the limbo of over-ambitious plans. The Air Staff had decided that five hundred bombers would be required to make the attack effective and that they were not prepared to launch it until the Special Operations Executive could arrange for the placing of ground beacons known as *Eureka* to guide the force to such an obscure target.<sup>1</sup>

Despite the difficulties, the Director of Bomber Operations, Air Commodore Bufton, who had so forcefully and persistently argued the case for creating the Pathfinder Force with the aim of increasing the accuracy of Bomber Command, continued with equal persistence to press the case for a selective attack upon ball-bearings production and particularly, of course, upon Schweinfurt. In spite of the difficulties and in spite of the mounting scale of success being obtained by Sir Arthur Harris in the general area assault, Air Commodore Bufton never allowed his superiors in the Air Staff to lose sight of the Schweinfurt issue and on frequent occasions he directly drew the attention of Sir Arthur Harris to it. In the summer of 1943 he strove vigorously to secure a follow-up night attack by Bomber Command against Schweinfurt immediately after the Eighth Air Force day attack which was planned for the first suitable opportunity after 17th July.<sup>2</sup>

'History may prove', he suggested that the Bomber Command crews should be told immediately before taking off, 'that tonight's operation, in conjunction with the day attack which is taking place at this moment, will be one of the major battles of this war. If both operations are successful, German resistance may be broken and the war ended sooner than could be possible in any other way'. He wanted the crews to know that 'every vital piece of mechanism is dependent upon ball-bearings' and that owing to extreme vulnerability to fire and water 'literally millions' of bearings could be converted into 'so much scrap metal'. Finally, he suggested that the crews should be told that they had 'the opportunity to do more in one night to end this war than any other body of men.'<sup>3</sup>

This, however, was not to be and Bomber Command did not follow the Eighth Air Force to Schweinfurt either in August or in October 1943. In any case the Eighth Air Force chose a full-moon period to make their first attack on 19th August, and, though they carried incendiary bombs in the hope of lighting the target for a night attack, it must have been obvious that Bomber Command could scarcely

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<sup>1</sup> Min. Grierson (S.O.E.) to Gubbins (S.O.E.), 20th Aug. 1942. Bomber Command did not, of course, possess 500 front-line bombers at the time.

<sup>2</sup> Min. Bufton to Bottomley, 15th July 1943.

<sup>3</sup> Min. Bufton to Bottomley, 25th July 1943. The exhortation was prepared in consultation with Mr. Lawrence of M.E.W. and Mr. Hubbard, the ball-bearing controller at the Ministry of Supply.

carry it out in such circumstances. Nevertheless, Air Commodore Bufton continued to press further for attacks and he did not abandon hope of getting Bomber Command to join in. The Ministry of Economic Warfare, he told Air Vice-Marshal Coryton, the Assistant Chief of the Air Staff for Operations, on 2nd September 1943, regarded the German supply of ball-bearings as being so critical that they had 'preempted' the Swedish output 'to the extent of some 2 million pounds'. They were, he added, 'most anxious' for a further attack on Schweinfurt and for Bomber Command participation. The Germans were also, he suggested, anxious. In August 1942 Schweinfurt had been defended, he observed, by 'only a few light gun batteries.' Now, a year later, he pointed out, the town was covered by forty-four heavy guns, fifty-seven light guns, forty-nine searchlights, three decoys and a very extensive system of smoke-screen generators.<sup>1</sup>

The two Eighth Air Force attacks on Schweinfurt, and particularly the second carried out on 14th October 1943, caused some significant changes in the situation. A confidential United States Intelligence Summary of 30th October 1943 claimed that in the second attack 'The striking force accomplished their mission and released over 500 tons of bombs on all five large ball-bearing plants. It is estimated', the report concluded, 'that this attack reduced the productive capacity of these vital plants by at least 75 per cent.'<sup>2</sup> Public opinion in the United States had, however, been profoundly shocked by the heavy losses sustained by the Eighth Air Force and General Arnold presently found it advisable to translate these optimistic claims into a public declaration. 'Our attack was', he said, 'the most perfect example in history of accurate distribution of bombs over a target. It was an attack which will not have to be repeated for a very long time, if at all.'<sup>3</sup> These claims, and particularly their publication, did not make a strong case either for a third Eighth Air Force or an initial Bomber Command attack on Schweinfurt.

Nevertheless, in the view of the Ministry of Economic Warfare, the case for further attacks on Schweinfurt not only continued to exist, but had actually been increased, and their appreciation of the situation was quite different from the view which was given public expression by General Arnold. They recommended, in fact, that the Kugelfischer plant in Schweinfurt should be regarded as a target of first priority

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<sup>1</sup> Min. Bufton to Coryton, 2nd Sept. 1943.

<sup>2</sup> Informational Intelligence Summary No. 43-48. 30th Oct. 1943, F.R.C. Central File 385-D. 'Warfare'. It is noteworthy that in the same report it is claimed that on 14th Oct. 1943 Fortress gunners destroyed 186 enemy fighters, probably destroyed another twenty-seven and damaged eighty-nine. Thunderbolts were thought to have accounted for a further thirteen, one probably destroyed and five damaged.

<sup>3</sup> *Report of the Commanding General of the Army Air Forces to the Secretary of War*, 4th Jan. 1944, p. 51 (published). Reported in *London Times* 'Bombers over Europe', 4th Jan. 1944.

and they suggested that in view of its situation right inside the town, the best means of disposing of it and its workers would be by a night area attack.<sup>1</sup>

This intelligence attracted the immediate attention of Air Commodore Bufton who, on 30th November 1943, suggested to the Assistant Chief of the Air Staff for Operations that 'the Schweinfurt complex represents the outstanding priority target in Germany, not only in respect of its importance to the armaments industry generally, but also in its relation both to the G.A.F. and to "Crossbow".<sup>2</sup> A completely successful attack upon it would,' he continued, 'have an immediate and far reaching effect upon Germany's war effort and incidentally upon her morale, as work in all kinds of factories would be held up through lack of ball-bearings.'

The importance of Schweinfurt had, Air Commodore Bufton said, 'consistently been impressed' upon Bomber Command, but no attack had been made. Bomber Command had, he complained, 'firmly set their faces against "panaceas", but,' he submitted, 'if one exists it is certainly the Axis ball-bearing industry.' The Americans, he observed, were now reluctant to contemplate a third attack, but he once more appealed for Bomber Command participation. He suggested that the difficulty of finding Schweinfurt at night had been much exaggerated at High Wycombe and he pointed out that the Commander of the Pathfinder Force, Air Vice-Marshal Bennett, saw 'no great difficulty' in the task.

Air Commodore Bufton did not think that further appeals to Sir Arthur Harris would serve any useful purpose. He thought the matter should now be taken up by the Deputy Chief of the Air Staff and that 'by some means' Bomber Command should be persuaded to place Schweinfurt in the first priority until it was destroyed.<sup>3</sup>

There was really nothing new about this suggestion by Air Commodore Bufton. It followed very closely the lines of the advice which he and his predecessor, Air Commodore Baker, had been persistently tendering since the early months of 1942. What had, however, changed was the attitude of the Air Staff. It is true that Air Commodore Bufton's superiors had long been impressed by the argument favouring a Bomber Command attack on Schweinfurt, but they had relied upon persuasion rather than directives to get it carried out by Sir Arthur Harris. At least they had tolerated the fact that Sir Arthur Harris had not made the attack. Now they were in a much more determined frame of mind and the reaction to Air Commodore Bufton's advice was sympathetic, swift and, eventually decisive. This

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<sup>1</sup> M.E.W./E.I.2 Report, 16th Nov. 1943.

<sup>2</sup> Code word for the attack on V-weapon launching sites.

<sup>3</sup> Min. Bufton to Coryton, 30th Nov. 1943.

was, no doubt, due to the realisation that almost on the eve of *Overlord*, the *Pointblank* plan was in danger of foundering in the crisis which beset it.

On 17th December 1943 the Deputy Chief of the Air Staff, Air Marshal Bottomley, sent an Air Staff paper to Sir Arthur Harris in which the conclusions reached by the Ministry of Economic Warfare in their recent report were brought to his attention. In a covering letter, Air Marshal Bottomley asked for an early Bomber Command attack on Schweinfurt.<sup>1</sup> Six days later, as will be recalled, and again as a result of a direct suggestion by Air Commodore Bufton, he reverted to the subject of Schweinfurt in a second letter to Sir Arthur Harris.<sup>2</sup>

These communications did not, however, result in a Bomber Command attack on Schweinfurt. On the contrary, the first letter drew from Sir Arthur Harris a vigorous reply. Addressing himself to Air Marshal Bottomley on 20th December 1943, the Commander-in-Chief asserted that a night attack on Schweinfurt was not a 'reasonable operation of war'. He pointed out that the town was heavily defended, small in size and difficult to find. He estimated that six or seven full-scale attacks would be necessary to destroy it and even then he thought the results would be 'dubious'. If the place was really as important as claimed he suggested that the Americans should attack it again.

Sir Arthur Harris did not, however, believe that Schweinfurt was of much importance. 'The claims as to the actual percentage of Germany's ball-bearing supply manufactured in Schweinfurt have,' he said, 'always been exaggerated and have been progressively reduced, even by their authors. At this stage of the war,' Sir Arthur Harris continued, 'I am confident that the Germans have long ago made every possible effort to disperse so vital a production. Therefore,' he added, 'even if Schweinfurt is entirely destroyed, I remain confident that we shall hear no more of the disastrous effects on German war production now so confidently prophesied.'<sup>3</sup>

Sir Arthur Harris did not, of course, have access to any intelligence about the German ball-bearing position, other than that available to

<sup>1</sup> Letter Bottomley to Harris, 17th Dec. 1943. The Air Staff Memo. is dated 12th Dec. Also enclosed was an M.E.W. note, dated 11th Dec. 1943, reporting the impression of the British Minister at Stockholm to the effect that the Germans were becoming increasingly anxious about ball-bearing supplies. In addition, another M.E.W. note, dated 13th Dec. 1943, was enclosed suggesting that the destruction of the RIV ball-bearing plant at Villar-Perosa in Italy would be a valuable contribution.

<sup>2</sup> See above, p. 59 ff. Air Commodore Bufton suggested the matter should again be raised in a minute of 20th Dec. 1943 which he addressed to Air Marshal Bottomley (through Air Vice-Marshal Coryton). Air Vice-Marshal Coryton concurred and added that Sir Arthur Harris should be 'ordered' to carry out the attack. Min. Coryton to Bottomley, 20th Dec. 1943.

<sup>3</sup> For an appraisal of what did actually happen, see below, p. 269 ff.

the Air Staff, but he claimed that his somewhat sceptical contention was supported 'by an unending series of previous examples with "Panacea" targets.' To show what he meant Sir Arthur Harris said, 'had we claimed two years ago to have been able to do half the damage to the German railway system and rolling stock that has since been done, I have not the least doubt that the "Panacea" mongers would have claimed such a scale of damage as lethal to the entire internal communication system of Germany. Nevertheless,' Sir Arthur Harris said, 'these people go out of their way in their reports now to point out that everything we have done to German transportation is ineffective because the destruction to industry has so reduced the demands on the railways that the railways have now plenty and to spare for dealing with what remains!'

Taking a less hypothetical example, Sir Arthur Harris said, 'for years we have been told that the destruction of the Moehe Dam alone would be a vital blow to Germany.<sup>1</sup> Both the Moehe and Eder Dams were destroyed and I have seen nothing, either in the present circumstances in Germany or in M.E.W. reports to show that the effort was worth while except as a spectacular operation.'

The same thing had happened, Sir Arthur Harris claimed, in the case of the molybdenum mine at Knaben. 'This again,' he said, 'was going to be a vital blow', but the only result of the destruction of the mine was, he asserted, that 'the Boche has merely reverted to the use of an alternative commodity.' Sir Arthur Harris found the case of the oil plan equally exasperating. 'We spent . . . the best part of a year,' he said, 'in attempting to destroy German synthetic petrol sources on the assurance that the German fuel situation was utterly precarious. On top of that assurance,' he complained, 'the Germans opened and waged the most extensive war of movement in Russia that the world has ever seen.'

Sir Arthur Harris poured equal scorn upon the attacks on the oil refineries at Ploesti, carried out by the United States Army Air Forces, and on the marshalling yard at Modane, and in the light 'of the above examples of the infallible fallibility of the "Panacea" mongers and parochial experts,' he asked to be excused if he had become 'cynical with regard to the continual diversions of the bomber effort from its legitimate role in which, as we all know, it has inflicted the most grievous and intolerable damage to Germany. In fact,' Sir Arthur Harris continued, 'I am completely convinced, while not denying that the claims of the "Panacea" mongers are put forward in good enough faith, that the continual stressing of targets which necessarily remove bombing pressure from the German nation

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<sup>1</sup> In fact, M.E.W. had made no such claim. See below, pp. 288-289. In the famous Dams Raid on the night of 16th May 1943, the Moehe and Eder Dams but *not* the Sorpe were breached by 617 Squadron.

as a whole, to concentrate on objectives such as the above (and, as a further instance, such as "Crossbow" sites) is in many cases a deliberately engineered A.R.P. manoeuvre initiated by enemy sources. Such dispersions', Sir Arthur Harris stated, 'are eagerly, if innocently, swallowed by those many people who like to have a finger in the bomber pie, when it comes to the direction or misdirection of the Bomber Offensive, while having no responsibility for it whatsoever as a military operation or in regard to its possible eventual failure as a major part of our strategical purpose.' In this frame of mind, Sir Arthur Harris naturally concluded that an attack on Schweinfurt would be a waste of effort.<sup>1</sup>

This outburst, which Sir Charles Portal rather tolerantly described as 'characteristically exaggerated',<sup>2</sup> amounted, in effect, to a demand for the autonomy of Bomber Command. Neither the Ministry of Economic Warfare nor any other intelligence agency had any power of operational control or direction over Bomber Command. The 'finger in the bomber pie' which was really causing Sir Arthur Harris such embarrassment was, therefore, that of the Deputy Chief of the Air Staff, Air Marshal Bottomley, who was acting under the authority of Sir Charles Portal. The policies which Sir Arthur Harris had so violently attacked and the supporting intelligence which he classified almost as a form of German espionage had, after all, been endorsed by the Air Staff and had, whether rightly or wrongly, been urged upon Sir Arthur Harris by the Air Staff. The challenge which the Commander-in-Chief had thrown down was, therefore, directed at the Air Staff. This, in itself, was a tribute to the immense prestige acquired by Sir Arthur Harris in the twenty-two months which had passed since the assumption of his command, but it produced a situation which could no longer be tolerated at the Air Ministry.

'I do not think the C.-in-C. would dispute the contention', Sir Charles Portal was optimistic enough to believe, 'that if it had been tactically possible to concentrate one quarter of our total bombs dropped on Germany upon any one of several classes of target, e.g. oil, ball bearings, aero-engines or airframe factories, and possibly many others, the war would by now have been won. Everyone knows', Sir Charles Portal continued, 'that this was not tactically possible and for this reason we were thrown back upon the general blasting of industry by means of big area attacks in which few bombs are wasted.' Expressed in another way, this most significant comment by the Chief of the Air Staff meant that, in his view, selective bombing, if it was tactically possible, was more than four times as effective as general area attack. Sir Charles Portal went on to say that the

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<sup>1</sup> Letter Harris to Bottomley, 20th Dec. 1943.

<sup>2</sup> Min. Portal to Bottomley, 23rd Dec. 1943.



general area attack, 'according to the C.-in-C.'s own claims elsewhere, has made possible the Russian victories, but surely', he added, 'it is the destruction of industry and the interference with industrial labour which have achieved the result and if we can pick a key industry the result per ton of bombs must inevitably be vastly increased.'<sup>1</sup>

This conclusion of Sir Charles Portal's amounted to an endorsement of the American belief that 'it is better to cause a high degree of destruction in a few really essential industries than to cause a small degree of destruction in many industries.' This, after all, had been the hopeful theory of the British Air Staff at the outset of the war and it reduced the role of the general area attack simply to that of a *pis aller*, justifiable only as long as it was tactically inevitable.

To talk of a 'key industry' was, however, in Sir Arthur Harris' view, only to beg the question. His various and increasingly forceful pronouncements had shown that he did not believe that such a thing existed. He believed that the enemy would, by means of dispersal, substitution or the use of stocks always succeed in surmounting any attacks on 'key industries'. Nor did he have any confidence in the intelligence appreciations which indicated the supposed 'key' targets. In his opinion, any selective plan of attack was the product of the 'panacea mongers' whose only effect would be, in his own words, to 'remove bombing pressure from the German nation as a whole.'<sup>2</sup> Thus, Sir Arthur Harris' belief amounted to the conclusion that, since it was difficult and probably impossible to assess and also perhaps to hit, the 'key' targets, it was only profitable to attack the whole German nation, or at any rate those parts of it which contained the largest concentrations of the German population. This, he thought, was certain to produce victory, and though Bomber Command possessed little more than a quarter of the front-line strength calculated in 1941 as the minimum necessary for the task, he thought he already had enough force to win victory in that way provided he was not distracted and diverted by the advice of the 'panacea mongers'.

As far as the particular case of Schweinfurt was concerned the whole Air Staff case turned, as Air Commodore Bufton recognised, upon the 'soundness of the M.E.W. appreciation of the Axis ball bearing position'. Though he believed that the time had come to 'make a stand', Air Commodore Bufton, therefore, thought it might be wise to call for yet another report from the Ministry of Economic Warfare.<sup>3</sup> This was done, but the conclusion was virtually foregone.

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<sup>1</sup> Min. Portal to Bottomley, 23rd Dec. 1943.

<sup>2</sup> Letter Harris to Bottomley, 20th Dec. 1943.

<sup>3</sup> Min. Bufton to Coryton, 30th Dec. 1943.

'If this appreciation substantiates the Air Staff view, as I believe it will,' Air Vice-Marshal Coryton suggested, 'I consider that our case should be represented to the C.-in-C. in the strongest terms'.<sup>1</sup>

The Ministry of Economic Warfare confirmed the expected and 'In view of the urgency of this problem and the authoritativeness of this report', Air Marshal Bottomley asked Sir Charles Portal, on 12th January 1944, whether he would authorise the despatch of a directive specifically ordering Sir Arthur Harris to attack Schweinfurt as often as might be necessary. The target did raise a difficult tactical problem, Air Marshal Bottomley admitted, but, if the Commander-in-Chief 'set his mind to it', it could, he believed, be destroyed.<sup>2</sup>

The draft of this proposed directive, which Air Marshal Bottomley now laid before Sir Charles Portal, was strongly worded and precise in meaning. The British and American Air Staffs 'firmly believe', it stated, in a strategy based upon 'the destruction of selected key industries.' They were also said to be 'satisfied' that the relevant intelligence appreciations were 'sound' and that the doubts expressed about them by Sir Arthur Harris must be 'rejected'. Any failure to pursue this policy of selective attack upon the German fighter aircraft and ball-bearing industry might, the draft directive said, lead to the failure of the *Pointblank* plan and might also lay the Royal Air Force open to 'justifiable criticism' by the Americans. Tactically, the draft suggested, 'it is impossible to accept that the bombing of any German town within range is impracticable until it has been tried, if necessary several times'. Schweinfurt, it stated, was to be destroyed 'at as early a date as possible'.<sup>3</sup>

Sir Charles Portal recognised that the despatch of this directive might 'lead to trouble with Harris'. Nevertheless, he was ready to approve it and, as he told Sir Archibald Sinclair, he was prepared to accept responsibility for one or two abortive attacks on Schweinfurt. 'The prize', he concluded, 'is worth it'.<sup>4</sup> But, possibly as a result of Sir Archibald Sinclair's advice, the directive was re-drafted and, as Air Marshal Bottomley explained, the portions likely to lead to further argument were omitted, but the directive, he added, was still 'a direct and unqualified order' to the effect that Schweinfurt should be attacked on the highest priority.<sup>5</sup>

The final version of the directive, which was despatched on 14th January 1944, ordered Sir Arthur Harris to attack Schweinfurt as his first priority until, either the place was destroyed, or until further instructions were received. The British and American Air Staffs, he was

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<sup>1</sup> Min. Coryton to Bottomley, 8th Jan. 1944.

<sup>2</sup> Min. Bottomley to Portal, 12th Jan. 1944.

<sup>3</sup> Draft of proposed directive to Sir Arthur Harris.

<sup>4</sup> Min. Portal to Sinclair, 12th Jan. 1944.

<sup>5</sup> Min. Bottomley to Sinclair and Portal, 13th Jan. 1944.

told, 'firmly believed' in the strategy of attacking 'selected key industries known to be vulnerable and vital in the enemy's war effort'.<sup>1</sup> Even this did not immediately lead to the required action. Sir Arthur Harris persisted in emphasising the tactical difficulties of the operation;<sup>2</sup> but the Air Staff was beginning to lose confidence in these tactical appreciations and the suspicion had been aroused that they tended to be coloured by the strategic thinking of the Commander-in-Chief.<sup>3</sup> Sir Arthur Harris' protestations were accordingly officially rejected and, on 27th January 1944, he was once more ordered to attack Schweinfurt.<sup>4</sup>

On the night of 24th February 1944, after yet further delays, 734 Bomber Command aircraft took off for Schweinfurt. Earlier on the same date 266 bombers of the Eighth Air Force had been despatched in a daylight attack on the same target. This was the beginning of the Combined Bomber Offensive.

Almost exactly in the way anticipated by Sir Arthur Harris, Germany was able to surmount the crisis produced by the Anglo-American attack on her ball-bearing industry. Though the attacks caused great anxiety to those responsible for *Luftwaffe* production, the destruction never became critical and it was not a shortage of ball-bearings which caused Germany to lose the war. Nevertheless, the joint attack on Schweinfurt, carried out on 24th February 1944, not only marked a major change in the direction and aim of British bombing policy, but also illustrated a recovery in the fortunes of the United States Strategic Air Forces.

In rejecting the advice and overruling the objections of the Commander-in-Chief, Bomber Command, and in insisting upon the adoption of a selective bombing policy, the Air Staff had not, as they repeatedly claimed, merely enforced the terms of the *Pointblank* directive. That document, it will be recalled, had contained the instruction that 'the forces of the British Bomber Command will be employed in accordance with their main aim in the general disorganisation of German industry.' Despite the qualifying clause that 'their action will be designed as far as practicable to be complementary to the operations of the Eighth Air Force', this did not amount to the policy now indicated by the statement that the British and American Air Staffs 'firmly believed' in the strategy of attacking 'key industries known to be vulnerable and vital in the enemy's war effort'.

The change was, perhaps, more one of emphasis than of doctrine because in all the bombing directives there had always been some con-

<sup>1</sup> Dir. Bottomley to Harris, 14th Jan. 1944, App. 8 (xxxiv).

<sup>2</sup> Letter Harris to Air Min., 19th Jan. 1944.

<sup>3</sup> Draft Min. Bottomley to Portal, 24th Jan. 1944, and Note by Bufton, 24th Jan. 1944.

<sup>4</sup> Letter Bottomley to Harris, 27th Jan. 1944.

cessions to the selective school of thought. There had also been several subsidiary instructions of a highly selective nature such as those which led to the attacks on the Ruhr dams, the marshalling yards at Modane or the molybdenum mine at Knaben. Though it was hardly true, as Sir Charles Portal now implied, that the Air Staff had accepted the plan of general area assault purely as a *pis aller* and solely on the grounds that it had appeared to be the only tactically feasible plan, it was undoubtedly the case that the Air Staff had at no time entirely lost interest in the theory of selective attack, and for several months before the issue of the Schweinfurt directive in January 1944 they had shown many distinct signs, not only of favouring it, but also of losing confidence in the policy of general area assault. Nevertheless, and whatever its exact nature may have been, an important change was officially registered by the despatch of the Schweinfurt directive.

This emphasis upon the value of selective attack corresponded more closely to the aim which had inspired the efforts of the Eighth Air Force than to the policy which had generally and primarily governed the conduct of Bomber Command since the summer of 1941. Yet it was undoubtedly the apparent failure of the Eighth Air Force, culminating in the Schweinfurt disaster of October 1943, which had produced this shift. The continuing growth of the German fighter force and the evident failure of the Eighth Air Force to check it coupled with the approach of *Overlord* and the overwhelming need for air superiority, had virtually forced the Air Staff into what amounted to a policy of desperation. In this situation, Sir Arthur Harris' argument for the general area assault had appeared to be not only extravagant but also irrelevant.

Whether the selective emphasis of the Schweinfurt directive was no more than another in the long series of emergency diversions lasting only as long as the crisis which produced it, or whether it was the foundation of a new bombing policy, was an eventuality which remained to be decided by future events and future arguments.

The adoption of a selective policy did not necessarily mean the practice of precision bombing. The immediate change brought about by the Schweinfurt directive did not relate to the tactics to be adopted but to the targets to be selected. All the same, it was evident, as Air Marshal Bottomley had already hinted, that a selective policy would, ideally, be better served by precision, as opposed to area attack. The operational ability of Bomber Command to carry out precision attacks was, therefore, likely to be an important factor influencing a possible change of policy. In this respect the imminence of *Overlord* also was to play a significant part. As will presently be seen, the immediate preparations for the military assault drove Bomber Command to the mastery of new techniques which were eventually to

make its night attacks not only more destructive, but also more accurate, than many of the daylight operations of the United States Strategic Air Forces.

Meanwhile, however, these United States Strategic Air Forces were emerging from the disasters and frustrations of the summer and autumn of 1943. New leadership, new organisations, new ideas and, above all, new equipment, were already carrying the Eighth Air Force, and with it the recently constituted Fifteenth Air Force, back into the struggle for command of the air. In unexpected ways the United States Army Air Forces were on the verge of great achievements and the solution of the crisis of *Pointblank* was at hand. The course of the war in the air, and with it the possibilities open to Bomber Command, were about to be changed and it is these developments that must now be described.

## 5. The approach to *Overlord* and the revival of United States strategic air power, December 1943–February 1944

‘Destroy the Enemy Air Force wherever you find them, in the air, on the ground and in the factories.’ These were the words with which General Arnold concluded his new year’s message to the Commanding Generals of the Eighth Air Force in England and the Fifteenth Air Force in Italy.<sup>1</sup> The content of the exhortation was not greatly different from that which had characterised the instructions given to General Eaker in the *Pointblank* directive of 10th June 1943, but the prospects of carrying it out which now lay before his successor, General Doolittle, and before the Commanding General of the Fifteenth Air Force, General Twining, were somewhat different.

Already the Eighth Air Force was emerging from the parsimonious reinforcement fulfilments which for most of 1943 had so largely beleaguered its intentions and frustrated its achievements. United States heavy bombers were at last beginning to reach England in formidable quantities and, on 26th November 1943, the Eighth Bomber Command had been able to despatch 633 bombers on operations. This record was soon broken, when, on 13th December 1943, 710 bombers took off.<sup>2</sup> Thousand bomber attacks were soon to be within the strength of the Command and, after the sustained deprivations of *Torch*, the Eighth Air Force was at last entering upon the opportunity of rivalling the massive attacks of the Royal Air Force Bomber Command. One of the principal weaknesses of the American contribution to the Combined Bomber Offensive, the lack of aircraft, which had so often been the cause of anxiety and complaint to General Eaker and Sir Charles Portal, was being rapidly, if belatedly, overcome.

The problem of sustained daylight bombing at long range was not, however, as the United States Air Staff now realised, simply a question of bombers or their numbers. General Eaker’s belief, voiced as early as December 1942, that the B-17 Flying Fortress had ‘completely demonstrated its ability to defend itself from enemy fighters’<sup>3</sup> had not been supported by subsequent experience. Nor had this subsequent experience upheld the expectation, expressed in February 1943 by General Stratemeyer, Chief of the United States Air Staff, that two, or preferably four, formations of seventy-two aircraft each would prove to be self-supporting and ‘that the losses in formations

<sup>1</sup> *The Army Air Forces in World War II*, Vol. 111, (Chicago, 1951), p. 8.

<sup>2</sup> *do.* p. 18.

<sup>3</sup> Letter Eaker to Arnold, 6th Dec. 1942. R.S.I. 168·491. Vol. 1.

of that size will be small.' <sup>1</sup> In the event, Sir Charles Portal's gloomy prognostications of the autumn of 1942 proved to be much nearer to the reality and the Eighth Bomber Command's casualty rate showed itself to be connected, not so much with the numbers of bombers in the formations, as with the depth of the penetrations which were made.

Over the whole period from 17th August 1942 to 31st December 1943, during much of which the Eighth Air Force was confined to fringe targets, a very serious number of casualties was sustained. During this time, some 23,305 sorties were despatched and 19,194 of these were credited with having carried out attacks. 1,013 aircraft had failed to return, a further 174 had returned so badly damaged that they had to be scrapped, 1,008 had suffered major damage necessitating their withdrawal from the line for repair and 5,932 had been less seriously damaged.<sup>2</sup>

These figures were grave enough, but they by no means told the whole story. Between August and December 1942, when there were no attacks against Germany and the Eighth Air Force was confined to targets in occupied territory, four per cent of the aircraft credited with having made attacks were lost in action. Another thirty-four per cent were damaged. In the period between January and June 1943 when the Eighth Air Force began to extend its range and to cross the German frontier a significant rise in the casualty rate occurred. In those six months 6·6 per cent of the aircraft credited with attacks were lost in action and 35·5 per cent were damaged. In July and August, when a still more ambitious policy was inaugurated and the targets selected included Hamburg, Kassel, Schweinfurt and Regensburg, the casualty rate rose still further. In July 6·8 per cent of the aircraft credited with attacks were lost in action and no fewer than 62·5 per cent were damaged. In August the corresponding figures were 6·5 per cent and 51·5 per cent. The more cautious policy of shorter penetration in September immediately reduced the figures for aircraft lost and damaged to four per cent and thirty-five per cent respectively. In October, however, when deep penetrations were resumed, the casualties again rose, this time to the unprecedented level of 9·1 per cent lost in action and 45·6 per cent damaged. During the remainder of 1943 the Eighth Air Force was once more restricted mainly to short-range targets and the percentages of aircraft lost and damaged fell to 3·7 and 24·7 respectively in November and 3·4 and 25·7 respectively in December.<sup>3</sup> 'Notwithstanding the great impor-

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<sup>1</sup> Letter Stratemyer to Eaker, 7th Feb. 1943. R.S.I. 168·491. Vol. 1.

<sup>2</sup> Eighth Air Force O.R.S. Report, 12th Feb. 1944. R.S.I. 524·0581. Of the operations on which these losses were incurred, 127 had been carried out by day and forty-four by night.

<sup>3</sup> It should be clear that all percentages relate to the numbers of sorties credited with

tance of flak,' the Eighth Air Force Operational Research Section concluded in its report on these casualties, 'the most dangerous opposition our bombers encounter, and the origin of most of our losses continues to be enemy fighter activity.'<sup>1</sup>

This conclusion and these casualty figures showed that the Eighth Air Force daylight bomber formations were not self-defending. It was only on the shorter range attacks, when the bombers could be accompanied by supporting fighters, that the losses had remained within bearable limits. As soon as the bombers began to exceed the range of the fighters, the casualties became insupportable. It did not follow, of course, that an increase in fighter range would necessarily solve the problem because the German opposition to the shallower attacks was in any case likely to be less severe than that offered to those aimed at the vital targets in the heart of the Reich, and also because an increase in range was likely to produce a reduction in performance by the fighters.

This latter probability was a consideration which, as we have seen, had always been much in Sir Charles Portal's mind and it had led him to the firm conclusion that a long-range fighter would never be capable of engaging a short-range interceptor on equal terms. These doubts had been conveyed by the British to the Americans. For example, in September 1941 when General Eaker, who was then a Colonel, had been on a mission to England he had been told by Air Commodore R. B. Mansell<sup>2</sup> that the construction of an effective long-range fighter was hardly a feasible project. 'How', the Air Commodore had asked, 'will you get such a big fighter thru' the little, single seater day fighter screen?' The long-range fighter, Air Commodore Mansell had said, would have to be a big heavy machine in order to carry the necessary fuel and armour and the light short-range fighter would, he thought, be able to get inside it 'and knock it down'. He supported this contention by pointing out that heavy fighters like the Typhoon and Tornado, which weighed more than 10,000 pounds, or the twin-engined Mosquito, 'have definitely demonstrated their

having made attacks. The numbers of aircraft despatched and the numbers credited with attacks during the various periods were:

	1942	1943						
	Aug.- Dec.	Jan.- June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Despatched	957	4,555	2,334	2,058	2,561	2,174	2,978	5,688
Attacking	780	3,794	1,609	1,653	2,088	1,926	2,545	4,799

<sup>1</sup> Eighth Air Force O.R.S. Report, 12th Feb. 1944, pp. 6, 8 and 32. R.S.I. 524-0581.

<sup>2</sup> Head of the Aircraft and Armament Experimental Establishment.



inability to stand up against planes of the Spitfire and Messerschmitt class'.

This, Colonel Eaker found, was the general British view, but Sir Charles Portal, who shared it, suggested to him that the proper escort for a bomber formation was a number of aircraft exactly similar in appearance and size to the bombers but carrying, in place of a bomb load, a massive quantity of armour and armament.<sup>1</sup> The idea of a heavy bomber escort cruiser was one which often recurred<sup>2</sup> and had, indeed, already been envisaged by the United States Air Staff. In the famous Joint Board Report of 11th September 1941 the Air Warfare Plans Division had suggested that the ability of daylight bomber formations to defend themselves was not proven. Though it was intended that the United States heavy bombers should carry much heavier armour and more formidable armament than the German daylight bombers of 1940, it was feared that these technical improvements might not be sufficient 'to overcome the pursuit airplane' and thus to permit 'day operations in the face of strong pursuit opposition'. For this reason, it was recommended that the design of an escort fighter should be considered. These machines, it was suggested, should be heavily armoured and armed and should be disposed around the bomber formation in such a way that the 'hostile pursuit could not attack the bombardment formation with impunity, without first passing through the fire of the aerial fighters, or without first disposing of them.'<sup>3</sup> This 'escort fighter' was clearly similar in conception to Sir Charles Portal's escort cruiser.

These machines were not expected to be capable of attacking the enemy fighters or of engaging in dogfights with them. They were to be designed, in the words of the Air Warfare Plans Division paper, 'solely for defense purposes' and their function was, therefore, to add to the fire power of the bomber formation in a further attempt to make it self-defending. No one explained why, if the fast interceptor fighters of the Spitfire or Messerschmitt class were expected to knock down Air Commodore Mansell's heavy long-range fighters, they should not also knock down Sir Charles Portal's escort cruisers or the Air Warfare Plans Division's escort fighters. The three conceptions were distinctly similar.

In the event, however, as we have noticed, American confidence in the ability of their bombers to defend themselves without these cumbersome escorts presently became much stronger. In a further Air

<sup>1</sup> Eaker's Report to the Chief, Army Air Forces, undated. Section 3, 'Fighter Development for the Future', R.S.I. 168·1-13A. Col. Eaker reached London on 30th August 1941 and completed his mission on 1st October.

<sup>2</sup> And was even ventilated in the Press by Major Seversky on the day after the Schweinfurt attack. See *New York Times*, 15th Oct. 1943.

<sup>3</sup> A.W.P.D./1 Report, 11th Sept. 1941. Tab. 4, Section 2, Part 3, App. 2, 'Escort Fighters', R.S.I. 145·81-23.

Warfare Plans Division paper of 24th August 1942, the need for escort fighters was not re-emphasised. On the contrary, 'The Commanding General of the American Army Air Forces in Great Britain has', it was said in this paper, 'expressed the opinion that our current type bombers can penetrate existing German defenses to the limit of their radius of operation without excessive losses.'<sup>1</sup>

The subsequent revelation that this was not the case did not, however, lead to the rebirth of the escort cruiser idea. It resulted in a completely different conception which envisaged a long-range fighter similar in design and performance, not to the bombers which it was to protect, but to the fighters which it was to engage. The range of this aircraft was to be provided, not by built-in bulk and weight, but by the provision of external and droppable fuel tanks. These machines, being basically of the interceptor type, and, after dropping their external tanks, having approximately the performance of an interceptor, would be able to attack the enemy fighters and engage in dogfights with them. This conception, if it could be realised, therefore, offered the prospect of offensive fighter support for the bomber formations rather than the mere addition of more strength to their defensive fire power which was all that had been promised by the escort cruiser idea.

The question remained, however, as to whether the apparently conflicting considerations of range and performance could be reconciled and an aircraft with the range of a bomber and the performance of an interceptor fighter introduced to the *Pointblank* offensive. This was the problem which Sir Charles Portal regarded as insoluble and which, at any rate until the middle of 1943, had been gravely neglected by the United States Army Air Forces.

It will be recalled that the initial operations of the Eighth Bomber Command were, at least to some extent, covered by Royal Air Force Spitfires, but when, in 1943, the American bombers began to cross the German frontier they, of course, had to leave the Spitfires behind. In May 1943, P-47 Thunderbolt single-seater fighters were brought into action, but their escort range was not much greater than that of the Spitfires, and at the end of the month General Eaker called attention to the 'critical' need for long-range tanks to extend the duration of these aircraft.<sup>2</sup>

Thereafter, Thunderbolt range was gradually increased by the provision of external droppable tanks, and while the Germans were still unaware of the consequences, some significant successes were achieved, largely as a result of the element of surprise which was introduced.<sup>3</sup>

<sup>1</sup> A.W.P.D.-42 Report, 24th Aug. 1942. Part 5, Tab. D, 'Penetration of Anti-aircraft Defenses'. R.S.I. 145-82-42.

<sup>2</sup> Letter Eaker to Giles (Chief of Air Staff), 28th May 1943. R.S.I. 168-491, Vol. 1.

<sup>3</sup> Eighth Fighter Cmd. Report, Aug. 1944. F.R.C. Central File 373-1 (Bulk).

## 78 COMBINED BOMBER OFFENSIVE: STRATEGY

These developments did not, however, make the Thunderbolt a long-range fighter in the true sense of the word. Its duration remained substantially less than that required to reach the more distant and the more important targets. In October 1943, when the Eighth Bomber Command attacked Schweinfurt, the Thunderbolt escort was, as will be recalled, incapable of penetrating beyond Aachen. The Germans were thus able to regain the advantage simply by withholding their attacks on the bombers until the Thunderbolt range had been exceeded.<sup>1</sup>

The need for a longer range fighter still existed, but it was not until the Assistant Secretary of War for Air, Mr. Robert A. Lovett, drew attention to it at the highest level that any real attack on the problem was made. In a memorandum for General Arnold of 19th June 1943 Mr. Lovett suggested that 'the greatest single factor differentiating the Eighth Air Force operations from those of other theaters is the extremely high proportion of battle damage resulting from combat with the best of the German fighters'. He insisted that there was 'an immediate need for long-range fighters' and, though he thought this might be partially met by the provision of 'proper tanks' for Thunderbolts, he added that 'ultimately P-38's and P-51's will be needed'.<sup>2</sup>

P-38 Lightnings had been operational for some time but not with the Eighth Air Force. Originally they had been intended for this purpose, but the great majority of them had been diverted to the North African theatre and it was not until November 1943 that these curious-looking machines went into effective action in support of the Eighth Bomber Command. They then had an escort range of 520 miles,<sup>3</sup> which was better than anything achieved by the Thunderbolts, but which was still less than what was required if continuous fighter cover was to be extended up to the limit of the bomber penetrations. Moreover, the unconventional design of the Lightning had

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<sup>1</sup> Eighth Fighter Cmd. Report, Aug. 1944, cit. above. Thunderbolt escort ranges were developed as follows:

May 1943—175 miles  
June 1943—230 miles (more experience)  
July 1943—340 miles (75-gallon drop tank)  
Aug. 1943—375 miles (108-gallon belly tank)  
Feb. 1944—425 miles (150-gallon belly tank)  
Feb. 1944—475 miles (two 150-gallon wing tanks)

Eighth Air Force Reports, Aug. 1942—May 1945. R.S.I. 520-549 B, Ch. 5.

The Eighth Fighter Cmd. Report cited above suggests that the range of 475 miles was obtained with two 108-gallon wing tanks.

<sup>2</sup> Memo. Lovett to Arnold, 19th June 1943. F.R.C. Central File 300-B. Mr. Lovett had just completed a two and a half weeks' visit to Eighth Air Force operational Groups in England.

<sup>3</sup> When equipped with two 75-gallon wing tanks. In February 1944 this was increased to 585 miles (two 108-gallon wing tanks). Eighth Air Force Report, Aug. 1942—May 1945. R.S.I. 520-549, B, Ch. 5.

the disadvantage of making it instantly and easily recognisable to the enemy. The machine was also subject to frequent mechanical failure.<sup>1</sup>

Though the Thunderbolts and Lightnings did render valiant services to the Eighth Air Force, their contribution, as only medium-range aircraft, was limited while no long-range fighter existed. To a great extent they could be avoided by the Germans and their position was analogous to that of a medium-altitude fighter force which possessed no high-altitude machines. The *Luftwaffe* could conduct most of its operations beyond their reach. Though General Arnold had, at the time, thought that the adaptability of the Lightning might eventually make it the best solution to the problem which had been emphasised by Mr. Lovett,<sup>2</sup> it was, in fact, the third aircraft mentioned by the Assistant Secretary of War for Air which performed the miracle. This was the P-51 Mustang.

The origins of the Mustang were curious, but, in view of the outcome, are worth noticing. In April 1940 the British Air Commission in the United States asked the North American Aviation Inc. to build Curtiss fighters for the Royal Air Force. The firm suggested that an entirely new aircraft should be produced. The result was the NA-73 Mustang, the prototype of which was completed in the astonishingly short space of 127 days. The preliminary design had been approved by Sir Henry Self, Air Vice-Marshal G. B. A. Baker and Mr. H. C. B. Thomas. The detailed specification was written in the New York office of the British Air Commission by Mr. Thomas and a representative of the North American Aviation Inc. The 'mock-up' was supervised by two British representatives of the British Air Commission. Quantity production was begun before the end of 1940 and the first Mustang was delivered to the Royal Air Force in November 1941.<sup>3</sup>

Before the Japanese attack on Pearl Harbour drew the United States into the war, some 620 Mustangs had been procured by the Royal Air Force. They were not, however, particularly impressive machines. Though capable of 388 miles per hour at 5,000 feet, their performance declined with altitude and at 15,000 feet their maximum

<sup>1</sup> For example, letter Kepner (C.G. Eighth Fighter Cmd.) to Giles, 1st April 1944. F.R.C. Central File 312-1-J.

<sup>2</sup> Memo. Arnold to Lovett, 10th July 1943. F.R.C. Central File 300-B.

<sup>3</sup> Doris A. Canham: *Development and Production of Fighter Aircraft for the United States Air Force* (unpublished monograph prepared for the Historical Office Executive Secretariat, Air Materiel Cmd., Wright Patterson A.F.B., Oct. 1949), R.S.I. 201-60. Waldo H. Heinrichs: *Achtung Indianer* (unpublished history of the U.S. Eighth Fighter Cmd., 1944), R.S.I. 524-058. The former monograph is closely documented from British and United States official files. The latter, for the origins of the Mustang, relied principally upon a memorandum sent to the author by W/Commander Nigel Tangye who in 1944 was R.A.F. liaison officer at U.S.St.A.F.E. H.Q. The account given by General Arnold in *Global Mission* (pp. 376-378) is inaccurate, though it adds some details.

speed was 366 miles per hour.<sup>1</sup> For this reason, they had been found unsuitable for service in the Royal Air Force Fighter Command and they had been handed over to Army Co-operation Command for low-level operations. In this capacity they went into action on the day of the commando attack on Dieppe in 1942. Meanwhile, the United States Air Corps showed no interest in the new aircraft. The foreign release agreement for the sale of Mustangs to the Royal Air Force, which had been signed on 4th May 1940, had stipulated that the Air Corps should receive two of the aircraft and these were delivered during the second half of 1941, but the American authorities did not place a contract with the North American Aviation Inc.<sup>2</sup>

The cause of the apparent failure of the Mustang was that with its Allison V-1710 engine of 1,150 horse power it was underpowered. Nevertheless, Rolls Royce were impressed with its potentialities and, in May 1942, they made estimates of what the performance of the aircraft would be if fitted with their Merlin 61 engine. In consequence, a trial installation was carried out on five Mustangs, and the first Merlin-Mustang was flown on 13th October 1942.<sup>3</sup> At the same time the experiment of equipping Mustangs with American-built Packard Merlins was tried. After a number of modifications a sensational improvement in performance was brought about.<sup>4</sup>

The United States Army Air Forces at last began to take an interest in the Mustang and it was thus possible for General Arnold, despite his hopes of the Lightning, to tell Mr. Lovett in July 1943, that for the solution of the long-range fighter problem, 'the P-51B now looks the best.'<sup>5</sup> This P-51B Mustang did, indeed, have a phenomenal performance. Powered by the Packard-Merlin V-1650-3 engine it was capable of 375 miles per hour at 5,000 feet, 400 miles per hour at 10,000 feet, 425 miles per hour at 15,000 feet, 430 miles per hour at 20,000 feet, 455 miles per hour at 30,000 feet and 440 miles per hour at 35,000 feet.<sup>6</sup> These performances, which were still further improved in later models, coupled with equally impressive manoeuvrability, gave the Mustang qualities which were equal or superior to those of

<sup>1</sup> Note by Bradley (Chief, Fighter Branch Production Engineering Section), 4th Sept. 1943. F.R.C. Central File 512·1-1.

<sup>2</sup> *Development and Production of Fighter Aircraft for the United States Air Force.*

<sup>3</sup> The pilot, Colonel Hough, reported that the result was not good.

<sup>4</sup> *Achtung Indianer.*

<sup>5</sup> Memo. Arnold to Lovett, 10th July 1943. F.R.C. Central File 300-B.

<sup>6</sup> Note by Bradley, 4th Sept. 1943. F.R.C. Central File 512·1-1. These figures were derived from flight tests at Wright Field. A P-51B pilot has recorded that this version of the Mustang only lost about 35 m.p.h. while carrying jettisonable wing tanks. When it had dropped these it could outpace a FW.190 by nearly fifty m.p.h. up to 28,000 feet and by about seventy m.p.h. above that height. It was superior in speed at all heights to the Me.109G. It could outdive both the FW.190 and the Me.109G. It could easily outturn the Me.109G and slightly outturn the FW.190. It had a similar rate of roll to the Me.109G, but in this respect was slightly inferior to the FW.190. *Achtung Indianer*, p. 165.

any interceptor fighter in the *Luftwaffe*. But this remarkable aircraft also had an enormous potential range. By September 1943, tests had already indicated that with two seventy-five gallon droptanks and making allowance for combats it would be able to accompany bombers up to 600 miles from base. The addition of a further eighty-five gallon fuselage tank had actually enabled a Mustang to cover 1,474 miles.<sup>1</sup> Even these extensions of range by no means exhausted the potential which was theoretically possible and ultimately achieved.

It is hardly surprising that an emergency programme for the production of Mustangs and their auxiliary tanks was eventually inaugurated by the United States Army Air Forces on the highest priority. What is surprising is that the need for it was not earlier recognised.<sup>2</sup> Moreover, there was also much delay in equipping such Mustangs as were produced for the long-range fighter role, and in sending them to England. Production of the P-51B Mustang began in June 1943, but of the first 145 machines, which had been delivered by 12th August, none at all was sent to England as a long-range fighter. Allocation plans showed that for the remainder of the year it was intended to fit out 333 of the 673 P-51B's which were expected to be produced in that period as reconnaissance aircraft. Only 180 were to be sent to England as long-range fighters.<sup>3</sup> As late as September 1943 General Arnold's directive to the effect that 'The reconnaissance program will be given priority less than our heavy bomber units involved in the Combined Bomber Offensive against Germany, but above all other Army Air Force activities,' was still in force.<sup>4</sup> It was only on 30th October 1943, sixteen days after the Schweinfurt attack and sixteen days after General Arnold's severe criticism of Sir Charles Portal for failing to put more fighters into offensive action against the *Luftwaffe* in the air, that this policy was changed. Then, on General Arnold's orders, all long-range P-38 Lightnings and P-51 Mustangs were to be withheld from reconnaissance units and reserved exclusively for a fighter role from English bases.<sup>5</sup>

Earlier alarms had resulted in a concerted effort to defeat the theoretical problem of a long-range fighter, but it was only the Schweinfurt disaster of 14th October 1943 which led to the translation of the solution into terms of mass production on the grand scale.<sup>6</sup>

<sup>1</sup> Note by Bradley, 4th Sept. 1943. F.R.C. Central File 300-B.

<sup>2</sup> In the middle of July 1943 the production priority of the Thunderbolt was still higher than that of the Mustang. Memo. by Echols (Chief, Material Division), 15th July 1943, F.R.C. Central File 452.1-H.

<sup>3</sup> Memo. Weyland (Chief, Allocations and Program Division) to Perrin (Deputy C.A.S.), 16th Aug. 1943. F.R.C. Central File 452.1-H.

<sup>4</sup> Memo. Craig (A.C.A.S. Operations Commitments and Requirements) to Giles, 7th Sept. 1943. F.R.C. Central File 452.1-i.

<sup>5</sup> Letter Arnold to Portal, 31st Oct. 1943. F.R.C. Central File 452.1-J.

<sup>6</sup> Before the end of the war, 14,000 Mustangs were produced by the North American Aviation Inc. *Development and Production of Fighter Aircraft for the United States Air Force.*

P-51 Mustangs made their initial operational appearance in support of the Eighth Bomber Command on 5th December 1943,<sup>1</sup> and, though they still lacked the tanks which were soon to take them to Berlin and beyond, their arrival portended a revolution in the entire conception of the strategic air offensive. An aircraft with the range of a bomber and the performance of a fighter had been created.

The arrival of powerful bomber reinforcements for the Eighth Air Force and the introduction of a long-range fighter were the two principal factors which were soon to alter the prospect of the American contribution to the *Pointblank* offensive, but other important changes were also taking place. In November 1943 the Fifteenth Air Force had been established on Italian bases with the object of bringing southern Europe more readily within the range of strategic air power and, therefore, of forcing the Germans to spread their defences. Though in July 1943 Sir Charles Portal had argued in favour of this use of Italian territory,<sup>2</sup> the American decision to do so caused the British some disquiet because it was feared that the supplying of the new air force might lead to the continued under-reinforcement of the Eighth Air Force which, as was observed in London, had superior bases from which to operate.<sup>3</sup> The agreement reached at the Cairo and Tehran Conference to the effect that the Eighth Air Force should receive priority in supply over the Fifteenth until the spring of 1944 had, however, more or less met the British objections.<sup>4</sup>

On New Year's Day 1944 this new strategic air force in Italy and the Eighth Air Force in England were welded together into one instrument known as the United States Strategic Air Forces in Europe and placed under the single and supreme command of General Carl Spaatz. This development also caused the British some concern. It was not believed that a single commander could control operations in Italy and England, if only because of weather considerations.<sup>5</sup>

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<sup>1</sup> *The Army Air Forces in World War II*, Vol. III, pp. 11-12. The target did not, however, on this occasion lie farther afield than Paris.

<sup>2</sup> Portal to Welsh (R.A.F. Del. Washington), 26th July 1943. At this time it was General Arnold who was apparently not 'elated' about the prospect of using Italian bases for this purpose. Welsh to Portal, 23rd July 1943. The positions were later reversed and by November 1943, after hearing more about weather conditions and the difficulties of crossing the Alps, Sir Charles Portal became doubtful about the value at least of North Italian bases for strategic purposes. Note by Portal, 3rd Nov. 1943.

<sup>3</sup> C.O.S. to J.S.M. (Washington), 13th Nov. 1943.

<sup>4</sup> For the Cairo-Tehran agreement see above, pp. 50-52. Sir Arthur Harris' objections, incidentally, were not overcome. He regarded the Fifteenth Air Force as a diversion on a 'comprehensive and disastrous scale.' *Inter alia* letter Harris to Coryton, 9th Nov. 1943. General Eaker substantially agreed with this objection. Letter Eaker to Coryton, 11th Nov. 1943. One of General Arnold's motives in persisting with the plan was apparently to forestall the complete absorption of all Mediterranean air power in the land campaign. Welsh to Portal, 2nd Aug. 1943.

<sup>5</sup> General Spaatz, according to Sir Archibald Sinclair, seems to have shared this view. He did not apparently expect to exercise much control over affairs in the Mediterranean area. Sinclair to Churchill, 7th Jan. 1944.

Moreover, the original American intention had been that the new strategic air commander should be, in turn, subordinated to the Supreme Commander Allied Expeditionary Force who had now at last emerged in the person of General Eisenhower. Though it was admitted in the Air Ministry that the strategic air forces would have to play some direct part in the *Overlord* campaign, it was feared that, if they were placed directly under the control of the Supreme Commander, the strategic air offensive would cease to be strategic. For the time being, however, the latter proposal was not pressed, and since the Royal Air Force Bomber Command was not, as had also originally been intended, directly affected by the creation of the United States Strategic Air Forces, Sir Charles Portal recognised that it was probably better to try to make the plan work than to oppose it, when the power to stop it did not exist.<sup>1</sup>

These changes in the command structure were the logical outcome of the constant American urge towards the greater unification of command which had so often been expressed by General Arnold, but which was less generally shared by the British with their greater respect for the geographical barriers between theatres and the functional and traditional divisions between the forces in those theatres. The American belief in supreme commanders was often to vie, and sometimes to become entangled with, the British system of committees of equals. But when *Overlord* became yet more imminent these matters had necessarily to be adjusted.

Meanwhile, General Spaatz had been placed in a position which, for an air commander, was unprecedented. Not only did his influence outweigh that of Sir Arthur Harris and the recently appointed Commander-in-Chief of the Allied Expeditionary Force, Sir Trafford Leigh-Mallory, which had been one of the motives for his appointment,<sup>2</sup> but it presently came to rival that of Sir Charles Portal himself. General Spaatz carried with him the long-standing and entire confidence of General Arnold and he brought to England a much more powerful and also a more independent judgment than had ever been exercised by General Eaker. This judgment was to have a profound effect upon the course of the Combined Bomber Offensive.<sup>3</sup>

Another important change resulting from American pressure was the despatch on 17th February 1944 to General Spaatz and Sir Arthur Harris of a new directive replacing that issued on 10th June

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<sup>1</sup> Air Staff Note submitted by Colyer to Portal, 11th Nov. 1943. C.O.S. to J.S.M. (Washington), 13th Nov. 1943. Min. Portal to Bottomley and Colyer, 9th Nov. 1943.

<sup>2</sup> *The Army Air Forces in World War II*, Vol. II, pp. 741-742, and Vol. III, p. 6.

<sup>3</sup> With General Spaatz's appointment as C.G. U.S.S.A.F.E. General Eaker was posted as C.G. Mediterranean Allied Air Forces. General Doolittle succeeded him as C.G. Eighth Air Force.



1943. This, for the first time in the war, made the aim of the Combined Bomber Offensive abundantly clear.

'Your overall mission', the directive began, 'remains "the progressive destruction and dislocation of [the] German military industrial and economic system, the disruption of vital elements of lines of communication and material reduction of German air combat strength by successful prosecution of Combined Bomber Offensive from all convenient bases."' <sup>1</sup>

This preamble was, of course, a variation on the familiar Casablanca formula, but it contained important modifications. For the first time the reduction of the German air force was mentioned in the general definition of the combined aim. Also for the first time the well-known phrase about morale which had so often been so useful to Sir Arthur Harris, was omitted. <sup>1</sup>

'Under this general mission', the directive continued, 'objectives of Bomber Command R.A.F. and U.S.S.A.F.E. are:

(A) Primary objective, the German Air Force. Depletion of German Air Force with primary importance upon German fighter forces by all means available including attacks against following precision targets and industrial areas and facilities supporting them:

(i) *Equal first priority.* German S/E fighter airframe and airframe component production. German T/E fighter airframe and airframe component production. Axis controlled ball-bearing production.

(ii) *Second priority.* Installations supporting German fighter air forces.'

The flying-bomb launching sites, which were already causing serious concern in England, Berlin and other important industrial areas were mentioned under the heading of 'other objectives'. Berlin and the other industrial areas were, however, only to be attacked when the weather was unsuitable for the primary tasks. <sup>2</sup>

This was a highly significant document, for not only did it make it clear that the German air force was the only primary target, but it specifically insisted that it was to be regarded as such not only by the United States Strategic Air Forces but also by the Royal Air Force Bomber Command. There were no saving clauses about the Bomber Command 'main aim' of general industrial dislocation. Precision and area attacks by night and day were to be harnessed to the same principal object: the reduction of the German air force. It is hardly surprising that the mistaken belief that the term *Pointblank* meant the

<sup>1</sup> The mention of communications foreshadowed the bombing policy being advocated in support of *Overlord* and already the subject of a vigorous controversy which is discussed in Vol. III, Chapter XII.

<sup>2</sup> Dir. Air Min. to U.S.S.A.F.E. and Bomber Cmd., 17th Feb. 1944, App. 8 (xxxvi).

attack on the German air force now became widespread. The conception of the Combined Bomber Offensive as a 'round the clock' attack was now defined in theory at least, by the conception of a 'round the clock' attack upon a common target system.

Despite the unusual clarity of these instructions, the effective attack on the German air force, which had so long been desired, was not ultimately a question of directives or of systems of command. It was a question of operational possibilities. Whether the United States Strategic Air Forces, under the command of General Spaatz, could achieve in 1944 what the Eighth Air Force had failed to achieve in 1943, therefore, ultimately depended upon what difference the larger reinforcements of heavy bombers and the introduction of long-range fighters would actually make.

It was, perhaps, because Sir Charles Portal was still extremely pessimistic about what this difference would be and because, as will be recalled, he had already taken vigorous steps to draw the Royal Air Force Bomber Command into the attack on the German air force, that he had regarded the new directive of 17th February 1944 as unnecessary and was much confused by what he described as 'all the manoeuvres and verbiage' accompanying the American proposals leading up to it.<sup>1</sup>

There was, indeed, some justification for this confusion for the United States Air Staff, in the course of the negotiations about the new directive, had shown a singular lack of realism about the past failures of the Combined Bomber Offensive. For example, in October 1943 General Kuter had suggested that the *Pointblank* directive was in need of revision, principally on the grounds that a greater concentration of effort was required against the German air force, that a smaller effort should be devoted to U-boat bases and that better co-ordination of the Eighth Air Force and Royal Air Force Bomber Command operations was needed.<sup>2</sup> These suggestions were, no doubt, theoretically excellent, but they did less than justice to the operational difficulties which at the time were confronting General Eaker, and which had been made startlingly evident by the Schweinfurt attack on 14th October 1943.

Nevertheless, the criticisms by the United States Air Staff continued in the same vein, and in January 1944, General Arnold signed a foreword to an official report on the 'Strategical Aerial Bombardment of Europe—Accomplishments and Potentialities'. This stated that there were only four industries in Germany, aircraft plants, ball-bearings, oil and rubber, which were important as bomber targets.

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<sup>1</sup> Welsh to Portal, 31st Jan. 1944, and Portal to Dill, 22nd Jan. 1944.

<sup>2</sup> Memo. Kuter (Gen. Arnold's Chief Planning Officer) to Arnold, 26th Oct. 1943, R.S.I. 520-422B.

The foreword then complained that in the four and a half months ending in the middle of November 1943, the United States Army Air Forces had devoted only twenty per cent of its effort to these four important targets. The remaining eighty per cent of the effort had, it said, been squandered in attacks of no strategic value against ports, submarine bases, transport centres and other objectives. Only 1,903 tons of bombs out of the total of 22,667 tons discharged in this period by the Eighth Air Force had been aimed at aircraft plants. These targets, the foreword said, should have received some 9,500 tons of bombs, and if the entire 22,667 tons had been concentrated on the four important target systems, the position of the German air force, it was suggested, would have been very different.<sup>1</sup> The future prospect was, however, this foreword went on to claim, very different, because of General Spaatz's appointment, the American proposals for a new directive and the personal messages which had been sent from Washington to United States Army Air Forces' commanders.<sup>2</sup>

This report, as General Marshall admitted, was 'awful'.<sup>3</sup> It completely neglected the most elementary considerations of tactical possibility, weather conditions, enemy opposition and the other problems confronting any bomber commander in the field. It is hardly surprising that Sir Charles Portal wondered whether the implication was that he should have ordered General Eaker to sustain his long-range attacks without any regard to the losses suffered by the American bomber formations.<sup>4</sup> If, indeed, the Eighth Air Force had, in the autumn of 1943, carried out even four or five attacks of the Schweinfurt type, there are many reasons to suppose that the position of the United States Army Air Forces and not that of the German air force, would have been the one to be very different.

If, however, it was General Arnold and his subordinates who, for whatever reasons, had shown a considerable tendency to disregard the operative causes of failure in the past, it was now Sir Charles Portal who failed to realise the extent to which the future prospects of the Combined Bomber Offensive had been changed by the revival of United States strategic air power. The British Air Staff, Sir Charles Portal told Sir Archibald Sinclair at the beginning of February 1944, still doubted the ability of the American strategic air forces to sustain

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<sup>1</sup> It may be assumed that these were short tons.

<sup>2</sup> Warburton (R.A.F. Del. Washington) to Portal, 19th Jan. 1944.

<sup>3</sup> General Marshall made this admission to Sir John Dill in a private discussion on 21st January 1944. He added, however, that he did not think that General Arnold had written the foreword. It seemed that the author was a member of his staff and that General Arnold, who at the time was suffering from influenza, had signed it without due consideration. Sir John Dill observed to Sir Charles Portal that General Arnold was 'very slapdash in both what he says and writes', but he attributed this particular outburst to General Arnold's failure to face difficult facts and to live up to the 'extravagant prognostications' which he had made. Dill to Portal, 23rd Jan. 1944.

<sup>4</sup> Portal to Dill, 22nd Jan. 1944.

a long-range daylight offensive against Germany. The German defences had increased, he said, 'to such an extent that any deep penetration in weather suitable for precision bombing is now bound to result in very heavy casualties to the attacking force.' Most of the important fighter plants, he explained, lay in the heart of Germany and many of them, he said, were 'beyond escorting fighter range.' They could, he continued, 'only be reached by a frontal assault through the now greatly strengthened enemy defences and at the cost of very heavy casualties, as the Schweinfurt attack showed.' It was 'just possible', Sir Charles Portal thought, that if there was a week of continuous fine weather and that if the Americans used this 'to make escorted attacks on centres of population which the Germans felt bound to defend, they may succeed in reducing the defences by sheer attrition to a state in which they can no longer effectively oppose unescorted attacks. Otherwise,' he assumed, 'they are bound to suffer heavy casualties in any deep penetration beyond the range of their fighter cover . . .'<sup>1</sup>

This was really an extremely pessimistic forecast of what the American contribution would be towards a 'decisive tipping of the balance against the Germans which,' as Sir Charles Portal said, 'is the object of the "Pointblank" Plan.' It was this prospect, Sir Charles Portal concluded, which made it so important that the Royal Air Force Bomber Command should play a larger part in the destruction of German fighter and ball-bearing production.

These comments showed that Sir Charles Portal was fully alive to the fact that it was the German fighter force in the air which stood between the American day bombers and any decisive action against the German air force in production or for that matter any other significant strategic targets. This meant, in other words, that the daylight bomber offensive could not become effective until a measure of air superiority over Germany had been won by the allies. Sir Charles Portal showed that he appreciated the possibility of attaining this air superiority by the combined action of bombers and long-range fighters or by the same method as had been attempted in the earlier Royal Air Force *Circus* operations. It was clear, however, that a terrific execution would have to be done among the German fighters before the *Luftwaffe* became incapable of effectively opposing the unescorted attacks which Sir Charles Portal still believed would be necessary if the majority of the distant fighter factories were to be reached. It was this consideration which made Sir Charles Portal so pessimistic. Indeed, the problem of trying to knock the German fighter force out at relatively short range in order to free the bombers for action at longer range and beyond the cover of friendly fighters

<sup>1</sup> Min. Portal to Sinclair, 7th Feb. 1944.

was not only formidable, but, on the basis of past experience, impossible. Thus, it seemed that the only real prospect of success lay with the Royal Air Force Bomber Command which, by operating at night, could, it might seem, still evade the German fighter force in being and reach those areas where the German fighter force was in production. Even this was not a hopeful prospect, for as Sir Charles Portal well knew, Bomber Command could not hit small precise targets at night with the great tonnages of bombs which were required to do decisive damage.

The key to Sir Charles Portal's pessimism was, however, an apparent oversight. He had not mentioned the possibility of fighter range being extended to cover the whole of Germany and thus enabling the United States day forces to attack the *Luftwaffe* simultaneously in the air, on the ground and in the factories. Yet the arrival of the first Mustangs equipped as long-range fighters had already made this revolutionary possibility an imminent probability. It seemed as if Sir Charles Portal, who had always been so sceptical about the feasibility of an effective long-range fighter, was still inclined to overlook it after it had arrived.<sup>1</sup>

In the event, the execution of the *Pointblank* plan, as modified in the directive of 17th February 1944, did not depend upon the virtually unaided efforts of Bomber Command. Within a matter of days, the revival of United States strategic air power enabled General Spaatz to inaugurate a gigantic and far-flung attack upon the *Luftwaffe* which subsequently became famous as 'Big Week'. In this attack, deep penetration was obtained without prohibitive losses. Immense damage was done to the German aircraft factories and large numbers of enemy fighters were destroyed in the conflict. Had this prospect been more readily appreciated in the Air Ministry, it is possible that Sir Arthur Harris' arguments would have received a more sympathetic hearing. By the time that the new potential of United States strategic air power had made itself evident, there were, however, other 'diversionary' tasks more directly related to *Overlord* awaiting Bomber Command, and the fulfilment of these was to point the way to new policies and new techniques in the strategic night offensive against Germany.

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<sup>1</sup> Mustangs had not yet developed their full range potential, nor had they yet gone into action in large numbers. General Spaatz himself was still thinking in terms of unescorted attacks on German fighter plants and he expected 'rather heavy losses' on these occasions. He knew, however, that fighter ranges would soon be extended 'as P-51's come more into the picture.' Letter Spaatz to Arnold, 23rd Jan. 1944. R.S.I. 168-491, Vol. 2.

CHAPTER X

THE  
COMBINED BOMBER OFFENSIVE:  
OPERATIONS IN THE  
BATTLE OF THE RUHR  
THE BATTLE OF HAMBURG AND  
THE BATTLE OF BERLIN  
January 1943–March 1944

1. The operational prospects of the full offensive, January–March 1943
2. The Battle of the Ruhr, March–July 1943
3. The Battle of Hamburg and the campaign on the road to Berlin, July–November 1943
4. The Dams raid and the development of precision bombing at night in 1943
5. The Battle of Berlin, November 1943–March 1944

‘At long last we were ready and equipped. Bomber Command’s main offensive began at a precise moment, the moment of the first major attack on an objective in Germany by means of Oboe.’

SIR ARTHUR HARRIS, *Bomber Offensive*, 1947

‘I have repeatedly pointed out that the strength of German defences would in time reach a point at which night bombing attacks by existing methods and types of heavy bomber would involve percentage casualty rates which could not in the long run be sustained. We have not yet reached that point, but tactical innovations which have so far postponed it are now practically exhausted.’

SIR ARTHUR HARRIS, 7th April 1944

## 1. The operational prospects of the full offensive, January–March 1943

AT the beginning of 1943 Bomber Command was still confronted with the fundamental limitations imposed by the inadequate strength of its front line, the insufficient accuracy of its navigation and bomb aiming and the increasing severity and effectiveness of the German defences against its onslaught. It had long been obvious that if the scale and intensity of the offensive was to be raised to a level which might be expected to produce decisive, or even seriously damaging effects in Germany, there would have to be a vast expansion of the front line and a substantial increase in the proportion of bombs lifted from base which fell in the allotted target areas. Moreover, the casualties suffered would have to be kept not only within the bounds of what could be sustained by human spirit, but also within those which could be afforded by the limited numbers of trained aircrews and operational aircraft which could be produced.

The campaigns of 1942 had pointed towards the partial solution of these problems but none of them had been adequately overcome. The front-line strength of the Command had remained disappointingly small. The daily average of bombers with crews available for operations in November 1941 was 506. By January 1943 this number had increased to only 515.<sup>1</sup> The massive Thousand attacks had, it will be recalled, been made possible only by the wholesale committal to battle of the Operational Training Units. The results, and especially those of the famous attack on Cologne, had underlined the power of the argument for an expanded front line. They had not provided an alternative to it because the Operational Training Units could not be regularly employed on operations without disrupting the training organisation and, therefore, the future of Bomber Command.

Navigational standards had been much improved by the introduction of *Gee* in March 1942, but the device had not proved sufficiently accurate to make possible blind attack through the murk or overcast which normally shrouded such prime targets as Essen in the Ruhr valley. It was also of limited range. Moreover, as expected, *Gee* had been largely jammed over Germany since August 1942. In the continued absence of an effective marker bomb, or target indicator, and with the lack of anything better to assist navigation than the already jammed *Gee*, the initial task of the Pathfinder Force had been

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<sup>1</sup> See App. 39.





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thankless, and over the more difficult targets, largely impossible. Air Commodore Bennett's courageous crews had neither the adequate means of finding the path, nor of indicating the target to their comrades of the main force.

Although, as will long be remembered, Bomber Command achieved some outstanding victories in 1942, these had been isolated events and the products of special circumstances such as, in the case of Lübeck, the extreme vulnerability of the target and its light scale of defences, or, as in that of Cologne, the calling into action of the Operational Training Units. Neither the size, nor the accuracy of the force throughout 1942 had been adequate to fulfil the stern tasks which had been assigned to it in the February directive. Casualties had, however, been on a severe scale. During the year 1,404 aircraft had been lost in action and another 2,724 damaged.<sup>1</sup> The constantly increasing scale, ingenuity and efficiency of the German air defences and particularly of their night fighter force made the future prospect appear to be even more grim.

The outlook for 1943 was, however, less bleak than might be suggested by these considerations. Despite the frequent, and sometimes publicly voiced, criticisms levelled at the performance of Bomber Command, the forceful, single-minded and courageous leadership of Sir Arthur Harris had not only infused the whole force with a spirit which, through many long and some dreadful nights, was to prove unquenchable, but had also stimulated new confidence among those higher authorities who directed the policy and controlled the reinforcement of the Command, which, throughout these frustrating years, had been in more constant and dangerous action than any other branch of the armed forces.

Though the goal of a four thousand strong front line for Bomber Command had long since been abandoned, this new confidence had, in the course of 1942, been translated into a resolve on the part of the Government, and particularly of the Prime Minister, to bring substantial reinforcements to the operational squadrons of Bomber Command and to check, as far as possible, their dissipation by loans and transfers to the Middle East and to Coastal Command. These measures had not produced significant results in 1942 itself, during which nineteen new squadrons had been formed in Bomber Command and thirteen withdrawn from it for service in other theatres and commands.<sup>2</sup> Nevertheless, some important foundations had been laid and a marked improvement in the quality, if not the quantity, of the

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<sup>1</sup> Bomber Cmd. O.R.B. and O.R.S. Nt. and Day Raid Reports. Of the 3,724 sorties directed against Essen in 1942 causing, as Sir Arthur Harris reports, 'no significant damage' to the Krupp works and 'very little' to the town, some 201 bombers failed to return. *Bomber Offensive*, (1947), p. 146.

<sup>2</sup> *Harris Despatch*.

front line had been achieved. Blenheims and Whitleys had been withdrawn from operations during the summer and the Hampdens had followed them into retirement during September. Meanwhile, starting in March 1942, the four-engined Lancaster had embarked upon its operational career and this aircraft, in the words of Sir Arthur Harris' Despatch, 'soon proved immensely superior to all other types in the Command.' Of the new heavy bombers which had their origin in the 1936 specifications, both the Halifax and the Stirling were already revealing themselves as disappointments. The Manchester, after a brief and disastrous operational career, had come to grief and had to be withdrawn altogether in June 1942. The Lancaster alone was an unqualified success. Measured 'in no matter what terms', it was 'incomparably the most efficient' and it 'far surpassed' the Halifax and Stirling in range, bombload, ease of handling, freedom from accident and in casualty rate.<sup>1</sup>

The withdrawal from operations during 1942 of the Blenheims, Whitleys and Hampdens, coupled with the failure of the Manchesters, represented a sacrifice of quantity to quality. The introduction of the new types naturally led not only to interruptions of output from the factories, but it also resulted in the withdrawal of many squadrons from the line for the necessary purposes of retraining and re-equipment.<sup>2</sup>

This change over was one of the principal factors which retarded the numerical expansion of the Command in 1942, but it did lead to a transformation in the composition of the front line. On 1st January 1942 there had been forty-eight operational squadrons in Bomber Command. Of these, nine had been heavy, thirty-four medium and five light. Twelve months later there were only forty-nine operational squadrons but, of these, thirty-two were heavy, eleven medium and six light.<sup>3</sup> One of the results was that in 1942 Bomber Command had dropped about 14,000 tons of bombs more than it discharged in 1941, though in 1941 about 500 more bombing sorties had been flown than in 1942.<sup>4</sup> Such were the foundations upon which was built the

<sup>1</sup> *Harris Despatch*. The Halifax Marks II and IV continued to be unsatisfactory throughout 1943 and it was not until about February 1944, when the Mark III became available in quantity, that the Halifax began 'to hold its own against the formidable fighter defences of the Reich'. Stirlings, because of their lack of ceiling, had to be withdrawn from major operations at the same time as Wellingtons in October/November 1943. *do*. The Lancaster casualty rate, of course, exceeded that for Halifaxes and Stirlings when the latter, as was often the case, were not used in the more formidable attacks.

<sup>2</sup> Between February and December 1942 inclusive the average proportion of squadrons established in Bomber Command which were non-operational on account of being re-equipped was 16.36 per cent. For the twelve months of 1943 this average fell to 3.3 per cent. Figures calculated from data supplied in *Harris Despatch*.

<sup>3</sup> A.M.W.R. Manual of Bomber Command operations 1942. By this time the term 'heavy bombers' included Stirlings, Halifaxes, Manchesters and Lancasters. 'Medium bombers' included Wellingtons, Hampdens and Whitleys. 'Light bombers' included Blenheims and Mosquitoes.

<sup>4</sup> Bomber Command dropped 45,501 tons of bombs in 1942 as against 31,646 tons in

dramatic increase of striking power which occurred in 1943. In January 1943, the Commander-in-Chief could call on an average of 515 aircraft available with crews for operations. There was an average of 336 heavy bombers available. By March 1944 Bomber Command was almost within reach of regular Thousand attacks. In that month the average number of aircraft available with crews for operations was 974. An average of 985 heavy bombers was available.<sup>1</sup> Thus, the plan for an 'all heavy' force, which had begun to mature in 1942, was brought to fruition in 1943. In this development the Lancaster played a part of increasing predominance and as the year 1943 progressed it became, as Sir Arthur Harris reported, 'the mainstay of all operations against Germany, and particularly Berlin'.<sup>2</sup> While, however, the medium bomber element of the Command, consisting of Whitleys, Hampdens and Wellingtons, died of old age after long and honourable service, the light bomber component which, in the days of the Battles and Blenheims, had been the weakest link in the front line, was given a fresh infusion of life by the discovery of the Mosquito. Only small numbers of these aircraft were left in Bomber Command after the transfer at the end of May 1943 of 2 Group to the Tactical Air Force, but, both before and after that time, as the extraordinary versatility of this high-performance machine was increasingly recognised, many new operational possibilities were opened to Bomber Command.

Indeed, 1942 had not only opened the way towards a great increase in the striking power of Bomber Command, but it had also presaged a radical improvement in the effectiveness of the effort which was to become available in 1943. The campaigns of 1942, it will be recalled, had revealed not only the sovereign necessity of expanding the strength and quality of the front line: they had also shown the urgency of improving the accuracy and widening the tactical opportunities of the striking force. Specifically, there emerged the need for further radar aids to navigation to supplement the limited range and accuracy as well as the susceptibility to jamming of *Gee*. At the same time, it had become obvious, that if the more difficult targets, notably those in the Ruhr, were to be repeatedly and effectively struck, radar aids which made possible reasonably accurate blind bombing, blind marking or at least preliminary illumination would have to be provided. On the experience of 1942, such

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1941. In 1942 Bomber Command flew 29,929 bombing sorties as against 30,508 in 1941. The total number of Bomber Command sorties in 1942 did, however, exceed those of 1941 (36,426 as compared with 32,262). The increasing mining and reconnaissance activity of 1942 accounts for the differences.

<sup>1</sup> See App. 39. There was, in addition, an average availability of fifty-eight Mosquitoes. It is interesting to note that in this month, the average availability of aircraft, therefore, amounted to a total of 1,043 as compared with an average of 974 aircraft available with crews for operations.

<sup>2</sup> Harris Despatch.

devices seemed to offer the only hopeful solution to the problems of night visibility created by industrial haze, searchlight dazzle, the intense anti-aircraft defences which forced the bombers to higher and higher altitudes and the increasing night fighter force which drove the bombers to operate on darker and darker nights. Finally, there was the problem of bomber casualties which in 1942, and especially in attacks on the Ruhr area, had assumed formidable proportions.

The battles of 1942 had, however, done something more than merely to expose these problems. They had provided a spur to the genius of British scientific inventiveness in their solution. Among the many new devices about to be introduced, there were four of outstanding significance which were ready to be applied to the battles of 1943. Two of these were radar aids known as *Oboe* and *H2S*. *Oboe*, for the first time in the war, brought the possibility of effective blind bombing within the reach of Bomber Command. It was first operationally employed on the night of 20th December 1942. *H2S* carried the scan of radar to the utmost limit of the bombers' range and it was first used in action on the night of 30th January 1943. The third device was the target indicator bomb which was first dropped operationally on the night of 16th January 1943. The last device was *Window*, which, it will be remembered, could easily have been employed in 1942. It was by far the simplest of the new aids and also the cheapest. It was not, however, released until July 1943 when, in the great Battle of Hamburg, it had a paralysing effect on the German radar-controlled air defences.

These technical devices which were constantly modified and improved and the many others by which they were accompanied and succeeded, transformed the operational capacities of Bomber Command, especially by virtue of the increased precision and power of direction which they imparted to the Pathfinder Force and the specialised elements of 5 Group. It is well to remember, however, that the devices alone would have availed little in the absence of the complex and often brilliant tactical methods of exploiting them which were devised particularly in the Pathfinder Force, under the command of Air Commodore Bennett, and 5 Group, under that of Air Vice-Marshal Cochrane. Moreover, these tactical methods could never have been attempted had it not been for the devoted and daring skill far beyond the normal calls of duty or expectation of a handful of particularly experienced and utterly fearless pilots, outstanding among whom were Wing Commander Gibson and Wing Commander Cheshire, both of whom were awarded the Victoria Cross.

Nevertheless, it would be, as succeeding pages will show, the greatest mistake to assume that all things were about to become possible, and least of all easy, to Bomber Command. The force still had to labour against intense and in some ways increasing difficulties.

Many disappointments were still ahead. Every one of the new aids suffered from grave limitations. *Oboe* had a restricted range which could not be extended much beyond the Ruhr. It could only be operated by a handful of aircraft at one time, it was liable, when discovered, to be jammed and remarkable as its accuracy was, it could not guarantee hits on specific pinpoints.<sup>1</sup> *H2S*, though of unlimited range, impossible to jam, and capable of simultaneous operation by as many aircraft as could be equipped, was a highly complicated apparatus from the point of view of the navigator in the air. Unlike *Oboe* and *Gee* it did not provide cut-and-dried answers. It provided data of varying obscurity which not infrequently defied the most skilled interpretation. The target indicator bomb was subject to counterfeit by the enemy and might in any case be dropped at the wrong place. *Window*, though it confused both the night fighters and anti-aircraft gunners, of course, destroyed neither. It allowed an opportunity for modified tactics in the defence of Germany against night bombing and, in the event, the Germans were neither slow nor stupid in exploiting this opportunity. Heavy and sometimes alarming casualties still lay ahead of Bomber Command.

All the same, the combination of increasing strength and improving operational capacity meant that in 1943 the strategic air attack began to assume the proportions of a major offensive. Hitler, more or less permanently marooned at his Eastern Headquarters, was increasingly compelled to attend to its consequences. It also meant that, for the first time in the war, Germany herself, in contradistinction to her armies abroad, began to pay the price of the fearful deeds which she had perpetrated, and was yet to perpetrate, against others. At last the strategic theories which for a quarter of a century had been the inspiration of the Royal Air Force were coming to operational maturity.

This great air offensive unfolded around three major battles, which are the most famous in the history of Bomber Command, the Battle of the Ruhr, the Battle of Hamburg and the Battle of Berlin. The engagement was opened with the Battle of the Ruhr in March 1943 and this struggle lasted until July. A path of destruction, initiated by the Battle of Hamburg, was then driven into the centre and south of Germany in preparation for the climax of the campaign which came in November when the Battle of Berlin was opened. These battles, unlike those which are joined on land, or even at sea, were neither self-contained nor exclusive. Weather and tactical considerations made this, as always, inevitable. Berlin, for example, was attacked at the beginning of the year and the Ruhr was often revisited after July.

The greater proportion of these attacks did, however, have it in

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<sup>1</sup> In the event, *Oboe* was not jammed until November 1943 and then not very effectively.

common that they centred upon the larger German industrial towns and that their object was the devastation of the greatest possible acreage in the most heavily built-up areas. Nevertheless, area bombing, which had not been the sole injunction of the directive of February 1942, did not by any means become the exclusive practice of Bomber Command in 1943. Revolutionary advances in the technique of night precision attack were also achieved and these were signalled not only by the breaching of the Möhne and Eder dams in May but also in many other ways which were scarcely less spectacular. The possibilities and limitations which these precision attacks indicated were of particular significance not only in relation to the policy of selective and even of precision attack upon which, as will be recalled, the Air Staff began to place increasing emphasis towards the end of the year, but also in their bearing upon the tactical problems of area attack itself.

Area bombing was not, as is so often supposed, simply a question of spilling bombs at random over large towns, though even that had been difficult enough in the past. If they were to be effective, area attacks had to be not merely heavy, but also accurate and concentrated. This called for a high degree of precision both in navigation and in bomb aiming. For this reason the techniques which were developed for precision attacks, including some of those used in the famous dams raids, were of the greatest importance in increasing the effectiveness of the much more massive area attacks, particularly in so far as the laying of the markers was concerned.

Such then was the legacy of 1942 and the prospect for 1943. Germany herself did not, however, immediately feel the brunt of the consequences. As in 1942, the offensive was not renewed in earnest until March when, also as in 1942, it was concentrated upon the Ruhr, already familiar to many Bomber Command crews as the 'Happy Valley'. In the meantime, again as in 1942 and, indeed, as in each of the previous winters of the war, there was a pause. This time, however, the circumstances were somewhat different and the delay was due more to the Admiralty and less to the season than had previously been the case.

In the winter of 1941-42, it will be recalled, the critical state of the Battle of the Atlantic had resulted in a great concentration of the Bomber Command effort against the German warships *Scharnhorst*, *Gneisenau* and *Prinz Eugen* which were then lying in Brest. Though the Air Staff had never been hopeful about destroying any of these ships, they had, perhaps, not been entirely dismayed by the attempt. The season was unfavourable for major attacks on Germany. Bomber Command was supposed to be gathering strength for the spring and, above all, the operational introduction of *Gee* was still being awaited.

At the beginning of 1943, as was presently indicated in the prior-

ities of the Casablanca directive, the Battle of the Atlantic was once more judged to be entering a critical phase. Bomber Command was now invited to concentrate a major effort against the German U-boat bases on the Biscay Coast, the four most important of which were Lorient, St. Nazaire, Brest and La Pallice.<sup>1</sup> This diversion, augmented by the Prime Minister's decision of 3rd December 1942, that 'the heat should be turned on Italy',<sup>2</sup> was irksome because *Oboe* and *H2S* were now ready for action and Bomber Command, being consequently somewhat more independent of the weather, was prepared to renew the offensive against Germany herself. Moreover, Sir Arthur Harris, at least, was firmly convinced that the attacks on the Biscay ports would achieve no significant results. In April 1942 he himself had suggested that a number of heavy attacks on Lorient, St. Nazaire, La Rochelle, Bordeaux and Brest would greatly complicate the turn-round of U-boats, but his advice had been rejected,<sup>3</sup> and by 1943, seeing that the massive concrete covers to the U-boat pens were completed, he had changed his mind. On 25th March 1943, for example, he told the Director of Naval Intelligence, Commodore Rushbrooke, that 'The total effect of bombing attacks on the French West coast bases will be negligible in reducing the threat to our Atlantic shipping. U-boats using these bases', Sir Arthur Harris said, 'are amply protected by concrete bomb-proof shelters.' Neither the labour nor the materials necessary for the servicing of the boats need, he added, be housed and stored within the built-up areas of the towns. The attacks, he, therefore, concluded, were 'completely wasteful'.<sup>4</sup> In this judgment, Sir Arthur Harris was not approximately, but precisely, correct. In the attacks which he, nevertheless, had to carry out nearly everything was destroyed except the U-boat pens, the U-boats and their servicing facilities. Grand Admiral Dönitz reported soon afterwards. 'You know that the towns of St. Nazaire and Lorient have been eliminated as main U-boat bases. No dog or cat is left in these towns. Nothing remains but the U-boat pens in which the U-boats are repaired. These were built by the Todt Organisation at an early stage on the far-sighted orders of the Führer. The enemy', he concluded, 'has realised that he cannot achieve anything by air attacks and has therefore transferred the struggle against the U-boats to the coastal waters.'<sup>5</sup>

Between the issue of the Air Ministry directive on 14th January

<sup>1</sup> Air Min. to Bomber Cmd., 19th Nov. 1942. Dir. Bottomley to Harris, 14th Jan. 1943, App. 8 (xxviii).

<sup>2</sup> Min. Bottomley to Sinclair, 16th Jan. 1943.

<sup>3</sup> Letters Harris to Portal, 7th April 1942, and Portal to Harris, 9th April 1942.

<sup>4</sup> Letter Harris to Rushbrooke, 25th March 1943.

<sup>5</sup> *Zentrale Planung*, 40th Mtg., 4th May 1943. Sir Arthur Harris referred to this diversion as 'one of the most infuriating episodes in the whole course of the offensive.' *Bomber Offensive*, p. 137. For a graphic illustration of the point see the photograph facing p. 103.



and his release from the commitment on 6th April 1943,<sup>1</sup> Sir Arthur Harris, obedient but unconvinced, directed no fewer than 3,170 bomber sorties to the Biscay ports. All of these were concentrated against Lorient and St. Nazaire. The two largest attacks were carried out on the night of 13th February when 466 aircraft were despatched to Lorient and on that of 28th February when 437 were sent to St. Nazaire. The opposition was generally very slight and only thirty-eight aircraft failed to return from these fourteen attacks. A further nine were, however, destroyed in accidents over England. Most of the attacks were well concentrated and excluding the night of 29th January when a force of 116 aircraft failed, owing to bad weather, to bring back any satisfactory photographs, it appeared, on the evidence of plotted photographs that at least 1,516 aircraft had dropped their bombs within three miles of the aiming points. In some cases these results had been facilitated by the use of *Oboe*-equipped Mosquitoes for the marking of the target.<sup>2</sup>

These attacks, therefore, contributed something to the development of the *Oboe* technique which was presently to achieve such remarkable results in the Battle of the Ruhr. Apart from that, however, their tactical significance was not much greater than their strategic contribution, and there is no need to devote further space to this diversion except to observe that it was, as Sir Arthur Harris repeatedly claimed, a gross misdirection of the force.

The Italian diversion did not amount to much and in the first three months of 1943 it absorbed no more than 336 sorties from which only five aircraft failed to return.<sup>3</sup> This meant that, in spite of the Biscay coast, Bomber Command was able to launch a number of attacks against German targets in the Ruhr and farther afield. Though these operations of January and February 1943 were only the curtain raiser to the full assault which began in March, they are of considerable tactical significance, as it was on the basis of them that the initial *Oboe*, *H2S*, and marker-bomb techniques were devised. They also included the first sorties against Berlin since 1941, and, therefore,

<sup>1</sup> Dir. Bottomley to Harris, 6th April 1943, see App. 8 (xxx), in which it was stated 'that after consideration of the results so far achieved, it has been decided that the employment of your main bomber effort in this form of attack [area bombing of the Biscay ports] is for the present to be discontinued. The effort thus released is to revert as far as possible to the attack of targets in Germany.'

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Reports, 14th/15th January-2nd/3rd April 1943 inclusive.

<sup>3</sup> There were four separate attacks, all in February 1943, against Italian targets:

4th/5th Feb.: 188 aircraft (eight using *H2S*) despatched to Turin. Estimated that fifty-seven bombed within three miles of the aiming point. Three missing.

4th/5th Feb.: Four Lancasters carrying 4,000 lb. bombs despatched to naval base at Spezia. All returned.

14th/15th Feb.: 142 Lancasters (none carrying *H2S*) despatched to Milan. Estimated that a hundred bombed within three miles of aiming point. Two missing.

14th/15th Feb.: Four Lancasters with 4,000 lb. bombs despatched to Spezia. All returned. O.R.S.(B.C.) Nt. Raid Reports.

the first attacks against the target known to Bomber Command crews as the 'Big City', which were carried out under the direction of Sir Arthur Harris, as Commander-in-Chief.

As has been mentioned, the first operational use of *Oboe* was on the night of 20th December 1942, of the target indicator bomb on the night of 16th January 1943 and of *H2S* on that of 30th January 1943. By the end of February considerable progress had been made towards assessing the value of, and developing the tactics and techniques appropriate to, these devices.

The range of *Oboe* increased in proportion to the altitude of the aircraft carrying it and this was one of the reasons for which the device was installed in Mosquitoes, which had by far the highest ceiling of any Bomber Command aircraft. These Mosquitoes belonged to 109 Squadron of the Pathfinder Force and six of them were ordered to carry out an *Oboe* attack on the power station at Lutterade in Holland on the night of 20th December 1942. The crews were briefed to fly at 26,000 feet and each Mosquito was armed with three 500-lb. M.C. bombs. The first aircraft made a good *Oboe* run across the target and it was calculated that its bombs fell about 200 yards from the aiming point. The second crew was rather less successful and it appeared that its bombs missed the aiming point by about 500 yards. The third Mosquito made a bad run and its bombs fell wide of the target. The remaining three Mosquitoes all developed technical faults in their *Oboe* equipment and had to abandon the operation. All of the six *Oboe* Mosquitoes returned safely to base and the Germans were left without any tangible evidence to show that the pinpricks around Lutterade and not the more massive assault on Duisburg were the significant events of the night.

The British were also, however, left in a state of some ignorance about the new device. A daylight reconnaissance photograph of Lutterade, brought back on 23rd December, showed that the whole surrounding area was pitted with bomb craters, caused presumably by errors in a recent attack on Aachen. This made it impossible to detect the points of impact of the first *Oboe*-directed bombs.<sup>1</sup> Nor was this lack of clear evidence about the operational performance of *Oboe* remedied by the further experiments which immediately followed.

On four nights between 22nd and 29th December, fifteen *Oboe*-equipped Mosquitoes were despatched to Hamborn, Rheinhausen, Ruhrort, Essen and other targets in the Ruhr. All these aircraft returned safely to base, and, though on at least one occasion it seemed that the bombs had fallen within two hundred yards of the aiming point, it was impossible to confirm this on reconnaissance photographs owing to the density of bomb craters already surrounding all

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 9th Feb. 1943.

these targets. Moreover, on each of these occasions the Mosquitoes had operated at 28,000 feet and not infrequently the bombs had been dropped through unbroken cloud. The observations of the crews were, therefore, necessarily of a strictly limited character.<sup>1</sup>

Thus, although more experience in the use of *Oboe* was gained, little was added to the sketchy information about its operational accuracy. Nevertheless, on the last night of 1942, the first experiment in marking a German target by means of *Oboe* was attempted. On this occasion two *Oboe* Mosquitoes, one acting as the marker, and the other, whose services were not in the event required, as a reserve, were despatched, ahead of eight Lancasters, provided by the Pathfinder Force, to Düsseldorf. The Mosquitoes carried flares which were to be dropped on the indication of *Oboe* to mark the aiming point for the Lancasters which carried 4,000-lb. bombs and loads of incendiaries. The flares were set to burst in the clear air above the cloud, which, as expected, almost completely covered the target area. Seven of the Lancasters flying at between 18,000 and 20,000 feet aimed their bombs at these sky markers. The eighth Lancaster did not return. Photographic reconnaissance carried out on 9th January 1943 revealed no new damage in Düsseldorf, but the responsibility or otherwise of *Oboe* for this failure was not, of course, apparent.<sup>2</sup>

This initial sky-marking experiment was followed in the first fortnight of January 1943 by eight more attacks in which similar tactics, but larger forces, were employed. These involved the despatch of twenty-five *Oboe* Mosquito and 355 Lancaster sorties. Seven of the attacks were aimed at Essen and, on the other, the target was Duisburg. All the Mosquitoes returned to base but seventeen Lancasters were reported missing. Varying success attended these efforts. Sometimes the Mosquito crews experienced technical difficulties with their *Oboe* equipment, and on one occasion the marking failed completely. At other times the *Oboe*-laid sky markers seemed to be well concentrated and substantial numbers of the Lancasters sent out from 1 and 5 Groups were able to recognise and aim at them. It became apparent that some of the attacks had been effective. Photographic reconnaissance of Duisburg, which was bombed through unbroken cloud on the indication of the sky markers on the night of 8th January 1943, showed that considerable damage had been caused, though it was not found possible to make an exact assessment. Moreover, reconnaissance over Essen showed that this important town no longer enjoyed its relative immunity of 1942. The seven sky-marker attacks were seen to have resulted in numerous points of industrial and residential damage which were scattered throughout the town. Above all, a

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 13th, 19th and 20th Feb. 1943.

<sup>2</sup> do. 24th Feb. 1943.

large building in Krupps, probably an open hearth steel working shop, looked as if it had been almost entirely destroyed and some saw-mills, glass works, brick works and a coke-oven plant appeared to have been severely damaged.<sup>1</sup>

The difficulty of attributing particular bomb craters apparent on reconnaissance photographs to particular aircraft, and, therefore, of comparing the calculated position of *Oboe*-directed bombs with their actual points of impact, remained. From the point of view of surmounting this particular problem the *Oboe* targets had not been well chosen and on the evidence up to the middle of January 1943, the Operational Research Section at Bomber Command was still in the dark as to the potentiality of the new device. Its error seemed to be in the region of 650 yards, but on occasions it might have been no less than between half and one and a half miles.<sup>2</sup> In the case of sky marking, the difficulty of assessing *Oboe* was even greater, because the markers, drifting with the wind, left no record of their original position. This, indeed, was the sovereign disadvantage of the sky-marking technique, for not only did the markers have to be placed so that the bombs aimed at them would strike the target far beneath, but also they had to be attacked before they drifted away from this position. The problem was not entirely different from that involved in aiming at a moving target which was proceeding at a somewhat indefinite speed. No entirely reliable solution was ever found. Nevertheless, as we have just seen, some bombs had fallen with reasonable accuracy through unbroken cloud. Moreover, it had been demonstrated that an *Oboe* aircraft could drop bombs with a marked, though not yet precisely defined, degree of accuracy from a great height. If this was possible, it followed that a ground marker bomb could be dropped with equal accuracy. These were revolutionary developments of the utmost significance, because at this moment effective marker bombs, or as they were more generally called, target indicators, were brought into action for the first time in the war.

The first operational use of these weapons was on the night of 16th January 1943 when, towards dusk, a force of 201 heavy bombers set course, for the first time since 1941, for Berlin. Three Lancasters of the Pathfinder Force were ordered to drop flares in the target area two minutes before zero hour. For this purpose, the selected crews had nothing other than their dead reckoning navigation upon which to rely, for, at Berlin, they were far beyond the range of both the old aid, *Gee*, and the new one, *Oboe*. The plan was that, by the light of these flares, five more Lancasters and five Halifaxes also of the

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<sup>1</sup> do. 23rd Feb., 27th Feb., 1st March, 12th March, 9th March, 10th March and 25th March 1943.

<sup>2</sup> O.R.S.(B.C.) Report. Abstract for A.C.A.S. (Ops.) by O.R.C., 7th Feb. 1943.

Pathfinder Force were to attempt a visual identification of the aiming point on which they were to drop the new target indicator bombs as a guide to the main force which followed.

As was so often to be the case where Berlin was concerned, the plan miscarried. Unbroken cloud covered the route to within ten miles of Berlin. At the target itself visibility was reduced by haze which at times was very thick. The flare and marker forces had the utmost difficulty and several of the flares were brought back to base. Three of the markers did however claim to have identified the city, though they were late in doing so. Their marker bombs may have attracted a fraction of the main force attack and, perhaps, accounted for the concentration of damage revealed on subsequent reconnaissance photographs around the Tempelhof district. It seemed that the greater part of the attack had been dispersed in the southern suburbs of the city. Though thirty-four aircraft were damaged only one, a Lancaster of 5 Group, failed to return from the attack.<sup>1</sup>

Not much more success was achieved on the following night when similar tactics were employed and, curiously enough, an identical route to the same target was followed. From a force of 187 heavy bombers which set out, twenty-two failed to return and a further thirty were damaged. Though the Pathfinder crews reported rather less difficulty in locating the target than on the previous night, the main part of the attack again appeared to have been dispersed through the southern suburbs.<sup>2</sup> The marker bomb without the guidance of radar was, as might have been expected, no solution to the problem of accurate attack on formidable targets, especially Berlin. Meanwhile, however, though it was impossible to extend the range of *Gee* or *Oboe* to that extent, the introduction of *H2S*, and so of unlimited radar range, was now imminent.

The formula *H2S* was not scientific. It stood, some said, for 'home sweet home' and this name, ascribed to Lord Cherwell, was an indication of the very high hopes which were entertained about the performance of the device. As will be recalled, the principles of *H2S*, which were similar to those of A.S.V., had long been understood but it was not until the night of 30th January 1943 that the instrument was first used operationally. The chosen target was Hamburg, which within six months was to become the scene of a major catastrophe for Germany in which *H2S* played a leading part. On this first occasion, however, little success was achieved and subsequent photographic

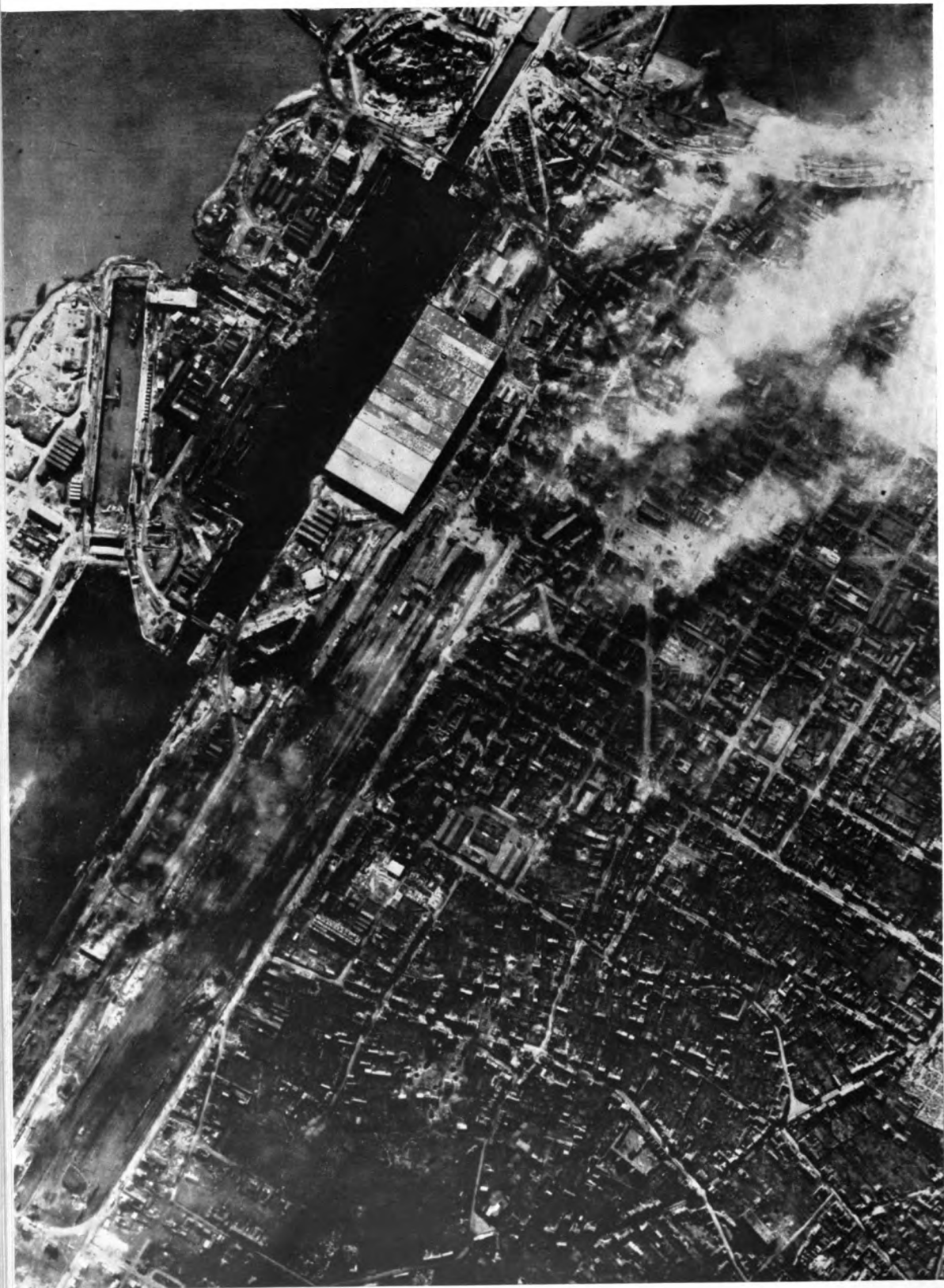
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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 17th March 1943.

<sup>2</sup> do. 11th March 1943. Photographic reconnaissance covering these two attacks showed some considerable damage in Berlin's southern suburbs and up to eight miles from the centre of the city. On this evidence it appeared that four fairly large sheds in the Daimler-Benz aero-engine works were destroyed and ten other factories were damaged. The damage to residential property was, however, very slight and it was clear that only isolated aircraft had penetrated to the centre of the city.



1. Air Chief Marshal Sir Norman Bottomley, K.C.B., C.I.E., D.S.O., A.F.C.,  
Deputy Chief of the Air Staff from May 1941.



2. The U-boat pens at St. Nazaire after attack on the night of 28th February 1943. Note that the pens are still intact.

reconnaissance showed that hardly any new damage had been caused.

The force despatched amounted to 148 heavy bombers and fourteen of these, Stirlings and Halifaxes of the Pathfinder Force which had been equipped with *H2S*, were sent ahead to carry out the marking. These *H2S* crews were briefed to drop flares at two of the turning points on the way to the target as a guide to the main force. At the target itself, they were, if the weather was clear, to mark the aiming point with red target indicators. If the weather was cloudy, they were to drop sky marker flares in the way that the *Oboe* Mosquitoes had done before. In the event, both types of marking were put down and reports suggested that the main force crews had not had much difficulty in recognising them.

On his return, one of the *H2S* navigators said that the target had been very poorly indicated on his cathode ray tube because his aircraft at the time was taking evasive action. All the other reports suggested, however, that the picture of the target area had materialised in exactly the expected form and two of the navigators claimed that it had enabled them to make a 'positive identification' of the Hamburg dock system. The reports also showed that *H2S* had been a most useful aid to navigation. Many landmarks on the route had readily been identified. This was particularly fortunate for those flying in Stirlings because on that night their *Gee* sets had been incorrectly tuned and were useless.<sup>1</sup> Despite the failure of the attack, the occasion was memorable not only for the introduction of a new radar aid which could not be jammed and which had unlimited range but also because it was the first time that the target indicator bomb had been used in combination with radar. Moreover, the introduction of *H2S* completed what was undoubtedly the most important phase of the technical revolution in Bomber Command. There were still a great number of devices which were yet, and in some cases imminently, to be brought into service. Numerous modifications and improvements were also to be made to the equipment already introduced. Indeed, these processes never ceased and as the war advanced the bombers became more and more crowded with gadgets of almost every kind until towards its end, even the escape hatches were often obstructed. Nevertheless, *Oboe*, the target indicator bomb and *H2S* together with *Gee*, were, as far as finding and hitting the target was concerned, the basic devices upon which the new tactics of the strategic air offensive were founded. In general, for most of the remainder of the war and for these purposes, Bomber Command was approximately as good as these four devices and the various tactical developments which they made possible. There were, of course, other equally important

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<sup>1</sup> do. 6th April 1943.

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considerations such as the destructive power of bombs, the intensity and efficiency of enemy opposition and, as always, the factors of weather and geography. There were also the exceptions produced by specialised training, specialised equipment and exceptional operational experience. None of them, however, diminished the significance of the introduction of *Oboe*, the target indicator bomb and *H2S*. Many of them were related to it. The attack against Cologne on the night of 2nd February 1943, in the course of which *Oboe*, *H2S* and the target indicator bomb were all used, was, therefore, particularly notable.

One hundred and sixty-one aircraft were despatched; two *Oboe* Mosquitoes and eleven *H2S* Halifaxes and Stirlings were to carry out the marking by dropping red target indicators. Twelve Lancasters carrying no special equipment were then to 'back up' this marking by aiming green target indicators at the red concentration. If the weather was cloudy the *H2S* crews were to drop red flares set to burst with green stars at 17,000 feet. As on earlier occasions when alternative plans had been made both types of markers were dropped. Nevertheless, one *Oboe* Mosquito and six of the *H2S* aircraft dropped red target indicators. These were seen to be somewhat scattered as also were the green 'backers-up' dropped by the Lancasters and the main force crews had much difficulty in selecting the aiming point. Once again it was impossible to say what success had attended the experiment. Only seven night photographs could be plotted and these were all between seven and nineteen miles away from the aiming point. A further fifteen photographs showed villages or open country of uncertain location and all the rest showed nothing but thick cloud. No special daylight reconnaissance was undertaken.<sup>1</sup>

Little or no success was achieved by a force of 263 aircraft despatched to Hamburg on the night of 3rd February 1943. The attack was carried out by such aircraft as managed to reach the target area on the indication of *H2S* sky markers. Conditions were most adverse and there was dense cloud in which icing was severe. Sixteen Bomber Command aircraft failed to return and a further twenty-nine were damaged. Most of the losses were attributed to German night fighters which despite the weather had operated with considerable effect. Four small-scale attacks carried out by eight *Oboe*-equipped Mosquitoes against Ruhr targets on the nights of 6th, 7th, 9th and 11th February may have been more successful but there was no evidence to prove it.<sup>2</sup> On the latter night, however, an important and demonstrable success was achieved by a force of 177 aircraft despatched to Wilhelmshaven.

This target was beyond the reach of *Oboe*, which, it was already apparent, was a more accurate device than *H2S*. The marking was,

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 29th March 1943.

<sup>2</sup> do. 4th, 10th, 12th and 21st April 1943.

therefore, to be carried out by *H2S* aircraft and three alternative methods were prescribed for three possible weather situations which might be encountered. If the target area was found to be covered by five-tenths or less cloud, the *H2S* crews were to drop flares at eight-second intervals across it. In the resulting illumination, these fourteen Pathfinder crews were to attempt a visual identification of the aiming point. If they succeeded, they were to mark it with green target indicators. The twenty-one 'backers-up' were then to consolidate this marking and were also to drop more flares and high-explosive bombs. If the target area was covered by between five- and eight-tenths cloud, the *H2S* crews were to drop the target indicators blindly on the indication of radar. Finally, if the target was covered by more than eight-tenths cloud, the *H2S* crews were ordered to lay down sky marking which, if attacked by the main force on a pre-arranged heading, would, it was hoped, result in the target being hit.

The plan for the first eventuality should be noted. In this case, *H2S* was to be used purely for the initial illumination and the actual marking of the target was to be by visual aim. This technique, known as *Newhaven*, with several modifications, was later to be developed by the specialised elements of 5 Group and it eventually resulted in the most remarkable successes. On the night of 11th February 1943, however, it could not be put into practice. Wilhelmshaven was found to be completely covered by a layer of cloud at between ten and twelve thousand feet. No ground marking, either blind or visual, was possible. The sky marking was, however, clearly visible above this cloud for fifteen minutes after eight o'clock, the Zero hour, and most of the main force attacked it within the first five minutes. At six minutes past eight 'a gigantic explosion was accompanied by a tremendous flash, which lit up the sky and remained for nearly ten minutes as a huge red glow.'

This spectacular sight, as subsequent reconnaissance showed, was the result of a direct hit on the Mariensiel Ammunition Depot which blew up and was almost totally destroyed. The reconnaissance also covered further Bomber Command attacks on the nights of 18th and 19th February as well as the daylight attack by the Eighth Air Force, its first against a German target, on 27th January. It showed, in addition to the destruction of the Mariensiel Depot, an area of devastation measuring some 118 acres, and other damage over a much wider area extending from the ammunition depot to the commercial harbour where the *Deutsche Werke* and shipyards, several oil tanks, harbour works and other buildings had been hit. All this, as well as the destruction of an oil tank at Sande, was attributable to the attack on the night of 11th February. Other damage could not be attributed to any particular attack.<sup>1</sup>

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<sup>1</sup> do. 21st April 1943.

This outstanding success, it is well to emphasise, had been achieved by aiming at sky markers laid blindly on the indication of *H2S* alone. It was achieved on a night when none of the photographs brought back by the victorious bombers showed anything but cloud. Severe damage had been inflicted when, without the new aids and tactics, no attack would have been possible. Moreover, it is interesting to compare the results with two other Bomber Command attacks on the same target which were carried out on 18th and 19th February. On the first occasion 195 heavy bombers were despatched and 181 of them claimed to have attacked in excellent weather. Most of them aimed at ground markers which had been laid by *H2S* aircraft. The night photographs showed, however, that the great bulk of the attack had fallen on open country five miles west of the town. Photographic reconnaissance showed that the damage to Wilhelmshaven was negligible and it seemed that the crews had been confused by the smoke screen in the target area and had made incorrect landmark identifications. On the second occasion 338 bombers were despatched and 300 of them claimed to have attacked the ground markers once again laid by *H2S* aircraft. Photographic reconnaissance showed little fresh damage.<sup>1</sup>

The advantage of blind attack was that smoke screens, decoys and other distractions did not interfere with such accuracy as it might achieve. Nevertheless, the success of *H2S* on the night of 11th February in making possible accurate blind marking was the exception and not the rule. Indeed, the equipment had not originally been intended for such precise purposes. It had been designed as a means of enabling aircraft to drop bombs on some built-up area even if the particular area could not be recognised. As such, it should have been part of the standard equipment of the main force and in this capacity it would in addition to having aided navigation generally, have reduced the numbers of bombs scattered in open country. During the first five months of 1943 it had, however, been found possible to equip only two flights of aircraft with *H2S* and it was, therefore, only as a pathfinder device that its value could be communicated to the main force.

Moreover, these two flights consisted of Stirlings and Halifaxes which were not the most effective aircraft in Bomber Command and had an inflexibility of speed which made it difficult to fulfil the first requirement of good markers: the ability to reach a particular place at a particular time. Furthermore, *H2S* had been introduced only six months after the decision to produce it had been taken. In its early operational career it, therefore, suffered from constant teething troubles and technical defects.<sup>2</sup> Though it had important advantages

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 4th May and 30th April 1943.

<sup>2</sup> O.R.S.(B.C.) Report, 25th August 1943.

and after improvements was to have many more, *H2S* was not a satisfactory device for blind marking and its accuracy compared very unfavourably with that of *Oboe*.

Another disadvantage of *H2S* was the fact that over very large and heavily built-up areas the screen became saturated with responses to such an extent that the recognition of particular features became difficult or impossible. This problem applied with particular force to Berlin, as was shown on the night of 1st March 1943, when sixteen *H2S* aircraft attempted to mark the city blindly for a major attack by the main force. Though the first marker aircraft, and possibly two others, succeeded in laying target indicators about three miles north-west of the aiming point, the remaining markers and backers-up were more widely scattered and the main force attack was dispersed over a hundred square miles. Even so, the attack was the most successful yet carried out on Berlin. Neither its accuracy nor its concentration compared with what had been planned, but photographic reconnaissance showed that 'very heavy damage' had been caused in the west and south of the capital. 'About 20 factories were partly destroyed, as well as the railway repair shops adjoining the Tempelhof Marshalling Yards, where 22 acres of workshops were devastated by fire.' Much other industrial and residential damage was caused.<sup>1</sup>

On the basis of experience gained in February, March and April, the Operational Research Section at Bomber Command came to the conclusion that the most useful role of *H2S* as a pathfinder device would be for the initial illumination intended to make possible the visual aiming of target indicators. Individual markers laid blindly by *H2S* could not be regarded as accurate enough to warrant instructions to the main force to aim at them.<sup>2</sup>

Such, then, was the experimental prelude to the offensive which was now about to be resumed on the grand scale. Though neither the full potentialities nor the limitations of the new devices and the tactics which they made possible had yet been by any means completely grasped, the introduction of *Oboe*, *H2S* and the marker bomb together with the substantial increase in both the quality and the quantity of the front line did offer a prospect for Bomber Command which was brighter than any in its previous history. 'At long last', as Sir Arthur Harris has written, 'we were ready and equipped,'<sup>3</sup> and the first phase of what it is no longer absurd to call the full offensive was about to be opened and presently to become famous as the Battle of the Ruhr.

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 14th June 1943. 302 aircraft were despatched on this attack. Seventeen failed to return and another forty-four were damaged.

<sup>2</sup> O.R.S.(B.C.) Report, 1st July 1943.

<sup>3</sup> *Bomber Offensive*, p. 144.

## 2. The Battle of the Ruhr, March–July 1943

The Battle of the Ruhr began as Sir Arthur Harris has himself recorded, 'at a precise moment'.<sup>1</sup> This was on the night of 5th March 1943 when a force of 442 Bomber Command aircraft was despatched to Essen and, for the first time, the *Oboe* marking technique was used to guide the main force in a major attack on a German target.

This was not an easy test of the new tactics, for Essen, with the Krupp Works lying at its very centre, was not only one of the most heavily defended targets in Europe, but it was also protected by an almost constant cloud of industrial haze and the close proximity of many heavily built-up areas, which could so easily be mistaken for itself by the invariably harassed and frequently blinded crews of Bomber Command. By virtue of these defences, active and passive, man-made and natural, Essen had, in the past, invariably escaped serious damage in all the major attacks directed against it, including the concentrated and costly series with which the campaign of 1942 had begun. This immunity, already infringed by the experimental *Oboe* operations mentioned above, was finally smashed in the great attack of 5th March. The evidence of the night camera suggested that 153 aircraft had, on that night, dropped their bombs within three miles of the aiming point.<sup>2</sup> The devastation of Essen had begun and the cost to the attacking force was unusually low. Fourteen bombers failed to return and a further thirty-eight were damaged.<sup>3</sup>

The operation, which we shall presently consider in closer detail, was, if not an unqualified, at least an unprecedented, success. It showed that Bomber Command had gained the mastery of a new degree of warfare which for almost a year of nearly uninterrupted violence was to be the scourge of Germany. It also marked the beginning of a famous Battle in the course of which Bomber Command was to show itself capable of achieving not only an occasional victory, as had previously been the case, but a whole series of consistent and pulverising blows among which the failures were much rarer than the successes.

The Battle of the Ruhr did not have about it quite the homogeneity that is sometimes supposed. It was no more than a phase of the continuing Bomber Command offensive and it is not even clear

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<sup>1</sup> *Bomber Offensive*, p. 144.

<sup>2</sup> It is stated in Denis Richards and Hilary St. G. Saunders: *Royal Air Force 1939–1945*, Vol. II, (1954), p. 287, that 367 bombers 'reached the target'. This was, in fact, the number which claimed to have done so.

<sup>3</sup> O.R.S.(B.C.) Nt. Raid Report, 21st June 1943.

when it ended. The operation on the night of 13th July 1943, when 374 aircraft were despatched to Aachen, may, however, not unreasonably be regarded as its last action if only because the next major attack after that was the first of a concentrated series against Hamburg and initiated a new battle soon to be made famous by the name of that unfortunate city.

Aachen, of course, is not in the Ruhr, but it is, perhaps, a mistake to regard the term 'Battle of the Ruhr' in its literal meaning. During the period of the Battle, Bomber Command carried out major attacks on areas as widely separated from the Ruhr as Berlin, Stettin and Pilsen in the east, Munich, Stuttgart and Nuremberg in the south-east, Turin and Spezia in the south and Lorient and St. Nazaire in the west. Though the Battle did have a geographical heart in the Ruhr itself, it is interesting to note that of the first ten major attacks on German targets after the initial thrust against Essen on 5th March only four were against towns in the Ruhr valley.<sup>1</sup>

In the bombing techniques adopted, the Battle of the Ruhr also showed a wide variety ranging from the unique accuracy of aim, which resulted in the breaching of the Möhne and Eder dams, to the primitive method, sometimes adopted by Mosquitoes of 2 Group, of releasing bombs through unbroken cloud on dead reckoning calculations. Once again there was, however, a certain symmetry about the Battle which lay between these two exceptional extremes. In the great majority of major actions the new pathfinder marking technique, aided in the case of Ruhr targets by *Oboe*, and in that of those beyond by *H2S*, was employed as a more or less standard procedure.

The variety of the Battle was also reflected in the scales of attack which went towards its making. These ranged from the activity of a single Mosquito, sent on the night of 21st June to Hamborn, to that of a great force, 826 strong, despatched on the night of 23rd May to Dortmund. These examples are, however, scarcely representative and it is necessary to mention here that throughout the Battle two quite different types of operation were constantly mounted.

The first of these was the major attack which involved the despatch of the main force or at least of some substantial elements of it. When *Oboe* was used, these attacks were led by Mosquitoes of 109 Squadron whose crews carried out the initial marking. These Mosquitoes and, until they were detached from Bomber Command, those of 2 Group, were, however, also sent out on independent operations designed to harass the enemy. Many attacks were made by 2 Group on Berlin and other targets to deceive the enemy as to the true target

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<sup>1</sup> The Ruhr targets were: Essen (12/13th March and 3/4th April), Duisburg (26/27th March) and Bochum (29/30th March). Targets outside the Ruhr were: Nuremberg (8/9th March), Munich (9/10th March), Stuttgart (11/12th March), Berlin (27/28th March and 29/30th March) and Kiel (4/5th April).

of the main force, as on the night of 13th July when two *Oboe* Mosquitoes were ordered to mark Cologne while the main force attacked Aachen,<sup>1</sup> or to make further *Oboe* calibration tests.<sup>2</sup> This was the second type of operation and on no single night did the total number of Mosquitoes committed to these kinds of independent action exceed thirteen. If these independent Mosquito operations are excluded from the reckoning, it will be seen that the Battle of the Ruhr did have a characteristic scale of attack. There were, in fact, forty-three major attacks on German targets<sup>3</sup> in the period of the Battle of the Ruhr and these took place on thirty-nine nights. On only ten of these occasions were fewer than 300 aircraft despatched and on only five did the force exceed 700.<sup>4</sup>

The increased power and efficiency of the striking force did not, however, bring any relief to Bomber Command from the cruel losses which it had for so long sustained. In the forty-three major actions of the Battle of the Ruhr, to which reference has been made, some 18,506 sorties were despatched. 872 of these failed to return and a further 2,126 were damaged, sometimes so seriously as to be total losses both as regards the aircraft and its crew. Thus, slightly over sixteen per cent of the bombers ordered into these actions became casualties of one sort or another and 4.7 per cent of them were lost over Germany. In the most costly attacks nearly thirty per cent of the force despatched was lost or damaged and in the cheapest attacks, which were few in number, the proportion occasionally fell to six or seven per cent.<sup>5</sup>

<sup>1</sup> A task in which they failed owing to technical faults in the *Oboe* equipment.

<sup>2</sup> Only the Mosquitoes of 109 Squadron (P.F.F.) carried *Oboe* and these were seldom employed on independent operations.

<sup>3</sup> Among which is included Pilsen in Czechoslovakia.

<sup>4</sup> Of the forty-three attacks:

2	were by less than 100 aircraft despatched
3	were by between 100 and 200 aircraft despatched
5	" " " 200 " 300 " "
10	" " " 300 " 400 " "
7	" " " 400 " 500 " "
8	" " " 500 " 600 " "
3	" " " 600 " 700 " "
4	" " " 700 " 800 " "
1	was by more than 800

Some of these attacks took place on the same night as in the case of those of 11th June when 783 aircraft were sent to Düsseldorf and seventy-two to Münster. On that occasion five independent Mosquitoes were also despatched, three of them to Duisburg and the other two to Cologne.

<sup>5</sup> Among the most costly operations were those against Pilsen on 16th/17th April, 327 despatched, thirty-six (eleven per cent) missing, fifty-seven (17.5 per cent) damaged; Essen on 27th/28th May, 518 despatched, twenty-two (4.3 per cent) missing, 113 (21.4 per cent) damaged; Oberhausen on 14th/15th June, 203 despatched, seventeen (8.4 per cent) missing, forty-three (21.4 per cent) damaged; Gelsenkirchen on 9th/10th July, 422 despatched, ten (2.4 per cent) missing, 103 (24.4 per cent) damaged.

Among the cheapest were those against Nuremberg on 8th/9th March, 335 despatched, seven (2.1 per cent) missing, fifteen (4.5 per cent) damaged; Duisburg on 26th/27th







These were grave losses and the margin left to Bomber Command with which to preserve the future fighting efficiency of the force was narrow indeed. The figures do not show the strain which was imposed upon the resilient morale of the Bomber Command aircrews, nor do they reveal the extent to which the force suffered from the loss of many experienced men who might have become leaders on other operations or instructors at Operational Training Units. It appeared likely that a loss rate of seven per cent from all causes over a period of three months would prove lethal to the fighting efficiency of the force and that a loss rate in excess of five per cent over the same period might produce an 'unacceptably low' standard of effectiveness. The two most important factors were the possible lack of experience and loss of morale among the surviving crews. In Bomber Command the latter problem was always less acute than the former.<sup>1</sup> Nevertheless, in two ways which are self-evident, Bomber Command triumphantly surmounted the crisis. The morale of the aircrews was maintained in readiness for the continuing struggle on the road to Berlin and the expansion of the front line was continued. In February 1943, the month before the Battle of the Ruhr began, the Commander-in-Chief could muster a daily average of 593 crews and aircraft in readiness for operations. In August, the month after the Battle had ended, this average had risen to 787.<sup>2</sup>

Undoubtedly, however, the most remarkable, as also, perhaps, one of the most significant things about the casualties in the Battle of the Ruhr was the almost complete immunity of the Mosquitoes. The German defences were shown to be virtually impotent against these high-performance little bombers, and from 203 sorties flown by them on independent operations during the Battle of the Ruhr, only two Mosquitoes failed to return. Yet many of the most formidable targets including Berlin, Essen, Düsseldorf, Duisburg and Munich had been attacked without any of the protection afforded by the saturation tactics of the main force. The *Oboe* Mosquitoes which carried out the marking for the main force also emerged practically unscathed from the Battle. From 282 sorties of this kind the number of Mosquitoes reported missing was again only two. Six more were damaged.

The Mosquito IV, with which 2 Group was equipped, and which was also used by 109 Squadron, was perfectly capable of operating at 28,000 feet and, though the 2 Group pilots often flew somewhat lower, this was the height from which *Oboe* attacks were habitually launched. The Mosquito IX, which was first flown on operations on

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March, 455 despatched, six (1.3 per cent) missing, twenty-six (5.7 per cent) damaged; Kiel on 4th/5th April, 577 despatched, twelve (2.1 per cent) missing, twenty-three (4.2 per cent) damaged. All these figures have been calculated from the O.R.S.(B.C.) Nt. Raid Reports covering the period.

<sup>1</sup> See App. 42.

<sup>2</sup> Bomber Cmd. O.R.Bs.

the night of 11th June 1943 by Squadron Leader F. A. Green of 109 Squadron, had an even better performance and its *Oboe* attacks were generally delivered from 30,000 feet.<sup>1</sup> At such heights flak, though often intense, was seldom effective. Nor were the German night fighters able to offer a serious challenge. The altitude and the speed of the Mosquitoes gave their opponents little opportunity for manoeuvre and interceptions were few and far between.

The success of the Mosquito as a bomber was of the utmost significance to Bomber Command. The *Oboe* aircraft were the hinge upon which the whole tactical plan for the attack on the Ruhr turned. If a machine with the necessary ceiling had not been available, *Oboe* would not have reached the Ruhr at all because its transmissions left the curvature of the earth at a tangent. Moreover, if the Germans had been able to destroy, or even seriously to harass, the inevitably small numbers of *Oboe* Mosquitoes,<sup>2</sup> the Ruhr plan would have been unhinged and the main force would, to a large extent, have been back in the haze which had become so familiar, especially over Essen. The success of the Mosquitoes appears all the more remarkable when it is remembered that the satisfactory operation of *Oboe* necessitated the kind of flight which invariably made the ordinary night bomber most vulnerable to attack; that is, a straight and level course on the approach to the target.

The great importance of the Mosquito as a marking aircraft should not, however, be allowed to obscure the significance of its contribution in the field of independent operations, and it will be remembered that the first effective, though, of course, small scale, blow ever to be struck against Essen, was delivered by *Oboe* Mosquitoes. But the independent Mosquito offensive was not developed to anything approaching its ultimate potential during the Battle of the Ruhr. The Air Staff were naturally anxious to preserve the secret of *Oboe* for as long as possible in view of the fact that the device was liable to be jammed. It was, therefore, decided on 11th March 1943 that it should only be used over enemy territory for the purpose of directing heavy attacks and that its use 'in light-scale and individual harassing attacks should be discontinued.'<sup>3</sup> This was a severe, if understandable, restriction, and it left the burden of the harassing action to the Mosquitoes of 2 Group. These aircraft, however, were equipped with nothing better than *Gee* and on many occasions their navigators had

<sup>1</sup> O.R.B. (109 Squadron), 4 Nov. 1940-31 Dec. 1943. This first Mosquito IX sortie was, however, abortive. S/L Green was unable to attack Düsseldorf owing to a 'technical hitch'.

<sup>2</sup> Only small numbers of which could be operated at the same time. The two pairs of *Oboe* stations now in use could, in fact, operate a maximum of twelve Mosquitoes per hour. A third *Oboe* channel was opened in July 1943 and this meant that eighteen aircraft per hour could be operated. See Harris: *Bomber Offensive*, pp. 145 and 160-161.

<sup>3</sup> C.A.S. Mtg., 11th March 1943.

difficulty in finding their way about Germany. In any case the removal of 2 Group from Bomber Command, which has already been mentioned, made an end of this contribution. All the same, the independent Mosquito offensive which dates from this period was to become far from the least of the many important contributions made to the strategic air offensive by this versatile aircraft. Such were the beginnings of the valuable consequences which flowed from the introduction of an effective 'speed bomber'.<sup>1</sup>

Though the contribution of the Mosquitoes was an undoubted success, the issue of the Battle of the Ruhr as a whole is somewhat more complicated. There are, indeed, among others, two quite different, though related, standpoints from which it may be judged. The first, the most obvious and the most important is, of course, the effect which it had upon Germany herself, or, in other words, the contribution which the Battle, in association with other preceding and succeeding battles, made to the defeat of the enemy. This is a strategic problem whose solution, so to speak, provides a verdict not only upon the operational performance of Bomber Command, but also upon the bombing policy, or, more broadly, the air strategy which set the offensive in motion. Moreover, it is a verdict which can only be reached and appreciated in the light of the conditions and reactions prevailing in Germany herself.

This problem is most profitably approached in the light of the German evidence after full consideration of the strategy and operation of the attack. It may, therefore, be postponed but it is now necessary to consider the problem of what the operational results of the Battle were and this is the second important standpoint from which the issue of the great struggle may usefully be judged.

The problem, reduced to its simplest terms, may be stated in the form of the question, 'how far did the Bomber Command crews succeed in carrying out the orders given to them?' In the answer to this lie the pointers to the other questions relating to both strategic and technical issues. Among these is the question of whether Bomber Command could have profitably pursued a different kind of policy during these months.

Though hypothetical, this question is particularly interesting in view of the fact that there was, at this time, the beginning of a growing

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<sup>1</sup> The idea of a 'speed bomber', it will be recalled, had been much under discussion both before and at the outbreak of the war. The Mosquito did not, however, stem from an Air Ministry specification. It was the result of the largely independent vision and courage of the De Havilland Aircraft Company which developed it on the basis of the Comet which they had built to compete in the Melbourne air race of 1934 without any definite prospect of selling it. Moreover, the Air Staff, distracted, no doubt, by the versatility of the Mosquito, was slow to realise its potentiality as a bomber. Initially it was allocated for photographic reconnaissance duties, in which role its fate may be compared to that of the Mustang and whence, as will also be recalled, Sir Richard Peirse had been unable to dislodge it in the summer of 1941.

controversy between the Air Staff and the Commander-in-Chief as to whether the technique of Bomber Command had reached reasonable maturity or whether it could and should be developed for more precise purposes. Added interest is lent to this question by the widely and often authoritatively held view, prevailing since the war, to the effect that Bomber Command at about this time could and should have progressed to a more precise form of attack. Sir Arthur Harris is often regarded as having delayed this development. It is to be noted, however, that the tendency has almost invariably been to lay down the law about what ought to have been done and to say little about what, in fact, could have been done. How far may the solution of these problems be found in the operations of the Battle of the Ruhr?

The first of these operations was, as will be remembered, directed against Essen on the night of 5th March 1943, and though the action has long since become famous it is necessary to describe it in some detail because it set a new pattern both as to plan and fulfilment which, within the range of *Oboe*, was soon to become almost standard.<sup>1</sup> Among the things which could not be planned was the weather. Nor, for this occasion, could it be predicted with much certainty. A cold front was expected to be lying across the Baltic from southern Sweden to Kiel from where a warm front was expected to reach to Scotland, but these frontal positions were uncertain. The Ruhr, however, was likely to be free of medium-level cloud, though there was a 'risk' of strato-cumulus of a depth up to 1,500 feet. 'Haze', it was added, 'should not be serious.' Visibility at the Bomber Command bases was not likely to be good though it was predicted that conditions would be 'just fit' for an early take-off. The probable development of fog during the night made it likely that some aircraft, particularly those in 5 Group, would have to be diverted on return.

In the event, mist and fog did gradually thicken over England towards dawn, but they never became widespread. Moreover, the bombers found the cloud conditions over Essen reasonably favourable. Small quantities of cirrus extending from 21,000 to 24,000 feet swept across the area and there were variable amounts of medium cloud down to 16,000 feet which, however, never exceeded seven-tenths and at times diminished to nothing. Below that only negligible amounts of very thin strato-cumulus drifted across the target. Essen was, however, as usual, shrouded in a thick smoke haze, and there is no reason whatsoever to suppose that this would not have defeated the whole object of the attack had it not been for the *Oboe* technique which was fundamental to the plan.

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<sup>1</sup> Three good published accounts of the operation will be found in Harris: *Bomber Offensive*, pp. 144-147, *Royal Air Force 1939-1945*, Vol. II, pp. 284-287, and W. J. Lawrence: *No. 5 Bomber Group R.A.F.* (1951), pp. 109-111.

Zero hour was 9.0 p.m. and at this time the first of the eight *Oboe*-equipped Mosquitoes from 109 Squadron was to drop a salvo of red target indicator bombs on the aiming point, which was Krupp's works. The second Mosquito was to follow three minutes later, the third seven minutes after that and so on until at thirty-three minutes past nine the last Mosquito was to drop its red target indicators. All these red markers were to be aimed blindly and purely on the indication of *Oboe*.<sup>1</sup> In support of this, twenty-two heavy bombers of the Pathfinder Force were detailed to act as backers-up. Their crews were told to sight the red markers dropped by the Mosquitoes and to aim green target indicators at them. These green markers were to go down at one- or two-minute intervals between two and thirty-eight minutes past nine o'clock. Thus, it was hoped that either red or green target indicators would be visible to the main force throughout the bombing attack which was to be compressed into the forty minutes immediately following zero hour.

The main force attack was to be divided into three overlapping waves. The first, consisting of Halifaxes, was to attack between zero plus two minutes and zero plus twenty minutes, the second, consisting of Wellingtons and Stirlings, between zero plus fifteen minutes and zero plus twenty-five minutes, and the third, consisting of Lancasters, between zero plus twenty minutes and zero plus forty minutes. The bombloads were to be in the proportion of two-thirds incendiary to one-third high explosive, and, of the latter, one-third was to be fused long delay.

The importance of timing in this operation was self-evident. The main force had to be brought over the target indicators, and if the navigators, either in the Pathfinder Force or the main force, allowed their aircraft to depart seriously from their schedules the attack would probably fail. Especial accuracy of aim was also of paramount importance. The main force crews were told that the method of placing the red markers was 'a new and very accurate one' and they were ordered to aim at them with the greatest possible precision. If no red markers could be seen, they were told to aim with equal care at the green markers. In order to alleviate the navigational problems confronting the main force, among which there were nine Wellingtons from 1 Group not yet even equipped with *Gee*, yellow target indicators, carried by the markers, backers-up and other aircraft of the Pathfinder Force, were to be dropped on track fifteen miles short of the target.

Such then was the plan. Its most revolutionary aspect lay in the fact that at no stage did it depend upon the visual identification of

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<sup>1</sup> This blind ground marking by *Oboe* was known by the code name of *Musical Parmatta*. Sky marking by the same means was known as *Musical Wanganui*. When *H2S* was used the word *Musical* was appropriately omitted in each case.

the target. The Mosquito crews did not need to see anything. The backing-up crews needed to see only the red target indicators and the main force crews needed to see only the red target indicators, or, failing that, the green ones. The smoke haze and the darkness of the night, on which there was no moon, therefore, for the first time in the war, did not matter. Nevertheless, each crew still had to find the target area and get to it at the right time. This was still, at any rate for the majority who had neither *H2S* nor *Oboe*, a task which was far from simple. It now remains to be seen how the plan was executed by the 442 crews who were detailed to take part in it.

From this force, there were some fifty-six sorties which proved to be entirely abortive. Forty-eight of these failures were due to 'technical and manipulative defects' <sup>1</sup> and among them were unfortunately three of the *Oboe* Mosquitoes including that flown by Wing Commander H. E. Bufton, the Commanding Officer of 109 Squadron. <sup>2</sup> The causes of the eight other failures were various, and included a crash on take-off, a collision over the North Sea, the sickness of a crew, damage caused by a night fighter and the failure of one man to take an oxygen tube. <sup>3</sup> In addition, the crews of five more aircraft reported that they had failed to locate Essen but that they had bombed alternative targets. The remaining eighty-three per cent of the force claimed that they had attacked the primary target. Some 293 of these aircraft returned with successful night photographs but only thirty-nine of these showed any ground detail which, in itself, is an interesting commentary on the proportion of the force which might have been expected to make a visual identification of the target. <sup>4</sup> Eighteen of these thirty-nine photographs were plotted as lying within three miles of the aiming point, seven as within three to five miles of the aiming point and only two as being more than five miles from the aiming point. It was, however, possible to see from the fire tracks on another 254 photographs, that a further 104 aircraft had bombed within three miles of the aiming point. On the basis of this reliable evidence it was estimated that 153 aircraft had dropped their bombs

<sup>1</sup> The statement in Richards and Saunders: *Royal Air Force 1939-1945* (Vol. II, p. 287) that these forty-eight aircraft 'failed to take off' is incorrect. Of the fifty-six aircraft concerned eleven, including the three Mosquitoes, were forced to abandon the mission while over enemy territory, and forty-five while over friendly territory or the North Sea. O.R.S.(B.C.) Nt. Raid Report, 21st June 1943.

<sup>2</sup> O.R.B. (109 Sqdn.) 1940-1943. These three Mosquitoes all carried out their operational flights but were unable to drop the markers owing to the failure of their *Oboe* equipment. Such failures were still far from uncommon.

<sup>3</sup> The crash resulted in the total destruction of a Wellington and the death of its navigator. The collision involved two Wellingtons, one of which carried on to the target and both of which eventually landed safely.

<sup>4</sup> It has to be remembered, of course, that it was one thing for an expert equipped with many aids and working in safety on the ground and in his own time to identify the detail on a photograph and quite another for a bomber crew moving through a battle at high speed to do the same with the detail on the ground.

within three miles of the aiming point. This, as far as Essen was concerned, was a unique result which had never previously been remotely approached.

The success was due to the accurate marking of the *Oboe* Mosquitoes and the backers-up and also to the good time-keeping of the main force. The initial salvo of red target indicators was dropped by a Mosquito two minutes before zero hour, and though this, the first blow in the Battle of the Ruhr, was struck slightly early, it seems to have been well placed,<sup>1</sup> and, as was equally important, it immediately attracted a shower of bombs from the leading elements of the main force. Within a matter of minutes substantial fires were burning around the point marked by the first Mosquito. At three minutes past nine the first of the backers-up went into action and the green target indicators which it dropped also appeared to fall with considerable accuracy. Thereafter, a most satisfactory continuity of marking was maintained both by the succeeding Mosquitoes and the backers-up until, exactly as planned, the final salvo of green markers burst at thirty-eight minutes past nine.<sup>2</sup>

By virtue of good time-keeping, the main force was able to put this display of pyrotechnics to good use. Of the seventy-five Halifaxes in the first wave which claimed to have attacked, seventy did so within their allotted period. Only one of these crews was late and that one was only one minute late. The other four were two minutes early, but this error probably made a substantial contribution to the success of the attack because it was almost certainly they who started the fires near the first red markers which were also two minutes early. In the second wave of Wellingtons and Stirlings, thirty-five crews reported that they had bombed somewhat early, but the remaining 106 attacked within their allotted period.<sup>3</sup> In the final wave of Lancasters, forty-three crews reported that they had attacked early and the remaining eighty-six that they had done so within their allotted period.

Though there is little doubt that many of these 345 crews of the main force did not, in fact, succeed in getting their bombs into the target area, it does seem certain that the target was clearly marked throughout the attack. This, especially in view of the fact that only four of the *Oboe* Mosquitoes were fully effective, was a great triumph

<sup>1</sup> It is not possible to say exactly where this vital salvo actually fell, but it cannot have been far from the aiming point.

<sup>2</sup> One of the five Mosquitoes which dropped red markers went wide of the aiming point by about two and a half miles to the SSW owing to a defect in its *Oboe*. This error was seen and reported by many of the main force crews, but it fortunately did not occur until half-past nine, by which time the attack had already become well concentrated.

<sup>3</sup> In the report the thirty-five early crews are said to have bombed eleven minutes before time, but it is hardly likely that they all made precisely this error. Among the 106 crews mentioned above as having bombed on time six are reported to have done so fifteen seconds late. Again it is unlikely that all six made precisely the same error and in any case, seriously to record an error of fifteen seconds by main force crews is to be pedantic. O.R.S.(B.C.) Nt. Raid Report, 21st June 1943.



for the new technique. Nor was it in any sense a hollow victory. It is difficult to know what became of the bombs which missed the target area, but it is easy to see what become of those which hit it.

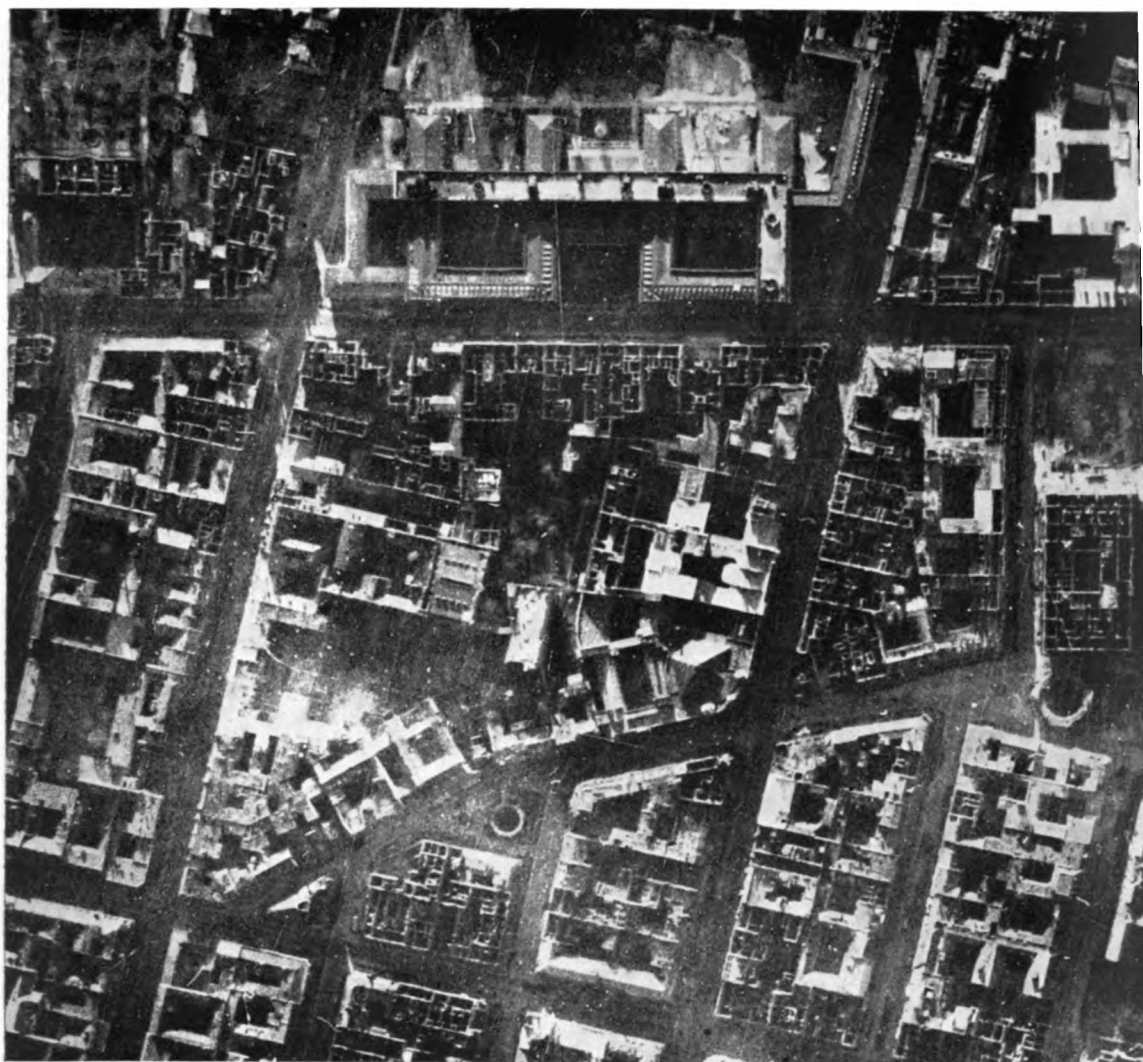
The returning crews were mostly of the opinion that the attack had been highly destructive. Large and spreading fires had been seen, spectacular explosions had been observed and towards the end of the operation the whole target area had appeared to be covered by fire and smoke. This impression was amply confirmed by three daylight photographic reconnaissance sorties carried out over Essen on 7th and 8th March. These photographs, which covered the whole town and its suburban areas with the exception of the north-western districts of Stoppenburg and Alten Essen, showed that the 'destruction was exceptionally severe and widespread'. Most satisfactory of all the good news brought by these photographs, was the clear indication that the heaviest concentration of damage was right in the centre of the town which was 'virtually devastated'. An area of 160 acres had been 'laid waste' and there were as many as 450 acres in which at least three-quarters of the buildings had been demolished or damaged by high explosives or gutted by fire. The Krupp works had suffered heavily. Thirteen of its main buildings were seen to have been destroyed or damaged and at least fifty-three of its separate shops had been affected. By far the greater part of all this damage had been caused by fire.

The losses to Bomber Command were, measured either in relation to the formidable task or the outstanding achievement, very slight. Fourteen aircraft failed to return and thirty-eight were damaged. Of the fourteen missing aircraft, it seemed probable that four had been shot down by flak and five by night fighters. The fate of the other five could not be guessed. Of the thirty-eight damaged aircraft, twenty-seven had sustained their injuries from flak, five from night fighters and six, including the Wellington which crashed on take-off and the two Wellingtons which collided over the North Sea, from causes not attributable to enemy action.<sup>1</sup>

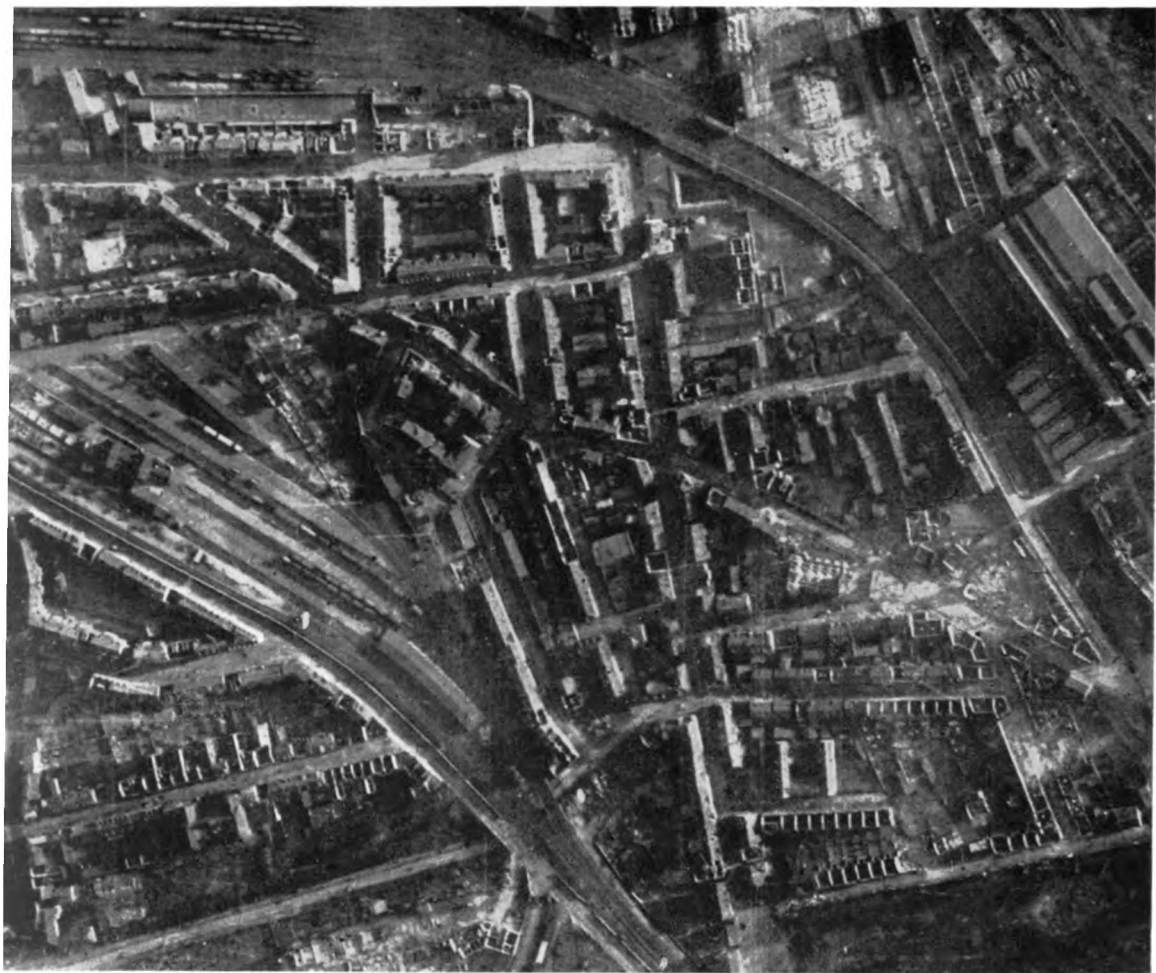
It will be seen in due course how severe was the shock not only to the people and the activities in the great arsenal of Essen, but also to some of the leaders of the Third Reich, including especially Goebbels and Speer, the Ministers principally responsible for national morale and for war production.<sup>2</sup> Meanwhile, the second major action of the

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 21st June 1943, has been used as the principal source for this account of the attack. In addition to the published sources already mentioned, reference has also been made to O.R.B. (109 Sqdn.) 1940-1943, and Bomber Cmd. O.R.B., March 1943, particularly, Interpretation Report, 13th March 1943. It should be noted that these photographs also covered the damage caused by five attacks on Essen by single aircraft between 19th February and 7th March 1943. Obviously, however, the vast bulk of the destruction was attributable to the major attack on 5th March.

<sup>2</sup> See below, p. 258.



3. Damage in the vicinity of the Krupp works at Essen in March 1943.



4. Damage in the vicinity of the Krupp works at Essen in March 1943.

Battle of the Ruhr, the operation against Nuremberg on the night of 8th March 1943, also merits detailed consideration. On this occasion the target lay far beyond the range of *Oboe* and reliance, therefore, had to be placed upon the *H2S* technique.

For this attack the zero hour was fifteen minutes past eleven and the plan was for five *H2S*-equipped aircraft to drop sticks of illuminating flares across the target area three minutes before zero hour. These flares were to be aimed blindly on the indication of the *H2S* screen and, in the resulting light, the crews were ordered to attempt the visual identification of the aiming point. If this could be done, they were then to mark it by visual aim with green target indicators. Two minutes later, a further nine *H2S* aircraft were to repeat the process and twenty-two backers-up were then to maintain the marking by attacking at one-minute intervals until twenty-two minutes after zero hour. These crews were told to aim visually at the aiming point, if it could be seen, and, if it could not, at the centre of the concentration of target indicators put down by the marking force. In the event of the marking crews failing to recognise the aiming point by visual means, they were to drop red target indicators blindly on the indication of *H2S*.

The main force, as in the attack on Essen three nights earlier, was again divided into three overlapping waves. The eighty-eight Halifaxes of the first wave were to bomb from zero plus four minutes until zero plus fifteen minutes, the fifty-three Stirlings of the second wave between zero plus ten and zero plus twenty minutes and the last wave of 157 Lancasters between zero plus fifteen and zero plus thirty minutes. All the main force crews were told to aim at the centre of the concentration of target indicators whether they were red or green and to disregard such ground detail as they might be able to see.

The plan showed the acknowledged limitations of *H2S* as a marking device which had been appreciated as a result of earlier operational experiments. It was obviously hoped that only the illuminating flares would be aimed blindly by *H2S* and that all the marker bombs would be visually aimed. The success of the operation was, therefore, much more dependent upon the weather and visibility as also upon the eyesight of the marking crews than was the case when the *Oboe* technique could be employed. In fact, Bomber Command was once again, at least to a large extent, confronted with the law that 'we cannot see in the dark'.

When the fourteen *H2S* aircraft reached the target area, the sky was found to be free of cloud, but the moon was down and a ground haze made visibility only 'moderate'. Some of the crews, therefore, launched their red target indicators blindly on *H2S* indications while others laid down flares and dropped green target indicators on the best visual identification they could make. Six of these aircraft

arrived with their *H2S* out of action but five of them, nevertheless, and, perhaps unwisely, dropped flares and in some cases markers as well. Two of the *H2S* aircraft failed to return, but there was reason to suppose that both of them had dropped red markers before being destroyed.

These markers were somewhat widely scattered at points varying between seven miles to the south and from half a mile to two miles to the north-west of the aiming point, and a number of them attracted concentrations of bombs from the main force. The main weight of the attack, instead of falling solidly on the middle of the town, was, therefore, dispersed over a number of different points, mainly in the suburbs. In these circumstances, it was, perhaps, remarkable that, on the evidence of the night camera, it was estimated that as many as 142 aircraft had dropped their bombs within three miles of the aiming point.<sup>1</sup>

Though the effects of a highly concentrated attack were not achieved, considerable damage was done on that night to Nuremberg. A daylight reconnaissance sortie flown on 10th March produced excellent photographs of the whole area and these showed that numerous industrial buildings and particularly those lying to the south of the city had suffered heavily. More than two-thirds of the main Siemens workshop, which covered five acres, was seen to have been wrecked by blast and fire. A timber yard covering three acres, and two other large workshops belonging to the same complex had been gutted by fire. The notorious M.A.N. works, which produced submarine engines amongst other things, had suffered even more heavily, and one of its workshops containing a diesel engine test bed appeared to have been completely burnt to the ground. Much other damage of the same kind had been caused to other industries, some of which could not be identified.<sup>2</sup>

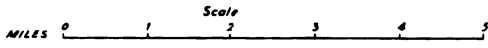
Even a superficial glance at the photographs of Essen and Nuremberg, with the damage plots superimposed, however, immediately showed the great difference between what was achieved in the first case as a result of *Oboe* marking and, in the second, as a result of *H2S* marking. In the picture of Essen a large black area almost in the centre of the photograph testified not only to the accuracy but also to the concentration which was achieved on the night of 5th March 1943. By contrast, the photograph of Nuremberg was covered by a large number of much smaller and isolated islands of damage, the majority of which were not in the centre of the picture. There was no

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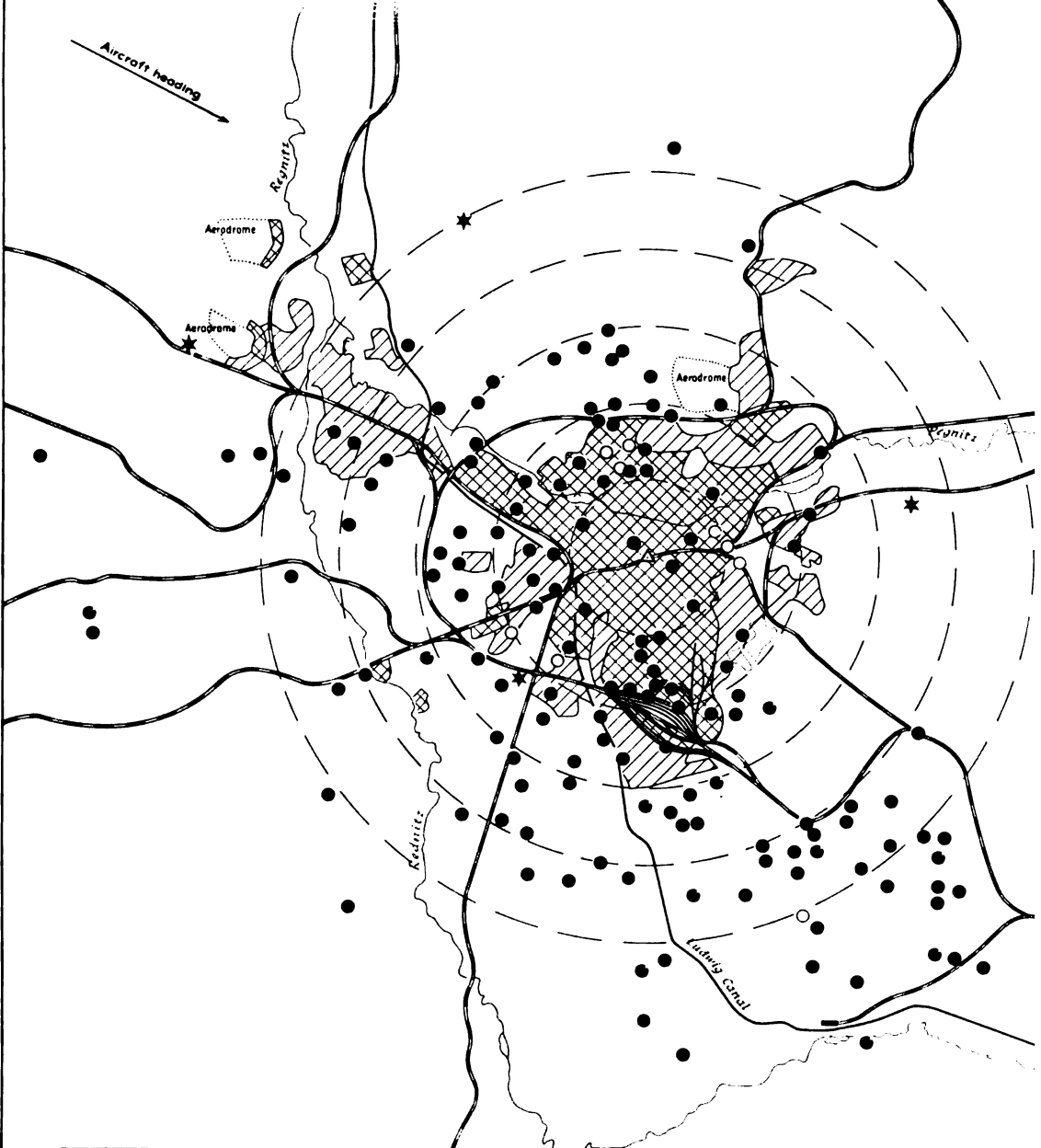
<sup>1</sup> See Map. 3. The force despatched amounted to 335 aircraft. Of these, 294 claimed to have attacked Nuremberg, three reported attacks on alternative targets and thirty made abortive sorties.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 13th June 1943, and Interpretation Report, 24th March 1943, which, with the photographs, is in Bomber Cmd. O.R.B., March 1943.

# Night Photographs NUREMBERG 8-9th March 1943



Aircraft heading  
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Legend		PATH FINDER FORCE MARKER AIRCRAFT	MAIN FORCE AIRCRAFT
PLOTTED BY GROUND DETAIL		●	●
FIRES		○	○
△	AIMING POINT	[Cross-hatched box]	TOWN
★	GERMAN DECOY	[Diagonal hatched box]	SUBURBS

Circles in broken lines show distance in miles from Aiming Point



single area of concentrated havoc such as appeared in the photograph of Essen and it was obvious that the total acreage of destruction in Nuremberg was very much smaller than was the case in Essen. The difference between the two results was, moreover, much larger than the difference between the two scales of attack, and it suggested some highly significant things about the tactics of area attack which it may be appropriate to consider here before returning to the course of the Battle of the Ruhr.<sup>1</sup>

The first and most obvious conclusion is that approximately equal weights of bombs achieved vastly more widespread destruction if they were concentrated rather than dispersed and particularly so when the incendiary bomb was the predominant weapon. This had, indeed, long since become apparent and the attacks on Essen and Nuremberg did no more than yet further substantiate the major conclusions reached by the Air Staff and Bomber Command in 1941. The principal reason for this was that a heavy concentration of incendiary bombs was liable to start major conflagrations which, after getting out of control, resulted in vastly greater damage than could possibly result from a series of isolated incendiary incidents. Under concentrated incendiary attack a town might, indeed, well become what was known as a 'self-destructive' target, whereas in the case of dispersed incendiary or high-explosive attack it was more probable that almost every building would have to be individually burnt or blasted.

If, however, the best effects were to be obtained from incendiary attacks, then clearly the most inflammable part of the target had to be selected as the aiming point. Just as Lübeck had once been chosen as a target because it was one of the most inflammable parts of Germany, so now the centres of the great towns were selected because they were the most inflammable parts of the built-up areas. These town centres were generally much more congested and usually of more archaic construction than the more modern and better-planned suburbs. This is why, as Sir Arthur Harris has subsequently explained, 'The aiming points were usually right in the centre of the town.'<sup>2</sup>

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<sup>1</sup> It will be remembered that 442 aircraft were despatched to Essen and 335 to Nuremberg, but that it seems probable that the number bombing within three miles of the aiming point at Essen was 153 and, at Nuremberg, 142. Owing to the greater range of the latter attack the bomb loads were somewhat lighter, but the force despatched to Nuremberg consisted entirely of heavy bombers, including 170 Lancasters. The force sent to Essen included Mosquitoes and Wellingtons and also had fewer Lancasters which numbered 157. In fact, the 367 aircraft which claimed attack on Essen carried 490.4 tons of H.E. and 524.4 tons of incendiary bombs, giving an average of approximately 2.8 tons per aircraft. The 294 aircraft which claimed attack on Nuremberg carried 349.3 tons of H.E. and 431.8 tons of incendiary bombs, giving an average of approximately 2.6 tons per aircraft. It will, therefore, be seen that the tonnages which fell in either case within three miles of the aiming point were probably not greatly different.

<sup>2</sup> *Bomber Offensive*, p. 147.



Now it happened, of course, that in the great towns and cities of Germany, these centres were generally congested areas of residential property and seldom, though Essen is an obvious exception, contained major industrial installations. The latter were generally to be found dispersed throughout the less congested and, therefore, less vulnerable suburbs.<sup>1</sup> This is why, to quote Sir Arthur Harris again, 'in no instance, except in Essen, were we aiming specifically at any one factory during the Battle of the Ruhr . . .'<sup>2</sup> It also explains why Sir Charles Portal, as may be recalled, took special steps to ensure that Sir Arthur Harris should clearly understand when he assumed his command in February 1942 that 'the aiming points are to be the built-up areas, *not*, for instance, the dockyards or aircraft factories . . .'<sup>3</sup>

It is not intended at this point to enter into a discussion as to whether it would have been more or less desirable to aim at factories rather than areas of housing, but it should be clear from what has been said that it would undoubtedly have been much less economical to do so and that to cause destruction of buildings, let alone of machinery, in the suburbs comparable to that which could be achieved against houses at the centres would have required a much greater force, either than Bomber Command possessed, or, indeed, was ever to possess.

There is, however, another important consideration which relates to the question as to whether, in fact, purely industrial destruction would have been increased if the Bomber Command aiming points had been shifted from the town centres to the sites of individual factories. The answer may seem to be obvious, but, on reflection, it will be seen that it is not. The case of the attack on the Skoda works which presently will be encountered is but one example of the complexity of this question.<sup>4</sup> Meanwhile, it must be remembered that the destruction of factories which, as Sir Arthur Harris says, 'could be regarded as a bonus' was in any case on a considerable and increasing scale.<sup>5</sup>

Indeed, the results of the Nuremberg attack are an example of this kind of 'bonus', but it should also be apparent that the long list of damaged and destroyed industrial concerns was symptomatic of the

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<sup>1</sup> Another exception was Düsseldorf, in which the great Rheinmetall Borsig plant lay not far from the centre. Nevertheless, the general rule clearly holds good not only for Germany but for most of the old and indeed the new world also. Bombs falling in the middle of Nuremberg, Manchester or for that matter Philadelphia would not be likely to strike important factories.

<sup>2</sup> *Bomber Offensive*, p. 147. Sir Arthur Harris clearly accepts the narrow meaning of the term 'Battle of the Ruhr' and, therefore, does not take into this account the attack on Pilsen which we shall discuss presently.

<sup>3</sup> See above, Vol. I, p. 324.

<sup>4</sup> See below, pp. 133-135.

<sup>5</sup> Harris: *Bomber Offensive*, p. 147.

relative failure of the operation. *H2S* had again shown itself to be a less than adequate substitute for *Oboe* and clearly the limited range of the latter was its most serious shortcoming. The night of 8th March did, however, have an important compensation and this was the light scale of casualties sustained by Bomber Command. Only seven aircraft failed to return and fifteen more were damaged. Among the latter was the somewhat unusual case of an aircraft which returned to England while all but one of its crew were reported missing. This was a Stirling of the Pathfinder Force whose captain, perhaps thinking that he had not enough fuel to recross the Channel, gave the order to abandon the aircraft while it was still over France. Everyone did so, except the mid-upper gunner who presumably did not hear the instructions. This fortunate gunner presently realised his lonely plight and took to his parachute when over Kent. Thereafter the Stirling continued a pilotless flight and eventually crashed, most obligingly, in the Thames Estuary.<sup>1</sup>

Though the casualties in the attacks on Essen and Nuremberg were abnormally low both in relation to the previous, and unfortunately, to the immediately succeeding experience of Bomber Command, the two operations were in other respects typical of the Battle of the Ruhr. They established a pattern, both in technique and in result, from which there were to be few important departures in the major actions which were to follow.

The most heavily attacked targets in the Battle of the Ruhr were Duisburg, Essen, Cologne, Düsseldorf, Dortmund and Bochum. There were five major attacks on Duisburg involving the despatch of 2,084 sorties, and there were also five major attacks on Essen involving the despatch of 2,070 sorties. Major operations were launched against Cologne on four occasions and amounted to the despatch of 1,761 sorties. Düsseldorf and Dortmund were both attacked in force twice in approximately equal strength. 1,542 sorties were despatched to Düsseldorf and 1,422 to Dortmund. Three major operations, comprising 1,102 sorties, were mounted against Bochum. It will be noticed that all these towns, with the exception of Cologne which is very near, were in the Ruhr and all of them were within range of *Oboe*, though in the first attack on Cologne *H2S* was used.

The concentration on the Ruhr and other towns in the close vicinity was, however, much less pronounced in what was approximately the first half of the Battle than in the second. In fact, until

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 13th June 1943. The reason which led this crew to abandon their aircraft is not known, but it may well have been the impression that the fuel supply was about to give out. Accurate petrol gauges were never supplied to Bomber Command throughout the war and the readings which they showed were not infrequently the cause of unnecessary alarm or inappropriate complacency. One of the principal duties of the Flight Engineer was to calculate fuel consumption independently of the fuel gauges.

after the attacks on the night of 20th April 1943 against Stettin and Rostock, more use was made of the *H2S* than the *Oboe* technique. In this period there were nineteen major attacks. The *H2S* technique was used on eleven of these occasions and *Oboe* on only six. In one attack, against Duisburg on the night of 8th April, both techniques were used in combination and on another, against Rostock on the night of 20th April, the marking was by purely visual means. After that the hours of darkness became shorter and the range of Bomber Command accordingly became less. The concentration on the Ruhr was, therefore, much increased. In the second half of the Battle there were twenty-four major attacks. On twenty of these *Oboe* was used and on only three was the marking dependent upon *H2S*. Once, in the attack against Barmen on the night of 29th May, *Oboe* and *H2S* were again used in combination.

Moreover, as a result of the steady expansion of Bomber Command, the attacks in the second half of the Battle tended to be on a larger scale than had been the case during the first phase. Only two attacks before 20th April involved the despatch of more than 500 aircraft, neither of these was against a town in the Ruhr, and both were beyond *Oboe* range.<sup>1</sup> In the second half of the Battle a force exceeding 700 aircraft was despatched on five occasions and in each case the target was in the Ruhr, and the marking was carried out by the *Oboe* technique.<sup>2</sup>

Only three towns outside the Ruhr were attacked more than once and these all received two attacks.<sup>3</sup> They were Berlin, Stuttgart and Pilsen, and the number of sorties involved was 725, 776 and 495 respectively. The single attack against Krefeld in the Ruhr on the night of 21st June, when 705 sorties were despatched, was, therefore, comparable in strength to these double attacks. Moreover, the bombers, when they were despatched to the Ruhr, carried heavier loads of bombs and lighter loads of fuel, than when they had to travel the greater distances to Berlin, Munich or Stuttgart. Above all, the bombs were almost invariably dropped in greater concentration and with greater accuracy when *Oboe* was used than when the marking depended on *H2S*. There is, therefore, no doubt that it was the Ruhr valley which bore the brunt of the attack in the Battle of the Ruhr.

Essen, in particular, which had been so severely damaged in the first action of the Battle, suffered much further damage from the four further great onslaughts launched against it in March, April and

<sup>1</sup> The targets were Kiel (4/5th April, 577 aircraft despatched) and Frankfurt am Main (10/11th April, 502 aircraft despatched).

<sup>2</sup> The targets were Dortmund (23/24th May, 826 aircraft despatched), Düsseldorf (25/26th May, 759 aircraft despatched), Barmen (29/30th May, 719 aircraft despatched), Düsseldorf (11/12th June, 783 aircraft despatched) and Krefeld (21/22nd June, 705 aircraft despatched).

<sup>3</sup> Cologne may, in this connection, be assumed to be in the Ruhr.

May. Nevertheless, these four attacks were not all equally devastating and they showed the extent to which even the *Oboe* technique was dependent upon the weather.

In the operations carried out on 12th March and 3rd April, when forces of 457 and 348 aircraft were sent to Essen, the sky was reasonably clear and it was possible to repeat the procedure of *Oboe* ground marking which had been so successful on 5th March. Both these attacks resulted in good and very destructive concentrations of bombs at the centre of the target. In the two later operations, carried out on the nights of 30th April and 27th May by forces of 305 and 518 aircraft, the weather was so cloudy that the *Oboe* Mosquitoes had to lay sky markers. In neither case was the accuracy of these attacks comparable to what had been achieved by the first three.

The plan of action on 12th March was very similar to that of the week before, and the development of the weather and the operation itself also preserved a most satisfactory parallel with the events of 5th March. The marking was again placed with great accuracy, and the main force, because of good time-keeping, was once more able to take advantage of it.<sup>1</sup>

Though the attack had been in progress for some ten minutes before anything spectacular happened, the eventual concentration of fire and explosion around the markers looked very satisfactory in the eyes of those who witnessed the scene. Nor were these impressions disappointed when the daylight reconnaissance photographs were duly developed. From these it could be seen that another great blow had been struck at the heart of Essen. In the Krupp works themselves 196,300 square yards could be seen to have been severely damaged. This was some 60,000 square yards more destruction than had been caused on 5th March. Heavy damage was also apparent in the north-western suburbs. This, no doubt, was mainly due to the considerable weight of attack, which in the last ten minutes of the operation appeared to be falling short of the markers.<sup>2</sup> However this may have been, there was no doubt that the aiming point, Krupp's works, had received its second baptism of fire within a week and that Bomber Command had gained another outstanding success by the technique of *Oboe* ground marking.

The cost had, however, been heavier. Twenty-three aircraft failed to return and another sixty-nine were damaged. These casualties amounted to twenty per cent of the force despatched. Of the missing bombers it seemed likely that ten had fallen to flak and ten to night fighters. The fate of the other three remained a mystery. No

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<sup>1</sup> Of the 384 aircraft claiming to have attacked, only sixteen did so late and thirty-nine early.

<sup>2</sup> Some crews might, it was thought, have been misled by dummy markers ignited by the Germans in an attempt to disperse the attack.

fewer than sixty-one of the sixty-nine damaged aircraft had been hit by flak.<sup>1</sup>

The weather forecast for the night of 3rd April 1943, when the third major attack on Essen was carried out, showed some pessimism. Over the Ruhr seven- to eight-tenths thin strato-cumulus was expected to be lying at 2,000 feet. Moreover, it was expected that there would be some patches of cloud extending up to 11,000 feet. Alternative plans for ground or sky marking, therefore, had to be made, because the conditions predicted might make ground markers invisible to the main force.

In the event, they did not, and the sky over Essen was found to be cloudless, though there was the usual ground haze. Nevertheless, the crews of the *Oboe* Mosquitoes, having in any case been instructed to drop sky markers and, if the conditions permitted, ground markers as well, proceeded to lay both types, the former bursting at 15,000 feet. This caused some confusion to the backing-up and main force crews who had evidently been inadequately briefed and had not expected to see any sky markers if the conditions were suitable for ground marking. This confusion does not, however, appear to have affected the outcome of the operation. Once again the *Oboe*-directed target indicators were accurately placed, once again the backing-up was accurate, once again the main force, which this time consisted exclusively of Halifaxes and Lancasters, kept excellent time, and once again a splendid concentration of bombs crashed down on the centre of Essen, causing, as the daylight reconnaissance photographs subsequently showed, further and very heavy damage to the Krupp works. Six of the Lancasters from 5 Group carried one 8,000-lb. bomb each. The remaining Lancasters carried 4,000-lb. bombs and loads of incendiaries. Each of the Halifaxes carried two 1,000-lb. bombs and loads of incendiaries.<sup>2</sup>

The evidence of the night camera suggested that 172 aircraft dropped their bombs within three miles of the aiming point. This was nineteen more than, on the same evidence, were thought to have done so on the night of 5th March and it was an encouraging result, because on 5th March 442 aircraft had been despatched whereas on 3rd April the original force amounted only to 348 aircraft.<sup>3</sup> The casualties, however, showed a further increase on those sustained in

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 25th June 1943.

<sup>2</sup> The P.F.F. Lancasters acting as backers-up each carried four green T.I., one 4,000-lb. bomb and four 1,000-lb. bombs.

<sup>3</sup> 5th March, 442 despatched, fifty-six abortive sorties, five attacked alternative targets. 367 claimed attack on Essen, night photographs suggested 153 bombed within three miles of aiming point. 3rd April, 348 despatched, twenty-seven abortive sorties, five attacked alternative targets, 295 claimed attack on Essen, night photographs suggested 172 bombed within three miles of aiming point. No estimate was made of the number of aircraft bombing within three miles of the aiming point in the attack on 12th March.

the operation on 12th March. Twenty-one aircraft failed to return and fifty-nine were damaged. This accounted for twenty-three per cent of the force despatched. Among the damaged aircraft was a Halifax of 158 Squadron which, on the return journey crashed into trees at Catfoss killing four of its crew, and another Halifax of 51 Squadron which crashed at Snaith where it was on the point of landing. Four of its crew were also killed and the other three were injured. In neither case was enemy action responsible, but accidents like these were bound to occur when crews returned exhausted after the ordeals of the night. An unpleasant feature of this night was the intense activity of the German night fighter force which was encountered even over the target while the anti-aircraft guns were in action.<sup>1</sup>

The weather which had on the whole favoured Bomber Command in the course of these three great attacks changed sides for the two remaining major operations against Essen. On the nights of 30th April and 27th May, the Ruhr, as had on each occasion been forecast, was covered by large amounts of cloud.<sup>2</sup> In both attacks the *Oboe* sky-marking technique was, therefore, adopted. On the first occasion, when the force despatched amounted to 305 aircraft, eight Mosquitoes were briefed to lay down sky markers at five-minute intervals throughout the attack which was due to begin at half-past two in the morning. Each of these sky markers was to initiate a wave of bombing by the main force whose crews were told of the importance of aiming while on a precalculated course and airspeed. In order to make this easier, the Mosquitoes were also to drop flares indicating the correct run-up on the sky markers. Main force crews who failed to see any sky markers were given a datum point from which to release their bombs. Two more Mosquitoes were to act as reserve markers.

For some reason, however, these reserves were not called into action when the fifth and eighth sets of sky markers failed to go down owing to technical hitches. The result was that the final wave of the main force attacked while no sky markers were burning. Except for a gap of about two minutes earlier in the attack when no flares were visible, it did, however, seem that the six effective Mosquitoes of 109 Squadron succeeded in maintaining reasonably continuous marking throughout the greater part of the attack.

Nevertheless, several crews said that they saw the sky markers go out while they were running up and that they could only aim by

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 29th July 1943.

<sup>2</sup> The forecast for the night of 30th April was the more accurate. It predicted nine- to ten-tenths medium cloud over the Ruhr which was what the bombers found when they got there. The forecast for the night of 27th May anticipated about five-tenths low cloud over the Ruhr, but in the event six- to eight-tenths, increasing at times to ten-tenths, was found. O.R.S.(B.C.) Nt. Raid Reports, 4th Aug., 19th Aug. 1943.

estimating the position of release in relation to the longer burning lead-in flares. Other reports complained of these lead-in flares sinking quickly into cloud and becoming visible only as a glow. There were also many observations of flares being shot up from the ground which may well have confused some of the bomb-aimers. Such were some of the difficulties associated with the technique of sky marking.

There were, of course, no night photographs showing ground detail, but the daylight reconnaissance did establish that some more bombs had fallen on the Krupp works. The attack had, however, on this evidence, appeared to have resulted in no new substantial damage to the target area. Of the force despatched, 239 crews reported that they had attacked Essen, three said they had bombed alternative areas, fifty-one made abortive sorties and twelve failed to return. Forty-five aircraft were damaged, forty-two of them, including one which crashed on return, by flak.<sup>1</sup>

In the second sky-marking attack on Essen carried out on the night of 27th May a larger force of 518 aircraft was despatched and the marking force was increased to ten Mosquitoes, again with two reserves. Otherwise the plan, and as far as can be judged the result, were both very similar.<sup>2</sup> This time only one of the Mosquitoes failed, owing to a technical hitch, to release its sky markers, but both reserves were called into action and eleven Mosquitoes, therefore, laid down marking, though not at quite the correct intervals, throughout the attack.<sup>3</sup> One of these, flown by Flight Sergeant C. K. Chrysler, failed to return and if, as seems probable, it came down over Germany, it was not only the first *Oboe* Mosquito to suffer that fate, but very possibly the only one belonging to 109 Squadron to do so in the whole of 1943.<sup>4</sup>

Most of the main force crews reported that they had been able to

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 4th Aug. 1943.

<sup>2</sup> The reconnaissance after the attack on 30th April was incomplete. It was, therefore, impossible to distinguish precisely between the damage caused on this night and that achieved on 27th May after which a complete reconnaissance was made.

<sup>3</sup> The plan provided that ten Mosquitoes should drop sky markers at five-minute intervals starting at 0045 and ending at 0130 hours. The actual times at which the eleven Mosquitoes dropped markers were: 0044, 0049, 0054, 0058, 0104, 0109, 0119, 0120, 0127, 0128 and 0133 hours. O.R.S.(B.C.) Nt. Raid Report, 19th Aug. 1943.

<sup>4</sup> Operational casualties in 109 Squadron were as follows in the period from 20th Dec. 1942 to 31st Dec. 1943:

*26th March 1943.* F/Lt. L. J. Ackland failed to return from Duisburg. From his last message it was known that this aircraft fell into the North Sea.

*8th April 1943.* F/O Walker crashed on take-off. Pilot and Navigator killed.

*27th May 1943.* F/Sgt. C. K. Chrysler failed to return from Essen. His aircraft probably crashed in flames.

*30th Aug. 1943.* P/O A. A. Dray crashed forty-seven minutes after take-off while in the circuit of his base (Marham).

*2nd Dec. 1943.* F/O L. F. Bickley failed to return from Bochum. His aircraft, a Mosquito IX, very probably crashed into the North Sea. O.R.B. (109 Sqdn.) 1940-43. A second *Oboe*-Mosquito Squadron, 105 (P.F.F.), began to operate in July 1943.

aim at sky markers or at the estimated position of sky markers which had just gone out. 472 aircraft reported attacking the target,<sup>1</sup> four bombed alternative areas and twenty-one, which was a smaller proportion than usual, made abortive sorties. The enemy defences were extremely active and of the twenty-two aircraft which did not return it seemed likely that the night fighters had claimed eleven or twelve and flak ten. No fewer than 113 aircraft, amounting to twenty-two per cent of the original force, were damaged and though once again the night fighters had been the chief killers, flak had caused by far the greater damage. Of these 113 aircraft only one had been damaged by a fighter and that also bore flak damage. Five others were damaged in accidents. One of these was hit by incendiary bombs, two more were hit by gunfire from friendly aircraft and a Halifax collided with a Lancaster over the target. The remaining 107, one of which came down on the North Sea,<sup>2</sup> all owed their injuries to flak. Though the missing rate of 4.3 per cent had twice been exceeded in the four earlier attacks, the total casualty rate of 26.3 per cent was the highest sustained against Essen during the Battle of the Ruhr. Some more damage was achieved and, once again, direct hits had been obtained on the Krupp works. By comparison with the ground-marking attacks, however, the devastation, on the evidence of the estimates made at the time, seemed to be on a small scale.<sup>3</sup>

These five attacks involved the despatch of 2,070 sorties to Essen. They cost ninety-two aircraft which failed to return and a further 334 which were damaged. 823 of these sorties were involved in the two sky-marking attacks which also accounted for thirty-four of the missing and 158 of the damaged bombers. Yet the overwhelming bulk of the vast devastation was achieved by the first three attacks when ground marking was possible. Sky marking, even with the aid of *Oboe*, was shown to be a very poor substitute for ground marking with the same device. To this extent, the weather still remained as one of the most formidable barriers standing between Bomber Command and the fulfilment of its aim. This was another respect in which what may well be called the Battle of Essen established the pattern of the Battle of the Ruhr.

Nevertheless, the two sky-marking attacks on Essen had resulted in considerable damage being inflicted on the target, even including its centre, the Krupp works. The technique had, in fact, produced better results than anything tried against Essen before the introduction of *Oboe*. It had made possible operations which were at least partially profitable on nights when, in the absence of sky markers, none could have been undertaken. Whether what was achieved by sky marking

<sup>1</sup> Including the missing Mosquito which was known to have attacked.

<sup>2</sup> It was a Wellington. Four of its crew were rescued.

<sup>3</sup> O.R.S.(B.C.) Nt. Raid Report, 19th Aug. 1943.



on these occasions was, in view of the casualties sustained, worth achieving is, however, another question, made yet more uncertain by the experience of Bomber Command over Duisburg.

This town, against which more sorties were directed than any other in the Battle of the Ruhr, was much more steadfastly defended by the weather than Essen. In the first three attacks cloudy conditions made it necessary to use the *Oboe* sky-marking technique, though ground markers were also dropped in two of the operations. On no occasion was any substantial concentration of bombing achieved and the three attacks, which involved the despatch of 955 sorties, the loss of thirty-three aircraft which failed to return and the damaging of seventy-six more, seemed to have done very little harm to Duisburg.<sup>1</sup>

The failure of the fourth attack on the night of 26th April when 557 aircraft were despatched was more surprising because on this occasion there was very little cloud in the target area. Seven *Oboe* Mosquitoes dropped red target indicators at 'fairly regular' intervals and this marking was well maintained by the twenty-six backers-up armed with green target indicators. The main force time-keeping was good and the evidence of the night cameras suggested that between one and two hundred aircraft got their bombs within three miles of the aiming point. Nevertheless, the daylight reconnaissance photographs suggested that very little damage had been done to Duisburg. The only possible explanation seemed to be that Duisburg was a relatively small target which contained several open spaces between its built-up areas.<sup>2</sup>

This disappointing and, no doubt, unexpected result was, however, reversed in the final attack when, on the night of 12th May, 572 aircraft were despatched to Duisburg. This time nine *Oboe* Mosquitoes went into action and eighty per cent of their red markers appeared, on photographic evidence, to have fallen within two miles of the aiming point where they and the green markers laid by the backers-up attracted an unusually high proportion of the main force. Indeed, of the 483 crews who claimed to have attacked the target, the evidence of night cameras suggested that no fewer than 410 had got their bombs within three miles of the aiming point.<sup>3</sup> This was a remarkable result and there were no unpleasant surprises when the subsequent reconnaissance photographs came to light. The greatest concentration of damage was then seen to lie in the centre of the target area where some forty-eight acres, including nearly the whole of the old town, had been devastated. Much industrial damage had also

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 4th June, 11th July and 4th July 1943.

<sup>2</sup> do. 27th July 1943.

<sup>3</sup> See Map 4.

Map 4

# Night Photographs DUISBURG 12-13th May 1943

MILES 0 1 2 3  
Scale

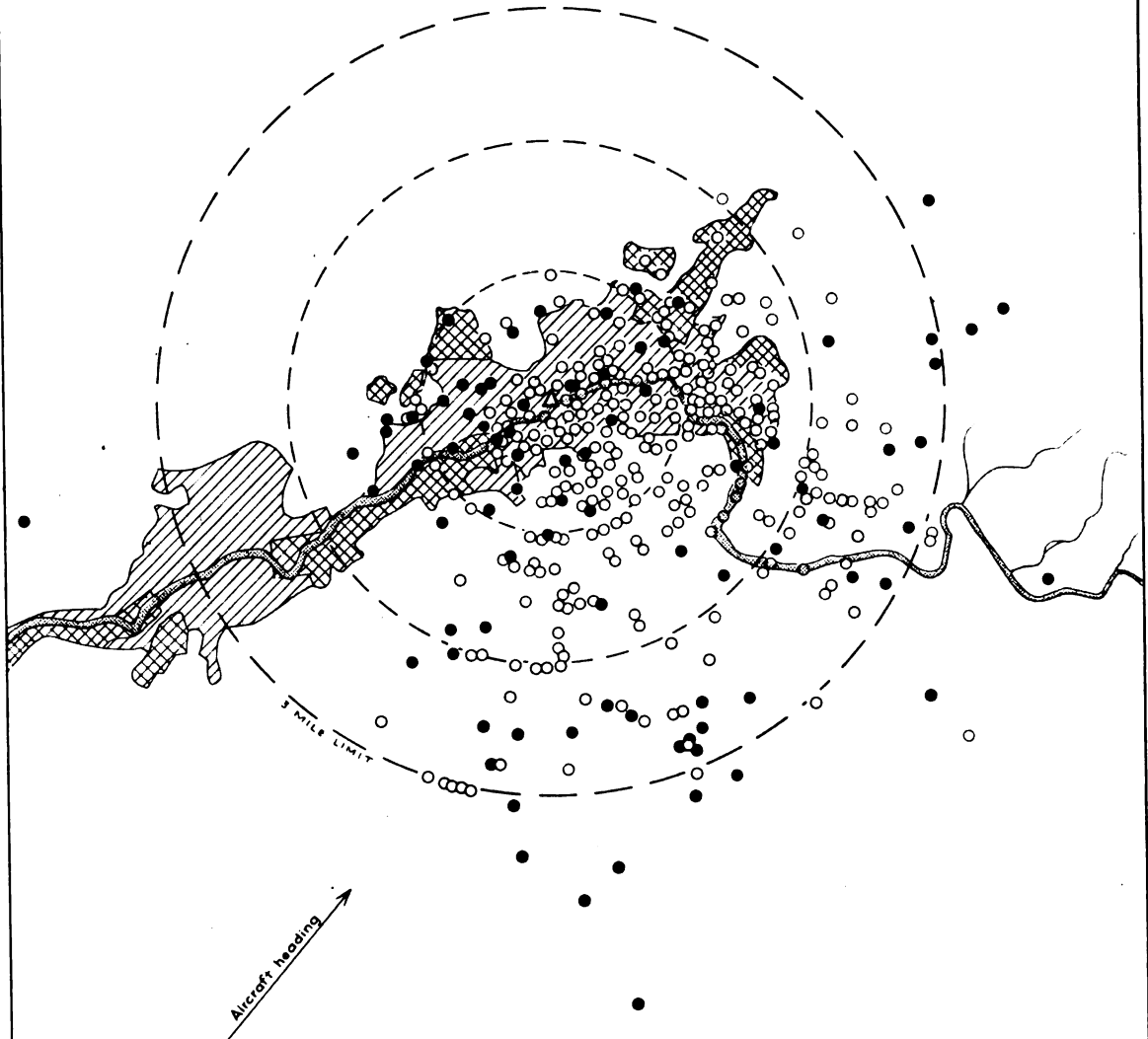
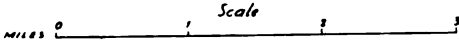
	BY GROUND DETAIL	BY FIRES
Plotted	88	126
Within 3 miles	88	126
Outside " "	18	19
Unplotted	23	143
No of Prints (with bombing) examined		420
3 PHOTOGRAPHS WERE PLOTTED OUTSIDE THE AREA OF THIS MAP		
Circles in broken lines show distance in miles from Aiming Point.		



**Legend**

●	PATH FINDER FORCE	●	MAIN FORCE
○	MARKER AIRCRAFT	○	AIRCRAFT
○	FIRES	○	
△	AIMING POINT	▨	TOWN
		▨	SUBURBS

Night Photographs  
**BARMEN - WUPPERTAL**  
 29-30th May 1943



**PHOTOGRAPHS PLOTTED**

	BY GROUND DETAIL	BY FIRES
Within 3 miles	73	279
Outside - -	22	1
Unplotted	16	131
No of Prints (with bombing) examined		519

*Circles in broken lines show distance in miles from Aiming Point.*

**Legend**

	PATH FINDER FORCE MARKER AIRCRAFT	MAIN FORCE AIRCRAFT
PLOTTED BY GROUND DETAIL	●	○
FIRES	•	◦
AIMING POINT	△	
	▨	INDUSTRIAL AREA
	▩	RESIDENTIAL AREA

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been done in the suburbs and among the damaged factories were four in the August Thyssen steel works group.<sup>1</sup>

This was not the medicine which Essen had received, but it may have served to confirm the impression that the *Oboe* ground-marking technique, if not accurate enough for precision attack, was, despite occasional failures, a reliable means of achieving effective area bombing.

The grounds for this conclusion were substantiated again and again by the almost uninterrupted series of outstanding successes achieved throughout the Battle of the Ruhr whenever the target was within *Oboe* range and whenever the weather permitted the use of the ground-marking technique. Frightful havoc was wrought in Dortmund in two heavy and well concentrated attacks on the nights of 4th and 23rd May. Düsseldorf, though screened from the first attack on the night of 25th May by dense layers of cloud, survived only to have its heart torn out on the night of 11th June. 130 acres of Bochum were wrecked on the following night and so the Battle proceeded until at the end more than half of Aachen was devastated on the night of 13th July. What was, perhaps, the most remarkable among these many successes is, however, still worthy of special attention.

This was the attack against the Barmen district of Wuppertal on the night of 29th May. For this operation 719 aircraft were despatched, 611 claimed to have attacked the target, sixty-two made abortive sorties, thirty-three failed to return and seventy-one were damaged. The night photographs suggested that 475 crews had dropped their bombs within three miles of the aiming point. This in itself was remarkable because the timing of the *Oboe* Mosquitoes was extremely poor throughout the attack. The first *Oboe*-directed red markers burst two minutes late but no more arrived until eighteen minutes later. In these decisive eighteen minutes, twelve backers-up dropped their green target indicators and forty-four fire-raising aircraft, which on this occasion had been added to the backing-up force, also attacked. The original red markers must have fallen very accurately, and the aim of the backing-up crews, some of whom carried *H2S*, must also have been extremely true and a highly concentrated attack began to develop.

The regular cascade of green target indicators nullified the effects of decoy markers vainly ignited by the Germans and compensated for the long delays which occurred between the bursting of the *Oboe*-directed red target indicators.<sup>2</sup> The resulting concentration of accurately placed markers was the best that had ever been achieved and the damage which appeared to have been inflicted upon the target

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 6th Aug. 1943.

<sup>2</sup> The times at which the *Oboe* Mosquitoes attacked were: 0047 (2), 0105 (2), 0219, 0130, 0140 and 0146 hours.

was amazing. It covered more than a thousand acres. Over ninety per cent of the fully built-up area of Barmen was devastated and more than half of the rest of the town had suffered the same fate. It was estimated from the reconnaissance photographs that 34,000 'housing units' had been made uninhabitable and that 118,000 people had been rendered homeless. Public utilities, including the main railway station, two electric power stations, two gas works and a waterworks, were severely affected. Five out of six of the most important factories as well as 108 other industrial establishments had been hit. Yet Barmen, as can be seen from Map 5, was a small target. The vast majority of the target area lay within one mile of the aiming point.<sup>1</sup>

The system of *Oboe* ground marking, despite the fact that only two Mosquitoes took part in the first eighteen minutes of the action, had produced what at that time was one of the most effective area attacks ever launched by Bomber Command.

In spite of its unusually complete nature, this success at Barmen did, nevertheless, conform to the pattern of operational results obtained during the Battle of the Ruhr, for it was achieved against a target within *Oboe* range and on a night when ground marking was possible. In this respect it was less remarkable than the surprisingly effective, though much lighter, attack on Oberhausen carried out in cloudy conditions on the night of 14th June 1943 by the *Oboe* sky-marking technique. 146 of the 203 crews despatched on this occasion claimed to have attacked the target, but, owing to the weather, only nine of the night photographs showed any ground detail.<sup>2</sup> The Mosquito sky marking was, however, reasonably continuous and it must also have been unusually accurate because the subsequent daylight reconnaissance photographs showed that the centre of Oberhausen had been devastated.<sup>3</sup>

All this was, however, only one side of the Battle of the Ruhr. What could be done within the range of *Oboe* if the weather was reasonably good and occasionally even if it was not, was one thing, but what could be done beyond the range of *Oboe* was, as the Nuremberg attack on 8th March 1943 had suggested, quite another. Indeed, Bomber Command did not in this period, when it was engaged on operations which carried it beyond the range of *Oboe*, achieve a single success which was in any way remotely comparable to the tremendous blows struck at targets in or near the Ruhr valley.

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 12th Aug. 1943.

<sup>2</sup> Three of them were plotted within three miles of the aiming point and two of them outside the target area. The other four could not be plotted.

<sup>3</sup> O.R.S.(B.C.) Nt. Raid Report, 5th Sept. 1943. The reconnaissance photographs were taken on 18th and 20th June 1943. No previous reconnaissance had been carried out since 7th June 1942, and though the operation on 14th June was the first major attack of the war against Oberhausen, it was possible that some of the damage shown on the photographs of 18th and 20th June had been caused on other occasions by bombs intended for other targets, especially perhaps Duisburg and Mülheim.

Neither of the two attacks on Berlin at the end of March 1943 achieved any concentration at all. From the 481 night photographs showing ground detail or fire tracks which were brought back from these two operations there were only three which lay within three miles of the aiming point and there were 281 which could be identified as being more than five miles from it. Only scattered damage was caused to Munich by an attack earlier in the month and the operation against Stuttgart on the night of 11th March 1943 was an almost total failure. Photographic reconnaissance showed little fresh damage in Kiel after a force of 577 aircraft had been sent there at the beginning of April. The bombing at Frankfurt on the night of 10th April was widely scattered, and, though considerable damage was done in the outskirts of Stuttgart during a second attack on the night of 14th April, very few bombs fell in the centre of the town.

The first attack on Pilsen, on the night of 16th April 1943, miscarried because the Pathfinders mistook a large lunatic asylum near Dobransy for the Skoda works. The result was that though 249 crews claimed to have attacked the target, the evidence of the night camera suggested that only six had got their bombs within three miles of it. The second attack on 13th May achieved a good concentration in open fields about two miles to the north of the Skoda works.<sup>1</sup> Meanwhile, however, a highly successful attack had been delivered on the night of 20th April against an equally distant target, Stettin. From the 304 crews who claimed to have attacked, no fewer than 256 appeared, on the evidence of the night camera, to have dropped their bombs within three miles of the aiming point. Photographic reconnaissance subsequently showed that nearly all the damage was concentrated in the centre of the town and that about a hundred acres of closely grouped industrial buildings had been devastated.

Another long-range success was achieved on the night of 11th June 1943 by an exclusively Pathfinder Force operation against Münster. Sixty of the seventy-two crews despatched reported that they had attacked the target and the night photographs indicated that forty-three of them had got their bombs within three miles of the aiming point. Daylight reconnaissance revealed considerable damage in the town and was made difficult by smoke which was still rising from burning buildings.<sup>2</sup>

All these attacks were directed by *H2S*-assisted marking and, though there were some exceptions, the majority of them, it will have been noticed, were relative failures. This was not, however, always directly attributable to the inherent limitations of *H2S*. In the first attack on Stuttgart, for example, the initial marking was probably

<sup>1</sup> See Map 6.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Reports, March-June 1943, *passim*.

quite accurate, but the main force was late and when it did reach the target area the markers had burnt out. On other occasions, as, for example, when Frankfurt was attacked on 10th April, the ground marking was concealed from view by thick cloud and, therefore, regardless of its accuracy or otherwise, did no good. Finally, in the case of the second attack on the Skoda works, the result, though quite fruitless, showed that the technical performance of the markers had been far from bad. If the target on that occasion had been the centre of a large town, the damage would have been extensive. The operation merely showed that an aiming point situated on the edge of a comparatively small town was not a profitable objective for area attack. Failures in these circumstances might equally have occurred if *Oboe* could have been used.

Nevertheless, it was the fundamental limitations of *H2S* which were the operative explanation of these long-range failures. The equipment, as earlier experience had suggested, was not accurate enough to make possible the blind marking technique which had been evolved for the *Oboe* operations. *H2S* was only likely to produce good results if lesser demands were made upon it and those who had to operate it. As already noticed a technique, known as *Newhaven*, had been evolved with this consideration in mind, whereby *H2S* was to be used only for the approximate purpose of placing flares in the light of which the ground markers could be aimed at a visually identified target. The actions of the Battle of the Ruhr had, however, revealed the shortcomings of the *Newhaven* technique. From the comparatively high altitudes at which the German defences compelled the heavy bombers of the Pathfinder Force to operate and in the face of all the old difficulties of weather and darkness it proved more often than not, to be impossible to make the necessary visual identification. This meant that the target indicators often had to be dropped blindly and, therefore, as a rule inaccurately. An attempt to correct the known errors inherent in this system by instructing the backers-up to aim, not at individual markers, but at the mean point suggested by all of them, was largely frustrated by the small numbers of initial markers which could be dropped and the consequent difficulty of determining a mean point.<sup>1</sup>

Moreover, the interpretation of *H2S*, unlike that of *Oboe*, was a highly skilled business and it was always easy to make the kind of mistake which had once led the Pathfinders to mistake Dobraný for

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<sup>1</sup> *H2S* was in short supply throughout the Battle of the Ruhr and it was not until September 1943 that all heavy bombers in the P.F.F. were equipped with it. Moreover, there was at this time a high unserviceability rate in the sets which had been supplied. *Harris Despatch*. In order to present the backers-up with the best possible mean point of aim the policy of concentrating the *H2S* markers in time over the target had to be adopted. This was why, if the main force arrived late, as it did at Stuttgart on 11th March 1943, it was liable to find that all the marking had burnt out.

# Night Photographs SKODA. PILSEN 13-14th May 1943

Scale 0 1 2 3 MILES

PLOTTED	BY GROUND DETAIL	BY FIRES
Within 3 miles	112	4
Outside - -	2	-
Unplotted	5	1
No of Prints (with bombing) examined 124		

*Circles in broken lines show distance in miles from Aiming Point.*



Legend		PATH FINDER FORCE MARKER AIRCRAFT	MAIN FORCE AIRCRAFT
PLOTTED BY GROUND DETAIL	●	○	●
" " FIRES	○	○	○
△ AIMING POINT	△	▨ SKODA WORKS	▨ RESIDENTIAL AREA





Pilsen and a lunatic asylum for the Skoda works. The equipment also showed a marked tendency to be comprehensible only over targets which had peculiar characteristics such as, at Stettin, the close proximity of a coast-line, or, as at Münster, the compact nature and isolated position of the town. Finally, it should be remembered that the *H2S* crews flying in Stirlings and Halifaxes were usually harassed and often shot down by the German defences while their *Oboe* comrades flying in Mosquitoes enjoyed an almost complete immunity from all forms of attack.

It was primarily for these reasons that anything beyond the range of *Oboe* remained for Bomber Command as a zone of relative inefficiency. The outlook for the campaign which was now about to begin on the road to Berlin was, therefore, unpromising. It was extremely unlikely that the rest of Germany, with the exception of certain peculiar targets, such as the coastal city of Hamburg, would have to bear the brunt of an assault such as the Ruhr had already sustained.

The *H2S* tactics of the Battle of the Ruhr had not, however, been without any reward. Not only had they resulted in some successful operations, but as a result of accumulating experience they pointed the way to improvements both in the equipment itself and in the methods of using it. It is, however, quite apparent that the techniques which had proved inadequate for area bombing could not have been applied to the greater problems of precision attack. Bomber Command was, therefore, and at this time, incapable, while it was operating in its zone of relative inefficiency, of attempting major night attacks against anything other than area targets.

It may be thought that the position in the nearer parts of Germany, including the Ruhr, was different. After all, the Krupp works had been deliberately and repeatedly hit in *Oboe*-directed operations. No doubt some other very large factories might similarly have been deliberately hit by the same means. Nevertheless, though *Oboe* was an excellent means of making area attack effective, it did generally produce aiming errors which varied between six hundred yards and a mile or more, and in addition to these errors, those of the main force crews aiming at the markers also have to be taken into account. A general policy of precision attack upon specific industrial targets would, therefore, even on the nights of better weather, have inevitably resulted in the major part of the Bomber Command effort falling, at best, upon the relatively uncongested suburban areas or, at worst, in the open fields near by. Nothing like the devastation which was produced by the area offensive would have occurred and it is highly improbable that the destruction of factories and other 'military objectives' in and around the Ruhr would have been any greater than, or, perhaps, even as great as, in fact it was.

The evidence of the Battle of the Ruhr over the Ruhr itself produces the irresistible conclusion that the revolutionary advances in the technique of bombing which it demonstrated had made Bomber Command into an effective bludgeon but that they had not yet enabled it to develop the potential of a rapier.

The obvious qualification to this generalisation may be thought to have been provided by the magnificent operation performed by 617 Squadron and led by Wing Commander Gibson which, on the night of 16th May 1943, resulted in the breaching of the Möhne and Eder dams and the damaging of the Sorpe dam. This was probably the most precise bombing attack which has ever been carried out by day or night by any air force, but it is also a classic example of the exception which proves the rule.

This superb feat was performed by a handful of the finest men in Bomber Command, most of whom had exceptional and long experience of air operations and all of whom had received intensive and specialised training in the use of the remarkable devices and weapons which were invented and improvised for the particular purpose. Moreover, though the dams were only lightly defended, the tactics which had to be adopted made the operation exceptionally hazardous. From the nineteen crews which set out only eleven returned and five of these came back in damaged aircraft.

There was nothing normal or representative about the dams raid. It was the achievement of a very small and a very select *élite* whose squadron was in any case put out of action for several months by the losses which it sustained. It is no more possible to contemplate the main force of Bomber Command undertaking operations of this nature than it would have been possible for Sir Arthur Harris to expose his ordinary squadrons to the sort of casualty rate which had been sustained by 617 Squadron on the night of 16th May 1943. Not only would the task have been absolutely impossible but the force would, after a couple of attacks, have ceased to exist.<sup>1</sup>

As it was, and as will have been noticed, Bomber Command was approaching perilously close to the unbearable, or at any rate, the insupportable sustained casualty rate during the Battle of the Ruhr.

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<sup>1</sup> It must not, however, be supposed that the Dams Raid bore no relation to the main offensive of Bomber Command. The attack was a strategic part of the Battle of the Ruhr. More important still, it produced new equipment, new tactics and new techniques which together formed the basis of a development which eventually made 617 Squadron as much a marking as a bombing force. In this role it was to lead the heavy bombers of 5 Group in many famous attacks and to contribute decisively to the development of main force precision techniques which in the later stages of the war produced astonishing results.

Though the Dams Raid was a part of the Battle of the Ruhr it has been thought better to describe it and the development of 617 Squadron separately in Section 4 below. This has been done not only because of the complexity and specialised nature of these events but because their bearing upon the major operations of Bomber Command was felt not in the Battle of the Ruhr but at a later stage.

This was a fact which caused not only considerable anxiety but also some vigorous counter-measures. Though some of the latter belong to the period of the Battle of the Ruhr, the most immediately rewarding measure, namely the introduction of *Window*, was delayed until the opening of the Battle of Hamburg on the night of 24th July 1943. For this reason, it may be more convenient to defer the consideration of these important matters until, in the following section, the second phase of the full offensive embracing the Battle of Hamburg and the campaign on the road to Berlin is reached.

### 3. The Battle of Hamburg and the campaign on the road to Berlin, July–November 1943

The striking power of Bomber Command developed during the Battle of the Ruhr was enormously greater than anything which had previously been brought to bear by any air force. Britain, in spite of her military defeats, her persistent maritime perils and her consequently generally defensive strategy, had, with the vigorous support of her sister Dominions, nevertheless, created an offensive air weapon which, though less mighty than once planned, was vastly more formidable than the German air power which in the last years of peace had helped to intimidate the Anglo-French alliance into abdication and humiliation and which, in the first year of war, had extended the British air defences to their utmost. Such a force as was now disposed in Bomber Command would, in the days of crystal gazing before the war, undoubtedly have given rise to optimistic expectations of an immediate and complete 'knock-out blow'.

Now, however, that the difficulties as well as the limitations of strategic bombing were somewhat more realistically appreciated, this was not a task which Bomber Command was expected to perform. Nor even were Bomber Command and the United States Eighth Air Force together expected to achieve more than 'the progressive destruction and dislocation of the German economic and industrial system'. This famous and often repeated Casablanca clause gave formal recognition to the belief that the strategic air offensive was a war of attrition. The obvious danger inherent in the strategy of the 'knock-out blow' or the 'Blitzkrieg' is that too much may be staked upon a single stroke which may fail. The prudence of the British Air Staff and, in their turn, of the United States Air Staff, had guarded Bomber Command and the Eighth Air Force against this danger.<sup>1</sup> But in the war of attrition there was an equally obvious danger, namely, that the attrition inflicted by the enemy might ultimately exceed that inflicted upon him. When, as was the case in the trenches of the First World War, the struggle was between opposing masses of foot soldiers the development of the war was relatively easier to follow and easier to predict than when, as was the case in the strategic air offensive, the struggle was between aircraft and industry or, as it has been graphically expressed, between bombs and concrete. The evidence of the Battle of the Ruhr did, at any rate, make it difficult to

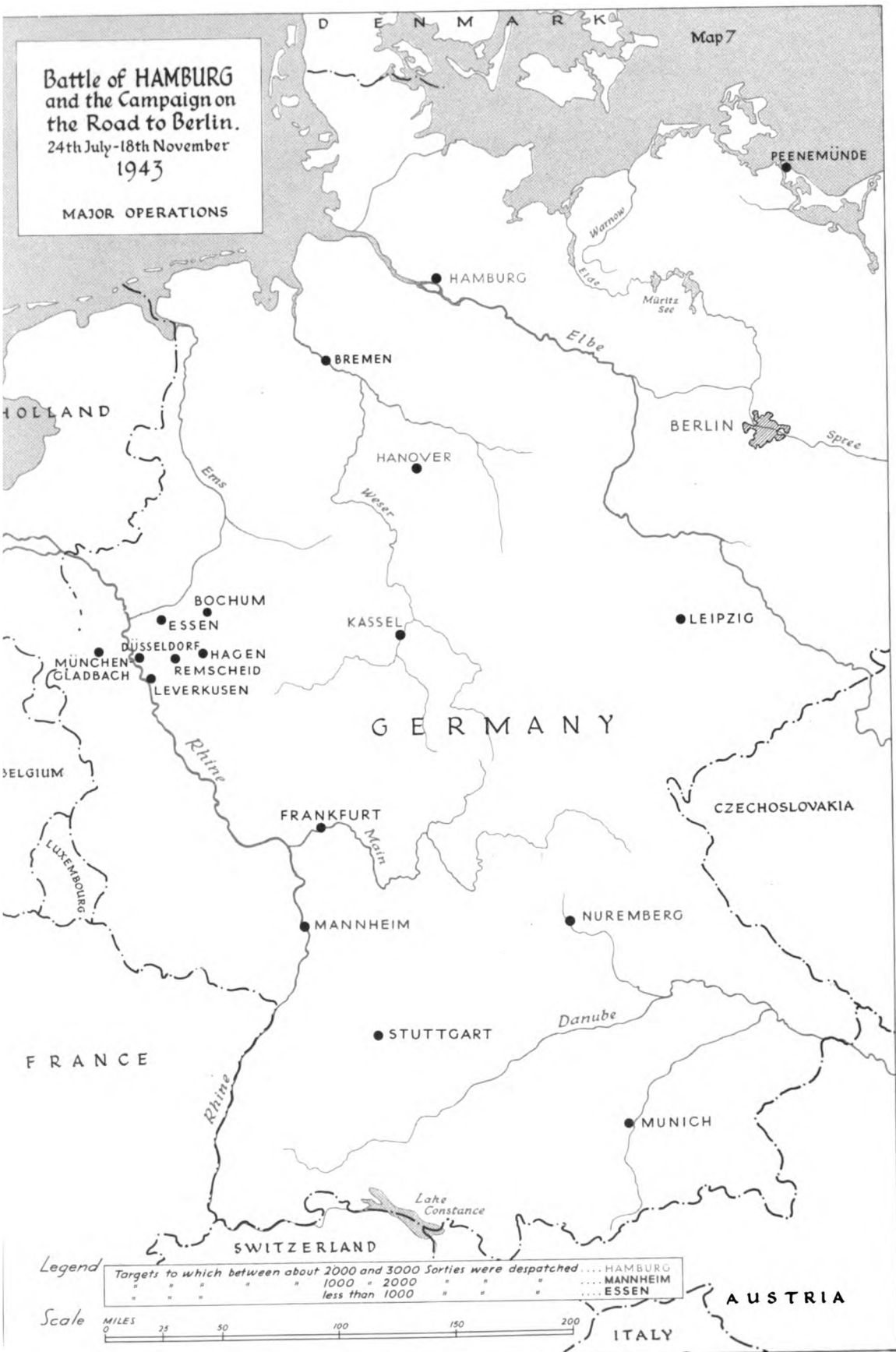
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<sup>1</sup> In this connection it is interesting to compare the somewhat similar attitudes of the two field commanders concerned. The attitude of General Eaker in 1942 and 1943 was fundamentally similar to that of Sir Edgar Ludlow-Hewitt in 1939 and 1940.



**Battle of HAMBURG**  
**and the Campaign on**  
**the Road to Berlin.**  
 24th July-18th November  
 1943

MAJOR OPERATIONS



PEENEMÜNDE

HAMBURG

BREMEN

HANOVER

BERLIN

LEIPZIG

GERMANY

CZECHOSLOVAKIA

FRANKFURT

NUREMBERG

STUTT GART

MUNICH

SWITZERLAND

AUSTRIA

ITALY

Legend

Targets to which between about 2000 and 3000 Sorties were despatched	.....	HAMBURG
" "	.....	MANNHEIM
" "	.....	ESSEN

Scale

MILES 0 25 50 100 150 200

judge whether, in a long-drawn campaign of that sort, Bomber Command would become the victim or the victor.

However this might be, the prudence of attempting to reduce the effectiveness of the German air defences had always been obvious. The emphasis placed upon the need to reduce the German fighter force in the *Pointblank* directive of June 1943 had, as will be recalled, arisen primarily from the parlous predicament of the United States daylight bombers as well as from the paramount importance of gaining at least a measure of air superiority before the launching of *Overlord*. Nevertheless, the mounting casualties sustained by the night bombers in the face of an increasing and improving German night fighter force made the *Pointblank* 'intermediate objective' not only a general but also a Bomber Command interest.

The prospects of Bomber Command contributing directly or significantly to the destruction of the German fighter force were, however, extremely poor. The technique of night area attack could scarcely be expected to produce effective results against the small, far-flung and mostly distant targets which comprised the German aircraft industry. Nor could a force whose acknowledged role was 'bombing and not fighting' effectively engage the German fighters which assaulted it. Though Air Vice-Marshal Saundby supported Air Vice-Marshal Cochrane's contention that a greater willingness on the part of the Bomber Command gunners to open fire might 'convert the German night fighter trade from one of the safest in the German Air Force to one of some peril', no one believed that this would result in the serious reduction of the German night fighter force.<sup>1</sup> The heavy and medium bombers possessed neither the armament nor the performance seriously to damage the German night fighter force in the air. The best that their gunners could do with their small-calibre weapons was to provide some deterrent to the less skilled or the more unwary among the German pilots.

The Mosquito bombers carried no armament at all, but these aircraft, with their remarkable performance and considerable range, were a promising potential means of engaging the German night fighters.<sup>2</sup> This idea had occurred to Sir Arthur Harris who, in October 1942, had suggested to the Commander-in-Chief, Fighter Command, Sir Sholto Douglas, that some Mosquito fighters might

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<sup>1</sup> Letters Cochrane to Saundby, 2nd July 1943, Saundby to Cochrane, 7th July 1943. Bomber Cmd. Tactical Note, 1st Aug. 1943. Air Vice-Marshal Cochrane's letter ends with the following surprising sentence, 'In the process, we shall, no doubt, put a number of 303 bullets into our own aircraft, but I doubt whether that would matter very much.' Air Commodore Bennett objected strongly to the Bomber Command Tactical Note and suggested that the great readiness on the trigger which it encouraged would merely help the German fighters to find their quarries. Min. Bennett to Bomber Cmd., 3rd Sept. 1943.

<sup>2</sup> De Havillands had originally suggested that the Mosquito would be suitable as a long-range fighter, and in July 1940 the Air Ministry had appeared to accept the advice. M. M. Postan: *Aircraft Production: Quality* (unpublished).



profitably be mixed in the bomber stream.<sup>1</sup> Nevertheless, it was not until June 1943 that Fighter Command began to attempt systematic operations designed to engage the German night fighters and, therefore, to relieve the pressure upon Bomber Command. The aircraft selected and equipped for the purpose was not, however, the Mosquito but the much inferior Beaufighter VI.

The task was allotted to 141 Squadron and the aircraft were fitted with a radar device known as *Serrate* which enabled them to home on the A.I.<sup>2</sup> transmissions of the German fighters. This equipment was effective up to ranges of between eighty and a hundred miles and it indicated the bearing, but not the distance, of the enemy. *Serrate* was displayed on the Mark IV A.I. tube and in the final stages of the interception the operator could switch over from *Serrate* to A.I. Thus, the intention was that *Serrate* should be used to bring the enemy within A.I. range and that A.I., as in normal night fighting, should be used to bring him within visual range. The problem was not, however, restricted to the interception of the enemy. These long-range fighter activities also presented the usual difficulties of night navigation, and the Beaufighters were, therefore, fitted with *Gee*. The navigator was placed in a swivel chair between the navigation and the interception equipment.

The crews of 141 Squadron were given a 'brief period' of training in the use of their complicated equipment and the first *Serrate* operations were carried out at short notice on the night of 14th June 1943. By the beginning of the following September it was evident that the experiment was not succeeding. During that time some 233 *Serrate* sorties were despatched and 179 of them completed their patrols. Though the *Serrate* equipment had established contact with the enemy on about 1,180 occasions, only twenty combats had resulted.<sup>3</sup>

The principal lesson of this experience was that the Beaufighter

<sup>1</sup> Letter Harris to Douglas, 5th Oct. 1942.

<sup>2</sup> Airborne radar apparatus for intercepting aircraft.

<sup>3</sup> For the period 14/15th June-6/7th September 1943, *Serrate* statistics were as follows:

Sorties despatched:	233
Sorties completing patrols:	179
Casualties:	3 lost, 3 damaged
<i>Serrate</i> contacts:	1,180 (approx.)
Too brief or distant to follow:	520 ( " )
Held and followed:	490 ( " )
Converted to A.I.:	108
Resulting visuals:	33
Resulting combats:	20
Claims:	13 destroyed, 1 probable, 4 damaged.

Fifty-four contacts, none of which resulted in combats, were obtained by A.I. without the prior use of *Serrate*. Ten of these were on friendly aircraft. Four fortuitous sightings of enemy aircraft also occurred. These resulted in the claim of one enemy aircraft being damaged. O.R.S.(F.C.) Report, 10th Sept. 1943.

was inadequate to the task. The failure of many of the interceptions was due simply to the superior speed and manoeuvrability of the German night fighters. It was obvious that if better results were to be achieved, a better aircraft would have to be used and this, the Operational Research Section of Fighter Command suggested, should be the Mosquito XIV.<sup>1</sup>

Thus, for the time being at least, the German night fighter force remained substantially immune to destruction. Occasionally its pilots might be overtaken by an unpleasant surprise, but the main dangers which they had to face arose from the normal hazards of night flying, augmented as in war time they sometimes tend to be, by lack of experience. Moreover, the use of radar and the elaborate systems of ground control which were now fundamental to the German night fighting technique had for a long time been steadily reducing the cover of darkness and, therefore, the scope for evasion which had once afforded a large measure of protection to Bomber Command. Despite the enormous damage inflicted by the bombers in the Battle of the Ruhr, the tactical and technical developments of the period were tending to favour the defence more and more and the offence less and less. The Bomber Command casualties had, at any rate, grown heavier and heavier. It seemed that it might only be a matter of time until science changed night completely into day and enabled the night fighter to master the night bomber as certainly as the day fighter had already mastered the day bomber. In this event, the only salvation of the night bomber, as was already seen to be the case with the day bomber, seemed to lie in the meeting of force by force, or, in other words, in the development of effective long-range fighting.

In the meantime, however, other and more immediately possible expedients were open, or could be opened, to Bomber Command. These were measures of deception designed to mislead and also to dislocate the German air defence system. Already Bomber Command had attempted some elaborate feints and methods of jamming enemy radio control had been used. These tactics and techniques were presently to be developed on a much greater scale and in much greater complexity, but the most promising radio counter-measure, namely *Window*, was still awaiting its operational introduction when the Battle of the Ruhr drew to a close.

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<sup>1</sup> O.R.S.(F.C.) Report, 10th Sept. 1943. Another interesting conclusion was that it was much more profitable for the Beaufighters to remain near the bomber stream than to engage in general hunting. This experience is comparable to that of anti-submarine craft, which achieved better results by staying near the convoys than by ranging far and wide over the broad oceans. See S. W. Roskill: *The War at Sea*, Vol. I, (1954), pp. 134-135, 352-353. The situation with regard to daylight long-range fighting was somewhat different, as will be seen below. It should, however, be remembered in this connection that the Beaufighters and later the Mosquito night fighters were in no sense 'escorting' the night bombers and that it was the role of 'escort' which imposed such a handicap upon the offensive power of the daylight long-range fighters.

It will be recalled how in April 1942 the Chiefs of Staff had agreed to the introduction of this weapon, if such, the bundles of metallised paper may be called, and that it was only after Lord Cherwell had observed that the effects would not be confined to gun-laying radar used for anti-aircraft guns, but would also extend to airborne A.I. equipment, that the permission had been withdrawn on the grounds of the effect which its use by German bombers might have on the efficiency of British night fighters.

This surprising decision had allowed the threat of the much inferior and diminishing German bomber force to deny an important tactical advantage to the much greater and increasing striking power of Bomber Command. Moreover, by the time that it was taken the introduction of *Window* had been so imminent that the device had become a subject of common gossip in the Royal Air Force and soon afterwards it had even been the inspiration of a cartoon which, to the chagrin of the Air Staff, actually appeared in the *Daily Mirror*. Despite the official decision to circulate a rumour to the effect that the trials of *Window* had shown it to be a complete failure, it was, therefore, hardly likely that the Germans would long remain in the dark as to the truth.<sup>1</sup> Thus, one of the principal reasons for withholding *Window*, namely the danger of revealing it to the enemy, was seriously undermined from the outset and seemed to have been completely destroyed by the end of October 1942 when an Air Scientific Intelligence report indicated that it was 'certain' that the Germans fully understood the *Window* principle.<sup>2</sup>

This consideration of the secret being out seemed, in the view of Sir Henry Tizard, to complete the argument for the immediate introduction of *Window*, but there were others who persevered with a different view.<sup>3</sup> Sir Sholto Douglas, Commander-in-Chief, Fighter Command was still haunted by the fear of the effect which its use by the Germans would have upon the efficiency of his fighters.<sup>4</sup> Nor, curiously enough, did Sir Arthur Harris exert himself at this time to secure the introduction of a measure which was expected so greatly to favour the offence at the expense of the defence. At the meeting to discuss *Window* which was convened on 4th November 1942 by Sir Charles Portal and attended by Sir Sholto Douglas, Sir Arthur Harris was represented by Air Vice-Marshal Saundby who did not, however, press for the introduction of *Window*. Air Vice-Marshal Saundby suggested, on the contrary, that the high concentration of bombers over the target, which he put at three hundred or more an hour, was

<sup>1</sup> Mins. of Air Min. Conf., 21st July 1942.

<sup>2</sup> Air Scientific Intelligence Report No. 16, 24th Oct. 1942.

<sup>3</sup> Memo. by Tizard, 31st Oct. 1942.

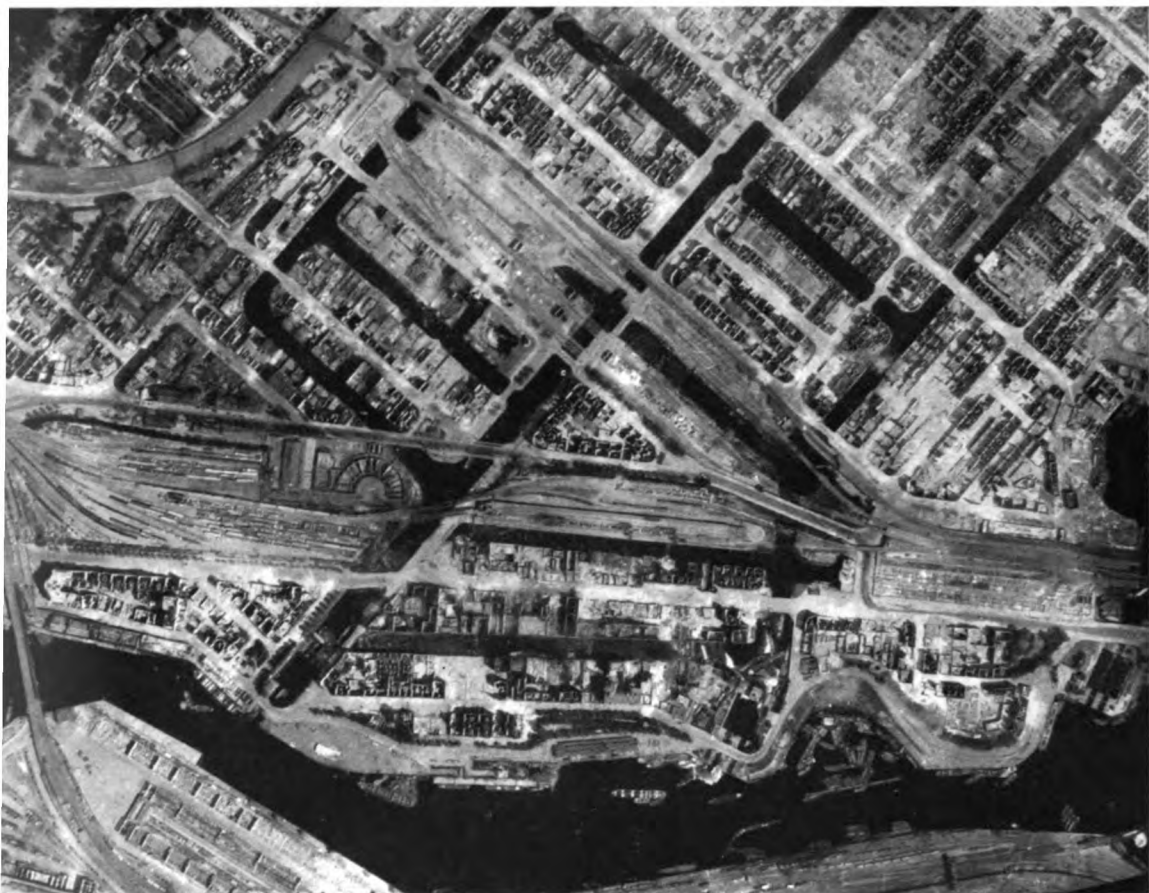
<sup>4</sup> Letter Douglas to Air Min., 5th Sept. 1942, and his remarks at Air Min. Conf., 4th Nov. 1942.



5. Lancasters.



6. A Lancaster crew embarking. Two members of the ground crew, not wearing flying equipment, are shown.



7. Part of Hamburg docks at the end of July 1943.



8. During the Battle of Hamburg. *German photograph.*



9. During the Battle of Hamburg. *German photograph.*



10. During the Battle of Hamburg. *German photograph.*

already achieving a considerable dislocation of the German defences.<sup>1</sup> This attitude and the absence of Sir Henry Tizard left the floor to those who were preoccupied with the dangers and not the advantages of *Window*, the introduction of which was consequently again postponed.<sup>2</sup>

By the end of March 1943 when the Battle of the Ruhr had begun, the case against *Window* was, however, palpably crumbling. The obvious fact that the German bomber force was an almost negligible factor and that the German fighter force was one of increasingly decisive importance was at last beginning to exert some influence upon the discussions. Indeed, it now appeared that of the losses inflicted by enemy action upon Bomber Command no less than seventy per cent were due to German night fighters. About half these losses to night fighters were, it was estimated, attributable to radar-controlled fighters which might be substantially put out of action by *Window*. Of the remaining thirty per cent of the casualties which were attributed to flak, it was thought that two-thirds were due to radar-controlled guns which similarly might be dislocated by *Window*. Thus, it seemed probable to the Air Staff that the introduction of *Window* would save from destruction no less than thirty-five per cent of the aircraft which were then being shot down by enemy action. This would amount to 1.7 per cent of the total Bomber Command sorties being despatched.<sup>3</sup>

There were, of course, astonishing defects in this optimistic argument, which, for example, assumed that the dislocation of radar would result in the G.C.I.s and A.I. equipped night fighters and the radar controlled anti-aircraft guns achieving absolutely no results at all. Nevertheless, the argument for introducing *Window* did seem to be overwhelming especially in view of the great weakness of the bomber force remaining to Germany with which to retaliate.<sup>4</sup>

<sup>1</sup> Mins. Air Min. Conf., 4th Nov. 1942.

<sup>2</sup> This apparent indifference on the part of Sir Arthur Harris is hard to explain. It may have been due to his belief that having missed the main campaign season in 1942 it would be better to await the spring of 1943 but, however this may have been, his attitude is not explained in his memoirs in which he writes, 'It would have been idiotic to drop metallised paper over Germany in August of 1940, but in 1942 I was certain that the time had come to take such risks, which did not seem to be very serious, for the sake of the offensive.' *Bomber Offensive*, p. 132.

<sup>3</sup> Air Staff Memo., 28th March 1943.

<sup>4</sup> The figures accepted in the Air Ministry at the time for a possible German bomber offensive against England were as follows:

A. Long Range Bombers	Maximum effort:	150-200
	Sustained, 3-4 nights:	50-75
	Sustained steadily:	20-25
B. Fighter Bombers	Maximum effort:	60
	Sustained, 3 or 4 nights:	40-50
	Sustained steadily:	10-15

But in June 1943 these figures were revised as follows:

A. Long Range Bombers	Maximum effort:	75-100
	Sustained, 3 or 4 nights:	30-40
	Sustained steadily:	10-15

(Cont. on p. 144)



Sir Arthur Harris came in person to attend the Air Ministry conference called on 2nd April 1943 by Sir Charles Portal while the Commander-in-Chief, Fighter Command, now Air Marshal Leigh-Mallory, was represented by a deputy. This meeting, held almost on the anniversary of the original decision to introduce *Window* reached by the Chiefs of Staff in April 1942, revealed a somewhat extraordinary state of affairs. It appeared that the *Window* being produced was inadequate in quantity and of the wrong size. Moreover, a Ministry of Aircraft Production spokesman announced that it would be another eighteen months before the automatic *Window* launcher was ready for service. In the meantime a member of the bomber crew would have to perform what would be almost a full-time task manually. Nevertheless, the conference agreed to recommend to the Chiefs of Staff that *Window* should be introduced on 1st May. At the same time steps were taken to increase *Window* production and to ensure that it was the correct size. Sir Arthur Harris was also authorised by Sir Charles Portal to make private arrangements about the production of automatic launchers.<sup>1</sup>

Even this was not the end of an already sad story. The Chiefs of Staff now decided that *Window* should be further delayed until after the projected invasion of Sicily had been carried out.<sup>2</sup> By the middle of June 1943, however, even Lord Cherwell was beginning to recognise 'on the whole that the time is rapidly approaching when we should allow it [*Window*] to be used.' Even so, he advised the Prime Minister that the introduction of *Window* should not be allowed to endanger allied plans in the Mediterranean.<sup>3</sup> Meanwhile, in the strategic air offensive, British bomber losses between 1st April and 14th July 1943 amounted to 858 aircraft. German bomber losses in the same period were, it seemed, twenty-seven aircraft.<sup>4</sup> It appeared to Sir Charles Portal that if *Window* had been used in these months, Bomber Command might have saved 230 bombers and crews and the Germans might have saved sixteen.<sup>5</sup>

Nevertheless, yet a further staff conference was necessary before a decision could be reached. This was held on 15th July 1943 and it was

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B. <i>Fighter Bombers</i>	Maximum effort:	20-25
	Sustained, 3 or 4 nights:	15
	Sustained steadily:	5-10

Min. Crawford to Portal, 23rd June 1943.

<sup>1</sup> Mins. of Air Min. Conf., 2nd April 1943 and letter Portal to Harris, 2nd April 1943.

<sup>2</sup> Min. Hollis to Evill, 14th May 1943. This Chiefs of Staff decision was not recorded in the usual way, for security reasons.

<sup>3</sup> Min. Cherwell to Churchill, 17th June 1943. It should be observed that Lord Cherwell was not as optimistic as some about the number of Bomber Command casualties which would be avoided by the introduction of *Window*.

<sup>4</sup> Min. Crawford to Portal, 15th July 1943.

<sup>5</sup> Note by Portal, undated. Sir Charles Portal was considering rather different casualties to those reported to him on 15th July 1943. His figures were 682 British long-range bombers lost. Twenty-six German long-range bombers shot down.

attended among others by the Prime Minister, Sir Charles Portal and Mr. Herbert Morrison, who as Minister of Home Security was responsible for civil defence. The view of the Chiefs of Staff was now that *Window* should be introduced as soon as the invasion of Sicily was safely launched. They recorded the opinion that if *Window* had been introduced on 1st April 1943 Bomber Command might, at the time of this discussion, have had 286 bombers and crews which had been shot down still in the air. This, they pointed out, represented twenty-five per cent of the existing Bomber Command first-line strength. Mr. Herbert Morrison was, however, still much impressed by what might be achieved against England by the German bomber force. It was his duty to safeguard in every way the civil population from air attack, a duty he felt all the more keenly after what they had endured in 1940-41. He was fearful of the strain which might be imposed upon civil defence and he suggested that efforts should be made to reduce the scale of German air attack by bombing aerodromes in western Europe. He said that he would have to raise the question of *Window* in the War Cabinet. Sir Charles Portal, however, explained that the German bomber force was 'weak, badly trained and fully extended' and that it would be a waste of effort to attack its bases. Thus, in effect, he reminded Mr. Morrison that this was the summer, not of 1940, but of 1943. Finally, Mr. Churchill said that the matter was too technical for the Cabinet, and that he personally was prepared to accept the responsibility for a decision to introduce *Window*. Mr. Morrison then agreed and it was decided that Bomber Command should be authorised to start dropping *Window* on 23rd July 1943.<sup>1</sup>

Such was the prelude to the introduction of a measure which was expected to save about one-third of Bomber Command's battle casualties.<sup>2</sup> The delay of some sixteen months which had been primarily occasioned by the threat of German retaliation was, perhaps, the last, and by no means the least significant, of the achievements of the German bomber force whose career thus ended, as it had begun, on a note of successful bluff.<sup>3</sup>

*Window*, supported by other radio counter-measures and the increasingly elaborate methods of deception now being adopted by Bomber Command could not, in themselves, lead to air superiority in the true and the full sense of the term. They could not lead directly

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<sup>1</sup> C.O.S. Mtg., 15th July 1943. An Air Ministry signal communicating the decision to Bomber Command was despatched on 16th July 1943.

<sup>2</sup> 'No one doubts *Window* would help.' 1/3' Sir Charles Portal had written in about the middle of July 1943. Dr. B. G. Dickins of the Bomber Command Operational Research Section stated on 2nd April 1943 that *Window* might save one in three of the aircraft then being lost to enemy action and Sir Arthur Harris pointed out on the same occasion that if *Window* was not introduced the Bomber Command casualty rate would rise above the level then being sustained. Mins. of Air Min. Conf., 2nd April 1943.

<sup>3</sup> In the event, the Germans who knew all about *Window* long before July 1943, were able to make little effective use of it either against England or in the Mediterranean.

to the destruction or even the reduction of the opposing air force, nor could they achieve more than its partial, and, perhaps, also temporary, neutralisation. However successful they might be, they would still leave the German fighter force in being, able to fire over open sights, able, perhaps, to devise new methods of night interception and, above all, still able to challenge the allies in the struggle for air superiority which was the inevitable concomitant of the United States daylight offensive and the indispensable prelude to the supreme operation of 1944: the launching of *Overlord*. They were, therefore, not a substitute for or an alternative to the measures of destruction which had been proposed in the *Pointblank* directive.

Nevertheless, these deceptive measures might well afford Bomber Command the protection which it needed if the night offensive was to be developed and extended on the lines of the Battle of the Ruhr. Their ultimate value depended not only upon the number of casualties which they might save but also upon the use to which Bomber Command could put such superiority over the German air defences as they might temporarily confer. The verdict upon this question lies in the phase of Bomber Command operations which may be called the Battle of Hamburg and the campaign on the road to Berlin and also, of course, in the Battle of Berlin itself.

There were no important operations on the night of 23rd July 1943 and Bomber Command's activities were confined to leaflet raids carried out over France by crews from Operational Training Units. Such operations, which were a characteristic and valuable climax to the final stages of operational training in Bomber Command, may seem, from the point of view of the significance of the date, to have been an anti-climax. Nevertheless, within twenty-four hours, on the night of 24th July 1943, the Battle of Hamburg had begun, *Window* had come into operation and Bomber Command had embarked upon an attack which, in the course of six major operations and the space of nine nights, produced catastrophic devastation in Hamburg, the heaviest blow yet struck against Essen and a lighter, though highly effective, thrust against Remscheid.

Thereafter and until the middle of November, the focus of the Bomber Command assault swung to and fro on the road from the Ruhr to Berlin, now and again coming back to the Ruhr, three times reaching to the capital itself and occasionally leaving Germany altogether for targets in Italy and France. On the night of 18th November 1943, the Battle of Berlin opened and the supreme climax of the night area bombing offensive was reached. The Battle of Hamburg remained, however, as the high tide of Bomber Command's achievement throughout this arduous campaign. No other town in Germany felt the weight of war in this period as Hamburg did in the last week of July and the first of August.

Meanwhile, as the heavy bomber squadrons, which bore the brunt of the main offensive, increased in number, the Mosquito light bomber element of the Command was also expanding, albeit somewhat gradually, and by the end of the year Bomber Command possessed four operational squadrons of these amazing aircraft. In addition to carrying out the marking of such targets as were within range of *Oboe*, these Mosquitoes mounted a steadily increasing and ever more varied independent offensive designed sometimes to divert and spread the German air defences by feints and 'spoof' marking sorties, sometimes to harass towns not under the immediate attack of the main force and sometimes to pick off special precision targets. Mosquitoes of Fighter Command also began to appear in the role of long-range support for Bomber Command.

Before, however, turning to the important details of these heavy and light bomber operations in the course of which many new tactical methods were adopted, it may be appropriate first to consider some of the salient characteristics of the campaign as a whole. In the period between the opening of the Battle of Hamburg and the opening of the Battle of Berlin, that is between the nights of 24th July and 18th November 1943, Bomber Command launched thirty-three major attacks against German targets. Though none of the forces sent out was individually as large as that numbering 826 aircraft, which had been sent against Dortmund on the night of 23rd May, the average scale of attack was greater than during the Battle of the Ruhr. Fourteen of the operations involved the despatch of more than six hundred bombers and only four of them were mounted by fewer than three hundred. In fact, the first attack, when 791 bombers were sent to open the Battle of Hamburg, was the largest, and the last, which involved the despatch of eighty-three bombers to Ludwigshafen, was the smallest.<sup>1</sup> This last attack did, however, have a special significance, for every one of the eighty-three aircraft was equipped with *H2S* which was thus at last coming into more general use. Moreover, the quality of the front line showed another important improvement in that the ratio of Lancasters to other types increased substantially. On the night of 3rd September, Sir Arthur Harris was able to muster no

<sup>1</sup> Of these thirty-three major operations against German targets:

7	involved the despatch of between 700 and 800 aircraft
7	" " " " " 600 " 700 "
4	" " " " " 500 " 600 "
5	" " " " " 400 " 500 "
5	" " " " " 300 " 400 "
3	" " " " " 200 " 300 "
1	" " " " fewer than 100 "

Comparable figures for the Battle of the Ruhr are given on p. 110 above, from which it will be seen that of the forty-three major attacks on German (and Czech) targets in that campaign, eight involved the despatch of more than six hundred aircraft and twenty involved the despatch of fewer than four hundred.

fewer than 316 of them to make the first all Lancaster attack on Berlin.<sup>1</sup>

These thirty-three major operations caused the despatch of some 17,021 sorties. From this total 695 aircraft failed to return and another 1,123 were damaged, or in some cases, destroyed over England. Thus, this, the major part of the campaign, produced a missing rate of 4·1 per cent and a damage rate of 6·6 per cent, making a total casualty rate of 10·7 per cent. These results bore most favourable comparison with those of the comparable part of the Battle of the Ruhr which, as will be recalled, had resulted in a missing rate of 4·7 per cent and a damage rate of 11·5 per cent making a total casualty rate of 16·2 per cent.<sup>2</sup>

*Window* obviously played an important part in bringing about this reduction at a time when there was every reason to believe that without it the casualty rate would have risen above that sustained during the Battle of the Ruhr. There were, however, other factors which must not be overlooked. The geographical concentration of the assault was far less pronounced than it had been during the latter stages of the Battle of the Ruhr and many of the targets did not possess such formidable gun defences as were common in the Ruhr. Flak was the main agency of damage, though not of destruction, and it was in the damage rate that the largest reduction had occurred. If, however, the flak encountered during the campaign initiated by the Battle of Hamburg, tended to be somewhat less formidable than that which had to be faced in the Ruhr, it was also less effective as also were the searchlights. This was due to *Window*. Moreover, the penetration of the attacks after the Battle of Hamburg, tended to be much longer than those attempted in a great part of the Battle of the Ruhr. This would, other things being equal, have given the German night fighters a much better chance of success. That other things were not equal was primarily due to *Window*. Thus, there is no doubt that *Window*, belated as it was, came powerfully to the support of Bomber Command in an hour of mounting danger. The use and the effect of this valuable measure against the German defences is, however, an integral part of the detailed operational history of this period and it will be necessary to return to this consideration again and again in the course of this section.

<sup>1</sup> Four Mosquitoes created a diversion near the target, but the actual attack was all Lancaster.

<sup>2</sup> The forty-three major operations of the Battle of the Ruhr caused the despatch of 18,506 aircraft, of which 872 were reported missing and 2,126 damaged. The highest individual casualty rates in the two campaigns also make an interesting comparison. They were:

	<i>Battle of the Ruhr</i>	<i>Battle of Hamburg etc.</i>
Highest missing rate:	Pilsen 11 per cent	Berlin 7·7 per cent
Highest damage rate:	Gelsenkirchen 24·4 per cent	Hagen 14·3 per cent
Highest total casualty rate:	Rostock 31·4 per cent	Hanover 16·5 per cent

Even though they were lower, and initially much lower, than previously, the casualties sustained in the main offensive by the heavy bombers were still severe and they continued to be much heavier than those sustained by the unarmed and widely dispersed Mosquitoes. In their various independent roles the Mosquitoes were out over Germany on seventy-five out of the 117 nights which passed between the beginning of the Battle of Hamburg and that of the Battle of Berlin. Ranging far and wide between the Ruhr and Berlin and using methods of aiming which varied between the precision of *Oboe* and a new device known as *G-H*, to the approximation of dead reckoning, these independent Mosquito operations involved the despatch of 819 sorties. Only thirteen of these failed to return, though another sixty-nine were damaged. Thus, for these Mosquitoes, the missing rate was 1.6 per cent and the damage rate 8.4 per cent, making a total casualty rate of 10 per cent.<sup>1</sup>

During the Battle of Hamburg and the campaign on the road to Berlin there was, as always, a certain diversion of the Bomber Command effort to targets which lay outside Germany. The Operational Training Units occasionally provided small 'main forces' which were led to targets in France by *Oboe* Mosquitoes, but on ten occasions during August, September and November, Sir Arthur Harris despatched considerable forces from his operational squadrons to Milan, Turin, Genoa, the Boulogne area,<sup>2</sup> Montluçon, Modane and Cannes to attack targets which were held to be of special importance. All of these attacks involved the despatch of more than a hundred aircraft and in the double onslaught against Milan and Turin on the night of 12th August, 656 bombers were sent out. From the total of 2,783 sorties engaged upon these major operations in France and Italy, the casualties were light. Twenty-nine aircraft failed to return and seventy were damaged.<sup>3</sup> On some of these attacks, as also upon some of the major area attacks on German cities, General Eaker placed four or

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<sup>1</sup> It should be remembered that the loss of a Mosquito meant the loss of two men and two engines, whereas the loss of a Lancaster, a Halifax or a Stirling meant the loss of seven men and four engines.

The rise in Mosquito casualties by comparison with those sustained in the Battle of the Ruhr is another interesting commentary on the performance of *Window*. The Mosquitoes, because they did not operate *en masse*, could, of course, gain no protection from *Window*. *G-H* was a radar device in which the *Gee* and the *H* systems were incorporated. *H* worked on a principle similar to *Oboe* but in reverse. That is, the position plotting was done in the aircraft. It was at least as accurate as *Oboe* and could be operated in a greater number of aircraft simultaneously. For a fuller description, see Annex I.

<sup>2</sup> Where V.1 Flying Bomb launching sites were thought to be under construction.

<sup>3</sup> These figures and those for the major German attacks and the independent Mosquito operations have all been calculated from the O.R.S.(B.C.) Nt. Raid Reports covering the period. They should not be assumed to be absolutely exact. In addition to the operations against Italy which are mentioned above, there was on the night of 24th July an attack on Leghorn by thirty-three Lancasters which were returning to England from North Africa after having flown there in the previous week after an attack on Italian transformer stations. This type of operation was known as 'shuttle' bombing.

five of his Flying Fortresses under the operational control of 3 Group, Bomber Command, and they mingled with their British allies in the struggles of the night.<sup>1</sup>

Such then were some of the salient characteristics of the campaign which carried Bomber Command across Germany from Hamburg, the second city in the Reich, to Berlin, the first. It now remains to consider the operations themselves to see what use Bomber Command was able to make of its increasing striking power and its new tactical opportunities and how far, as it concentrated primarily upon targets beyond the range of *Oboe*, it was able to conquer what, in the course of the Battle of the Ruhr, had been revealed as a zone of relative inefficiency.

The force despatched to Hamburg on the night of 24th July 1943 was 791 strong, and consisted of 347 Lancasters, 246 Halifaxes, 125 Stirlings and seventy-three Wellingtons. It was routed well to the north of the fifty-fourth parallel so that it could turn on to the target from a north-westerly direction and make a landfall on the northern bank of the Elbe estuary. This point was to be indicated by yellow route markers dropped by six *H2S*-equipped aircraft and thirty backers-up. Also, at this point, six of the *H2S* marking aircraft were to transmit to England their calculation of the wind velocity between their last *Gee* and their first *H2S* fixes. Three broadcasts of the wind, to be sent out ten minutes before, ten minutes after and twenty minutes after zero hour, were then to be made from England to the main force. Thus, the crews who were not carrying *H2S* would cross the enemy coast with good information about the wind which, otherwise, they would have been unlikely to obtain. The whole force was instructed to start dropping *Window* at the rate of one bundle a minute when they reached seven degrees thirty minutes east and to continue doing so until they had passed seven degrees east on the homeward journey.

The appointed zero hour was one o'clock on the morning of 25th July but the attack was to be opened three minutes before this by twenty *H2S* aircraft which were to drop yellow target indicators and flares blindly on the area of Hamburg. This was to be the signal for eight crews, also equipped with *H2S*, to attempt a visual identification of the aiming point in the centre of the city, which they were to mark with red target indicators. Fifty-three backers-up were then to

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<sup>1</sup> Thus five Fortresses of the U.S. Eighth Bomber Command took part in the attack on the Boulogne area on the night of 8th September. Five took part in the Montluçon attack on the night of 15th September, five joined the Modane raid on the night of 16th September. Five took part in the Mannheim attack on the night of 23rd September, five, from which one failed to return, joined with the 678 Bomber Command aircraft sent to Hanover on the night of 27th September, three went to Munich on the night of 2nd October and three, one of which failed to return, to Frankfurt am Main on the night of 4th October.





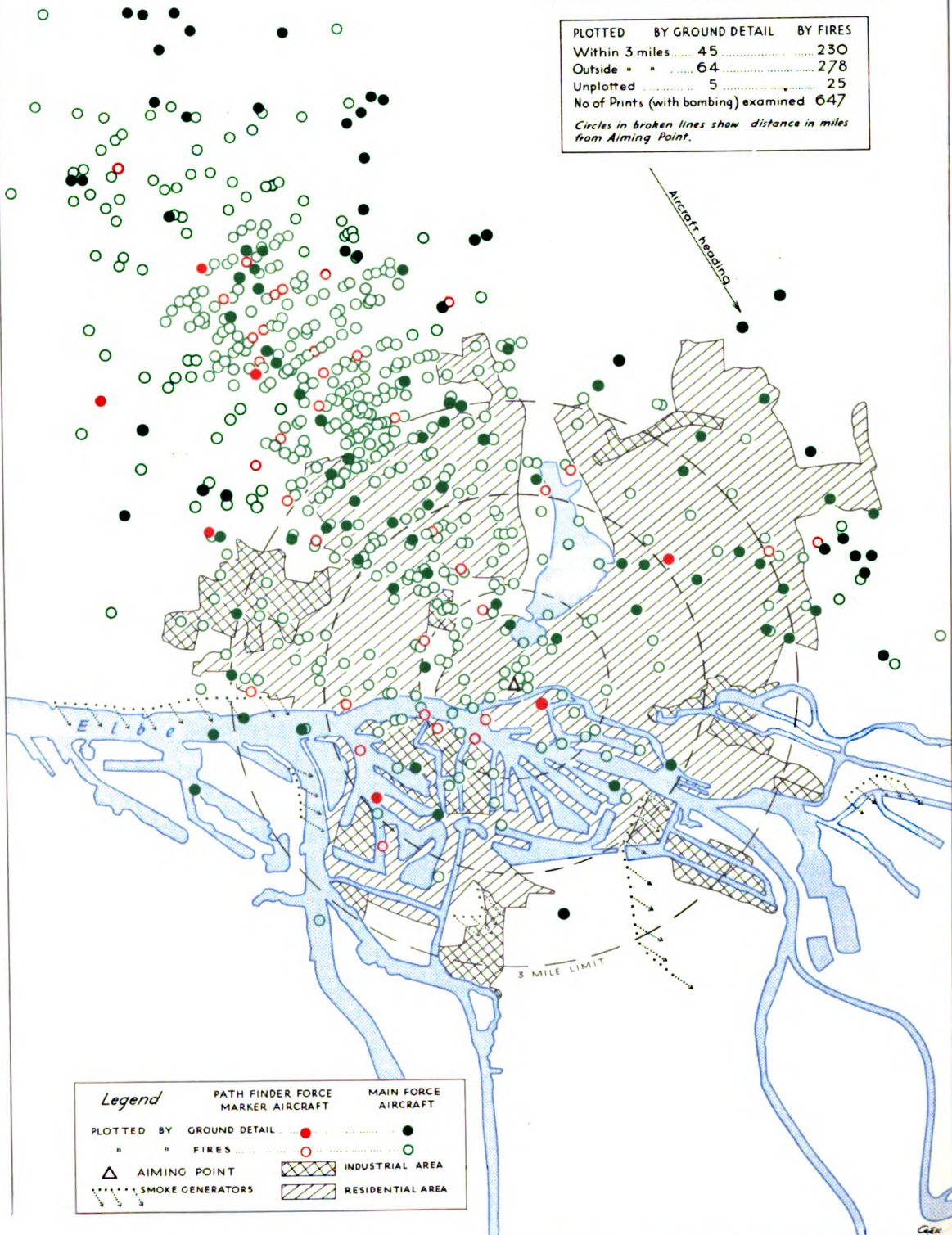
# Night Photographs HAMBURG

24-25th July 1943

MILES 0 1 2 3  
Scale

	BY GROUND DETAIL	BY FIRES
Plotted Within 3 miles	45	230
Outside " "	64	278
Unplotted	5	25
No of Prints (with bombing) examined 647		

*Circles in broken lines show distance in miles from Aiming Point.*



**Legend**

	PATH FINDER FORCE MARKER AIRCRAFT	MAIN FORCE AIRCRAFT
PLOTTED BY GROUND DETAIL	●	●
" " FIRES	○	○
△ Aiming Point	⊠	⊠
⋯⋯⋯ Smoke Generators	⊠	⊠
	⊠	⊠

INDUSTRIAL AREA  
RESIDENTIAL AREA

put down green target indicators from zero plus two to zero plus forty-eight minutes. Their crews were instructed to aim preferably at the red markers, but, if these could not be seen, at the centre of their own green concentration. Failing that, they were to aim at the centre of the blindly laid yellow concentration. Each of the bomb-aimers in the backing-up force was, however, told to overshoot by two seconds, by which means it was hoped to check the 'creep back' of bombing which had become so common in previous attacks. Moreover, eleven of the backers-up who were to be dispersed throughout the attack were ordered to re-assess the true aiming point and, by marking it, to 'recentre' the attack. The main force was to start bombing two minutes after zero hour and the whole attack was to be completed forty-eight minutes later. The main force crews were told to ignore the yellow markers and to aim at any reds which could be seen. If none was visible they were to aim at the centre of the green concentration. Thus, were the lessons of the past applied. *H2S* was not expected to produce miracles and the chief reliance was to be placed upon the visual marking which, it was hoped, would be made possible by the *H2S*-laid flares. This hope largely depended, of course, upon the weather.

The forecast had spoken of an 'even chance' of a little cloud being encountered over the target, but, in the event, there was none and only a slight haze affected the otherwise good visibility. This was unfortunate for Hamburg as also was the fact that the city lay across distinctive river banks and near a coast line which clearly showed up on the *H2S* screen. Some of the attacking force had, of course, by this time fallen away. Forty-six bombers made abortive sorties and five more attacked alternative targets.<sup>1</sup> Nevertheless, the Battle of Hamburg began on time at three minutes to one on the morning of 25th July. The first two salvoes of blind markers probably fell short and one was later plotted some five and a half miles from the aiming point, but the remainder seemed to fall with much greater accuracy near the centre of the target area. Meanwhile, the visual markers were arriving with their red target indicator bombs. Only a moderate success attended their efforts. One salvo fell, probably in the dock area, about two miles south-east of the aiming point, another single red marker which, incidentally, was dropped by mistake from an aircraft whose bomb-sight was out of order, went down one and a half miles to the north-west. A further salvo burst three and a quarter miles to the east-north-east right on the edge of the built-up area and yet another could be seen two and a half miles to the west in Altona. Around these four points, the main force soon began to establish four distinct concentrations of bombing, but for nearly a quarter of an

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<sup>1</sup> Though one of these also dropped some bombs on Hamburg.

hour the backers-up succeeded in keeping the attack reasonably well centred.

Thereafter a marked 'creep back' developed and by half past one a carpet of incendiary bombs stretched back for seven miles along the approach to Hamburg. The evidence of the night camera suggested that of the 728 crews who claimed to have attacked the target, some 306 had in fact got their bombs within three miles of the aiming point.<sup>1</sup> This, though by no means an unsatisfactory result for an attack beyond *Oboe* range, did not, perhaps, appear to be exceptional.

What was exceptional was the low casualty rate sustained by Bomber Command. Only twelve aircraft failed to return and thirty-one were damaged. *Window*, on its initial appearance, had thrown the German defences into confusion. Intercepted radio conversation between the air and the ground showed the extent to which the German night fighter controllers and pilots were confused and frustrated. Searchlights were seen to rake the sky aimlessly and the anti-aircraft guns were obviously 'sadly hampered'. Of the missing aircraft, five or six probably owed their destruction to night fighters and five or six to flak. Among those damaged, two Lancasters sustained their injuries in a collision over Wyton. Another Lancaster and two Halifaxes were struck by incendiary bombs dropped by friends from above, and another Lancaster was damaged by the premature explosion of its own marker bomb which, by one of those curious strokes of chance which were so common in Bomber Command, seems to have been hit, as it left the bomb bay, by an anti-aircraft shell.<sup>2</sup>

The destruction in Hamburg after this attack was widespread and severe and about 1,500 people had already been killed, but the damage did not yet exceed that which was already common in many of the Ruhr towns. Hamburg had, however, been chosen for a different kind of attack and the Battle continued. By day on 25th and 26th July, the United States Eighth Bomber Command joined in the assault and in two attacks General Eaker despatched 235 of his aircraft.<sup>3</sup> On each occasion half a dozen Bomber Command Mosquitoes followed up at night so that the doomed city had enjoyed little respite when on the night of 27th July the second major action of the Battle took place. This time Bomber Command despatched a force of 787 Lancasters, Halifaxes, Stirlings and Wellingtons. This time the route lay across the neck of the Danish peninsula and the target was approached through the gap between Lübeck and the Elbe. There was also an important change in the marking tactics adopted. The visual marking stage was abandoned and the backers-up were

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<sup>1</sup> See Map 8.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 6th Oct. 1943.

<sup>3</sup> Monthly Analysis of Operations, Eighth U.S. Bomber Cmd.

ordered to aim, with a two-second overshoot, at the centre of the yellow concentration which was to be laid blindly by twenty-five crews who were instructed to aim purely on *H2S* indications. This was a concession to the extraordinarily good performance which *H2S* had given over Hamburg during the first attack and it was also a recognition of the relatively poor performance of the visual markers on that occasion. *Window* was again to be used. Zero hour was once more to be one o'clock in the morning and the whole main force attack, for which 653 aircraft were detailed, was to be compressed into forty-three minutes. The weather helped Bomber Command as it had done two nights earlier, though there was a smoke haze over Hamburg rising to 20,000 feet.

The attack opened slightly early and in the five minutes before one o'clock fifteen salvoes of yellow target indicators dropped blindly by *H2S* markers went down. Except for two or three strays, they were exceptionally well concentrated in the Billwärder district about one and a half to three miles to the east-south-east of the aiming point. The main force very rapidly established a massive concentration of fire around these points, and though the bombing tended to drift eastwards there was no marked 'creep back' during the rest of the attack which marked the second stage of the catastrophic disaster which was now remorselessly overtaking Hamburg. The evidence of the night camera indicated that 325 of the 722 crews who claimed to have attacked the target had got their bombs within three miles of the aiming point.

*Window* again confused the defences but to a lesser extent than on the earlier occasion. The Germans had now experienced two *Window* attacks and already they had begun to devise new fighter tactics appropriate to the new situation.<sup>1</sup> The ground controllers could be heard giving the pilots a running commentary on the course and height of the Bomber Command stream as a whole. Directions about individual aircraft, except when they were held in searchlights, were no longer given. These measures brought the Germans no substantial success on this night, but they pointed the way towards the method of loosely controlled cat's eye interception which was presently to be developed with marked success. Seventeen of the bombers failed to return and forty-nine were damaged.<sup>2</sup>

Four Mosquitoes which attacked Hamburg on the following night found that the fires were still burning and then on the night of 29th July 1943, the third great blow of the Battle of Hamburg was struck, when the blind-marking technique was again adopted and the force despatched consisted of 777 Lancasters, Halifaxes, Stirlings and

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<sup>1</sup> The second was the Essen attack on the night of 25th July 1943. See below, p. 157.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 11th Oct. 1943.

Wellingtons. For the third time in succession, the weather was favourable, but the initial blind marking was not as accurate as on the night of 27th July. The developing attack was, therefore, considerably dispersed and by twenty-four minutes after zero hour, which was at a quarter to one, an area of twenty-four square miles was dotted with burning incendiaries. The evidence of the night camera suggested that 238 of the 699 crews who claimed to have bombed the target, had got their bombs within three miles of the aiming point.

The declining effectiveness of *Window* was indicated by the higher casualties. Thirty of the Bomber Command aircraft failed to return and forty-three were damaged. The German 'running commentary' technique of loose fighter control, the best that was possible in the deluge of *Window*, was beginning to produce better results and it is probable that the night fighters made nearly a hundred interceptions on this night.<sup>1</sup>

The final action of the Battle of Hamburg occurred on the night of 2nd August 1943, when a force of 740 bombers was despatched to set the seal upon the already frightful destruction wrought in the first three attacks.<sup>2</sup> The weather, as had been at least largely predicted, was appalling and as the bombers flew across the North Sea they ran into increasing masses of cumulo-nimbus cloud, soaring at times to 25,000 feet and associated with violent thunderstorms. Large numbers of determined men pressed on through these hazardous conditions until, in the area of Hamburg, they found an unbroken mass of cloud rising generally to 15,000 feet and often to 25,000 or 30,000 feet. There was no moon and the visibility was described as 'nil'. On the ground it was pouring with rain. The ground marking laid by *H2S* was scarcely and only very occasionally visible to the main force and about half the force did not claim to have reached the target at all. It was, at the time, impossible to know whether any success had rewarded the sustained efforts of those who aimed at what they believed to be the position of Hamburg. Thirty bombers failed to return and fifty-one were damaged. The German fighters, like the British bombers, had managed to get into the air and a number of combats took place.<sup>3</sup>

Hamburg had, however, suffered a heavy blow. Indeed, this last attack came as a macabre climax to the 'great catastrophe' which had overwhelmed the whole city, and for Bomber Command the victory was complete.<sup>4</sup> In the earlier months and years of the war it was with-

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 12th Oct. 1943.

<sup>2</sup> This force consisted of 329 Lancasters, 235 Halifaxes, 105 Stirlings, sixty-six Wellingtons and five Mosquitoes. In Hilary St. G. Saunders: *Royal Air Force 1939-1945*, Vol. III, (1954), p. 8, it is incorrectly stated that this attack was mounted entirely by Lancasters.

<sup>3</sup> O.R.S.(B.C.) Nt. Raid Report, 14th Oct. 1943.

<sup>4</sup> The physical effects of the Battle were soon apparent to the Air Ministry and to Bomber Command from daylight reconnaissance photographs. O.R.S.(B.C.) Nt. Raid

out precedent, and in those that were still to come it was never excelled. As an exemplification of what could be achieved by the technique of mass and sustained incendiary area attack, the outcome of the Battle of Hamburg was the vindication of the plans which had been made for this kind of bombing in 1941, and it is, perhaps, appropriate to recall that it was the precept and the practice of the *Luftwaffe* which, at that time, had inspired the British Air Staff. Indeed, the Germans were now reaping the harvest of what they themselves had sown.

Moreover, Bomber Command had won this victory at an amazingly low cost to itself. In the four major actions of the Battle of Hamburg, Sir Arthur Harris had despatched 3,095 sorties. Nearly nine thousand tons of bombs, about half of them incendiaries, had been cast into the assault. Yet only eighty-six bombers, amounting to 2·8 per cent of those sent out, had failed to return. Another 174, or 5·6 per cent of those despatched, had been damaged. Thus, in the pursuit of this gigantic achievement Bomber Command had sustained a total casualty rate of no more than 8·4 per cent. In the five attacks on Essen during the Battle of the Ruhr some 2,070 sorties had been despatched and ninety-two of the aircraft, representing 4·5 per cent of the force, had failed to return. Another 324, or 15·4 per cent, had been damaged and the total casualty rate therefore amounted to 19·9 per cent.

It would be unwise to attach too much significance to these figures which relate to attacks upon different targets at different times of the year especially as Essen, lying in the heart of the Ruhr, was a notoriously well-defended town. Nevertheless, the fact that the casualty rate sustained in the four major operations against Hamburg was substantially less than half that sustained in five major operations against Essen, is an indication of the quite remarkable change of situation which had been brought about by the introduction of *Window*. This had enabled Bomber Command to concentrate its efforts against a single target for long enough to bring about its complete devastation and yet to avoid the full and usual penalty of such a concentration. Repeated attacks upon the same target usually resulted in increasing losses because they enabled the enemy to concentrate his defences at that point. In the five attacks on Essen, for example, the missing rates had been 3·2 per cent, five per cent, six per cent, 3·9 per cent and 4·3 per cent. The corresponding damage rates had been 8·6 per cent, 15·0 per cent, 17·0 per cent, 14·8 per cent and 21·4 per cent. Thus, the total casualty rate increased from 11·8 per cent on the first attack to 25·7 on the last.

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Report, 14th Oct. 1943. Here we are only concerned with the operational performance of Bomber Command, but the wider implications of the attacks for Germany are discussed below.

The Battle of Hamburg was no exception to this general rule. The missing rates in the four major operations were 1.5 per cent, 2.2 per cent, 3.5 per cent and four per cent. While the damage rates were 3.9 per cent, 6.2 per cent, 5.5 per cent and 6.9 per cent. Thus, the total casualty rate rose from the initial 5.4 per cent to the ultimate 10.9 per cent. Even so the proportional increase was less than in the attacks on Essen, though the latter were spread over a much longer period than the Battle of Hamburg.<sup>1</sup>

Though it is clearly impossible to say how many aircraft had been saved in the Battle of Hamburg by the use of *Window*, it is obvious that considerable numbers of crews and machines which lived to fight another day did directly owe this ability to *Window*.<sup>2</sup> How far this advantage could be made permanent was problematical, but even before the Battle of Hamburg was over it became evident that the Germans were finding ways round their new difficulties and it would have been unrealistically optimistic to believe that Bomber Command casualties would long remain at the pleasantly low Hamburg rate.

The small losses in the Battle were, however, not more remarkable than the vast destruction which had been inflicted on the target. Here again, however, there was no ground for complacency. Hamburg was, as has been observed, an ideal *H2S* target. The vast majority of the other large towns in Germany did not possess the attributes which, at Hamburg, enabled such accurate results to be obtained even when the range of *Oboe* had been exceeded. Moreover, the fact that Hamburg lies so close to the North Sea and called for such a slight penetration of the German mainland, meant that *Gee* could be operated almost up to the limit of its range which extended almost, and on some occasions entirely, to Hamburg itself. This again was an advantage which would be lost when inland targets, even if they were closer to England than Hamburg, were attacked. Though it was now apparent that Bomber Command could deal shattering blows to targets within range of *Oboe* or with the special attributes of Hamburg, there was no guarantee that such results could be obtained against

<sup>1</sup> All these figures have been computed from the appropriate O.R.S.(B.C.) Nt. Raid Reports. In *Royal Air Force 1939-1945*, Vol. III, p. 8, it is stated that eighty-seven bombers failed to return from the Battle of Hamburg. It is also stated that 2,630 crews attacked the target and dropped 8,621 tons of bombs. The last two figures must, however, be regarded as speculative. In fact, 2,542 of the crews engaged upon the four major operations against Hamburg claimed to have attacked it.

<sup>2</sup> An interesting estimate on the basis of the first two *Window* operations (Hamburg 24/25th July, and Essen 25/26th July) was made at the time. The calculation was as follows:

(a) HAMBURG: *Window* attack on 24/25th July 1943. 1.5 per cent missing. Compared with missing rate of 6.1 per cent for the last six heavy attacks on Hamburg before the introduction of *Window*. Thus *Window* saved seventy-eight aircraft on 24/25th July.

(b) ESSEN: *Window* attack on 25/26th July 1943. 3.4 per cent missing. Compared with missing rate of 5.4 per cent for the last six heavy attacks on Essen before the introduction of *Window*. Thus *Window* saved forty-nine aircraft on 25/26th July. B. Ops. 2(a) Reports, 26th July 1943 sent by Bottomley to Portal, 27th July 1943.



targets like Munich, Hanover or Nuremberg and least of all Berlin. Nor was there any certainty that *Window* would continue to control the German defences to such an extent that Bomber Command would be able to concentrate on single targets for long enough without suffering a crushing casualty rate. Though the Battle of Hamburg was a brilliant beginning to the campaign on the road to Berlin, its success, though much greater, was really no more significant than that achieved against Lübeck at the beginning of the resumed offensive in 1942.

Meanwhile, before the Battle of Hamburg had ended, the effectiveness of *Oboe* had been further demonstrated in attacks on the nights of 25th July and 30th July 1943 against Essen and Remscheid. It was while the attack on Essen was actually developing that the Germans finally realised that *Window* was being used, but this did not, of course, immediately do them much good and, as we have noticed, it was not until the second attack on Hamburg two nights later that they began to develop the running commentary technique. In what was to be its parting shot at Essen for a long time, Bomber Command achieved immense damage. The attack was highly concentrated on the accurately placed ground markers which had been dropped by eleven *Oboe* Mosquitoes. Of the 604 crews who claimed to have attacked the target, it appeared, on the evidence of the night camera, that 368 had got their bombs within three miles of the aiming point. Daylight photographs later showed that the very severe damage was centred on the Krupp works, where 110 of the 190 workshops had been affected. Great havoc had been wrought by fire in the town and many buildings were still burning two days later. Though the marking was entirely *Oboe* guided, forty-one of the aircraft taking part in the attack carried *H2S* which was used as a navigational aid. Twenty-three bombers failed to return and sixty-seven were damaged, forty-three of them by flak.<sup>1</sup> So great was the apparent destruction that the rumour began to spread among crews at Operational Training Units that the one target to which they need not expect to be sent when they joined their squadrons was Essen.<sup>2</sup>

The Remscheid attack, though on a much smaller scale, was also highly successful, and technically, perhaps even more so. Two hundred and seventy-three aircraft, led by nine *Oboe* Mosquitoes which carried out the marking, were despatched.<sup>3</sup> Two hundred and twenty-eight crews claimed to have attacked the target and the night

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 27th Sept. 1943.

<sup>2</sup> An example of the extent to which photographic evidence may be misleading about actual industrial damage.

<sup>3</sup> Seven of them actually dropped markers. Three were despatched as reserves, but when one of the markers had to return early with a defective air speed indicator, two of the reserves were called into action.



photographs suggested that no fewer than 191 had got their bombs within three miles of the aiming point. The force as a whole, to which all the bomber groups contributed, had, therefore, probably operated with greater efficiency than ever before and the result was not unlike that which might have been expected to follow the despatch of five or six hundred bombers. The centre of Remscheid appeared from the photographs to have been almost completely destroyed and devastation throughout the town was on a severe scale. Apparently uncontrollable fires were seen to be still burning on the following day.

The Bomber Command losses were, however, much higher than was usual in these, the early nights of *Window*. Fifteen bombers failed to return and twelve more were damaged. Eight of the missing aircraft were Stirlings which belonged to the force of eighty-seven put up by 3 Group. They had tended to fall behind the time schedule and had probably failed to gain proper protection from *Window* which was reserved for those who kept in the main concentration or, as it was more often called, the 'bomber stream'.<sup>1</sup>

Despite these rather severe losses in the Remscheid attack and despite the hostile weather on the last night of the Battle of Hamburg, Bomber Command had, nevertheless, enjoyed an almost uninterrupted run of unprecedented success in the course of the six major operations which it had carried out between 24th July and 3rd August 1943. There followed a slight pause during which Mosquito harassing operations were mounted against Cologne, Duisburg and Düsseldorf and in which 220 Lancasters were sent, with the loss of only two aircraft, to Milan, Turin and Genoa, but in all the major operations against Germany which followed in the remainder of 1943, the same consistent success that had crowned the last nights of July and the first of August, was not again achieved. Nor was it until the Battle of Berlin opened in the middle of November that Bomber Command again concentrated upon a single target as it had done in the Battle of Hamburg.

There were, nevertheless, some outstanding successes in this phase of anti-climax in the bombing offensive and, perhaps, the most remarkable, as also one of the most expensive, of these was the famous attack, carried out on the night of 17th August 1943, against the flying bomb research and experimental station at Peenemünde.

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 26th Sept. 1943. A Bomber Command Air Staff Note of 17th July 1943 had sought to impress upon crews the vital importance of keeping in the bomber stream if the proper *Window* protection was to be obtained. The bomber stream was often well concentrated on the outward journey, but it usually tended to become dispersed on the homeward run. Bomber Cmd. O.R.B. Dispersal was not, however, the only cause of heavy losses in the Stirling Squadrons. Of the 273 aircraft despatched on this occasion to Remscheid, nine were Mosquitoes, eighty-two were Lancasters, ninety-five were Halifaxes and eighty-seven were Stirlings. Of the missing aircraft eight were Stirlings, five were Halifaxes, two were Lancasters and none was a Mosquito. O.R.S.(B.C.) Nt. Raid Report.



11. Lancasters at dusk.



12. A Stirling, Mk. I.



13. Peenemünde before attack.



14. Peenemünde after the attack on the night of 17th August 1943.



15. Mosquitoes, Mk. XVI.



16. A Lancaster taking off at night.

The usual area bombing tactics were not appropriate to this task as the aim was to destroy a number of specific buildings. Three precise aiming points were allotted to the force of 597 four-engined bombers which was despatched and a combination of the night precision bombing techniques, being evolved in the Pathfinder Force and in 5 Group, was adopted. The operation was directed by Group Captain J. H. Searby, Commanding Officer, 83 (P.F.F.) Squadron, who remained over the target throughout the attack and made his instructions known by means of radio telephone. Though Group Captain Searby had rehearsed this procedure in the attack on Turin on the night of 7th August, the Peenemünde operation was the first occasion upon which the 'Master Bomber' technique, first evolved by Wing Commander Gibson in the dams raids, had been applied to a major attack. The gallant and persistent manner in which Group Captain Searby discharged his difficult and dangerous role not only contributed largely to the accuracy of the attack on the Peenemünde station but also demonstrated the practicability and value of the new technique which was later to be of such importance to Bomber Command.<sup>1</sup> This Peenemünde attack was also notable as being the first occasion upon which a new and much-improved marker bomb was operationally used. This formidable and conspicuous weapon, consisting of a 250-lb. case packed with impregnated cotton wool, soon became famous in the Command as a 'red spot fire'. It burst and ignited at 3,000 feet and burnt on the ground as a vivid crimson fire for about ten minutes. Its appearance was easy to recognise and difficult to simulate.

Satisfactory as the severe damage at the Peenemünde station was, the success was not achieved without heavy casualties. Forty aircraft failed to return and thirty-two others were damaged. Seven of the latter had been injured by night fighters and it is probable that more than half of the missing bombers were shot down by night fighters, for which the conditions of bright moonlight, good visibility and a deep penetration were almost ideal. *Window*, however, once more played a vital part, and, denied their former close control, the German night fighters had to rely upon the general running commentary which was heard to give the target successively as Kiel, Berlin, Rostock, Swinemünde and Stettin. Thus, as was becoming common, it was not until the later stages of the action that the German night fighter pilots were able effectively to engage the bomber stream.<sup>2</sup>

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<sup>1</sup> For an account by Group Captain Searby see Sir Philip Joubert de la Ferté: *Rocket* (1957), pp. 66-70. See also the photographs following p. 158.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 20th Oct. 1943, and O.R.B. 83 (P.F.F.) Sqdn. 17/18th Aug. 1943. The value of this attack in impeding the German V-weapons offensive against England is discussed below, pp. 282-286.

Though some of the contrasts between land and water which abound in the neighbourhood of Peenemünde did not distinguish themselves on the *H2S* screen as clearly as might have been expected, *H2S* did, nevertheless, play an important part in making the visual identification of the target possible. The device also largely contributed to the success of several later operations, directed by the more conventional tactics of area bombing, at the centres of German towns on the road to Berlin. Four notable examples are to be found in the attacks on Mannheim-Ludwigshafen, Frankfurt am Main, Hanover and Kassel which were carried out during September and October. In none of these did *H2S* play the same singular part which it had been allotted in the second, third and fourth actions of the Battle of Hamburg, for, on each occasion, the initial blind *H2S* marking and illumination was followed by visual identification and marking. Nevertheless, in all four operations, the *H2S* blind marking was accurate enough to make the task of the visual markers possible. On all four occasions a good and accurate concentration of bombing by the main force was the result.

In the Mannheim-Ludwigshafen attack on the night of 5th September 1943, the initial blind markers dropped their target indicators and flares 'with extraordinary accuracy' and five of the six salvos, whose positions were subsequently plotted on night photographs, were found to be within one and a half miles of the aiming point. The visual markers found the aiming point 'brilliantly illuminated' and they were able to mark it closely with target indicators. Eleven minutes after zero hour, 111 main force bombers had attacked and fires were burning over an area measuring four by three miles and covering nearly the whole of Mannheim-Ludwigshafen. At this time very little stray bombing had occurred. In the later stages of the operation the attack began to shift slightly to the east and the south, but the usual 'creep back' did not develop and the main weight of the attack continued to fall upon the heavily built-up central area. Of the 512 crews who claimed to have attacked, the evidence of the night camera suggested that 380 had got their bombs within three miles of the aiming point, and daylight reconnaissance showed that very severe destruction had been wrought throughout the target area.<sup>1</sup>

Though the attack on Frankfurt, carried out on the night of 4th October 1943, was somewhat less successful, the daylight reconnaissance photographs showed that heavy damage had been caused in the eastern half of the town which included the industrial area. After a good initial concentration the attack later tended to become more scattered and the night cameras indicated that of the 341

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 31st Oct. 1943.

crews who claimed to have attacked, not more than 170 got their bombs within three miles of the aiming point.<sup>1</sup>

Hanover, which at this time was often the cause of disappointment owing to a number of unsuccessful attacks upon it, had two square miles in its centre devastated in the operation on the night of 8th October. The *H2S* blind marking was extremely accurate and once again the aiming point was brilliantly illuminated for the visual markers. In spite of this, the first four visual markers overshot the aiming point by between two and three and a half miles. Those who followed did better and a good concentration of marking was soon laid within half a mile of the aiming point. The main force crews followed the usual procedure of attacking the first markers which came into view with, in this case, the fortunate result that they were not distracted by those which had overshot. Thereafter, an extremely concentrated attack developed which, at the time, was judged to be among the most successful ever achieved by this, the *Newhaven*, technique. The night photographs suggested that 340 of the 430 crews who claimed to have attacked had got their bombs within three miles of the aiming point.<sup>2</sup>

In the attack on Kassel on the night of 22nd October 1943, the *H2S* blind marking was less successful and most of the flares overshot the aiming point by one and a half to five miles. All the same, at least two sticks of flares were hanging over the aiming point at five minutes before zero hour and these sufficed for the visual markers to identify it and to drop their target indicators with 'extreme accuracy'. Within three minutes, some eighty red markers could be seen burning in a compact group within half a mile of the aiming point. An exceedingly destructive attack followed and the night photographs suggested that 380 of the 444 crews, who claimed to have attacked, had got their bombs within three miles of the aiming point. Subsequent daylight reconnaissance photographs showed that fires were still burning in Kassel seven days after the attack. The central area of the town presented a scene of utter devastation. In the oldest part which embraced the main business and shopping district between the river and Königsplatz, no building was undamaged and few were still standing. Vast industrial damage had also been caused along both sides of the river Fulda and extending into the suburbs.<sup>3</sup> A fire-storm had, in fact, been created in Kassel similar to that which did so much damage in Hamburg.

These four brilliant operations, approximating in their results to the *Oboe*-directed attacks on the Ruhr towns, were by no means unique in this period, but they were not typical of what was generally

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<sup>1</sup> do. 4th Dec. 1943.

<sup>2</sup> do. 6th Dec. 1943.

<sup>3</sup> do. 6th Jan. 1944. See the photographs following p. 174.



achieved by the *H2S Newhaven* technique. A factor determining the result of a *Newhaven* attack which was, except in the case of specially suitable targets like Hamburg, just as important as the performance of *H2S*, was the weather. *H2S* blind marking could not be relied upon to produce accurate results and sky marking of any kind very rarely did so. If, therefore, the visual markers could not identify the aiming point or if the main force crews could not see the ground markers, the attack was almost certain to be dispersed and inaccurate. In each of the four great *Newhaven* successes just mentioned, the weather was most helpful. The visibility in the target areas was generally good and only negligible amounts of cloud were encountered at the crucial times. This was fortunate, but bad luck was the contemporary of good luck. A heavy attack aimed at Munich on the night of 6th September went largely astray because the target indicators were barely visible to the main force through the cloud, especially during the vital opening phase of the operation. The same thing happened on the night of 18th October when Hanover was the target, and an equally disappointing fate befell the first major action of the war against Leipzig on the night of 20th October.<sup>1</sup>

The limitations of *H2S* itself continued, however, to be the principal causes of a number of important failures. In the Hanover attack on the night of 27th September, for example, the *H2S* blind markers failed to get their flares near enough to the aiming point to enable the visual markers to identify it and in consequence the bulk of the bombing attack fell outside the built-up area in open country or upon surrounding villages. Again, on the night of 3rd October an attack aimed at Kassel caused only slight damage to the target area because of a considerable overshoot by the blind markers, which, owing to haze, was not corrected by the visual markers.<sup>2</sup> Nevertheless, and in spite of these and other similar failures, the *H2S Newhaven* technique was responsible for much heavy destruction in several towns far beyond the range of *Oboe*. Indeed, the results were, perhaps, more satisfactory than might have been expected on the basis of the *H2S* operations carried out before and during the period of the Battle of the Ruhr. This was due to the higher serviceability of the equipment, to the increasing experience of the operators and above all to the much larger numbers of aircraft carrying the device.

This increasing availability, use and serviceability of *H2S* was illustrated in the first of three major attacks on Berlin which were carried out on the nights of 23rd August, 31st August and 3rd September 1943. On this occasion, from the total force of 727 aircraft despatched, ninety-four carried *H2S*. Ten of these failed to return

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 14th Nov. 1943, 13th Dec. 1943 and 5th Dec. 1943.

<sup>2</sup> do. 23rd Nov. 1943 and 29th Nov. 1943.

and ten more made abortive sorties, but sixty-four *H2S* crews returned with the report that their equipment had functioned satisfactorily throughout the operation. Nevertheless, the technique which had proved so effective against Hamburg and to a lesser extent against other targets continued to be an almost complete failure against Berlin. Indeed, from the total of 1,719 sorties despatched on these three nights, it appeared, on the evidence of the night cameras, that only twenty-seven had dropped their bombs within three miles of the aiming point. Though this did not mean that the German capital was left unscathed, it did show the continuing intractability of a target which was so large that the *H2S* screen became a blaze of incomprehensible light and which was so heavily defended that attempts to sight the aiming point were more likely to end in blindness from searchlight dazzle or disaster from anti-aircraft fire, than in a visual identification of the target.<sup>1</sup> Moreover, and in spite of *Window*, the cost of these operations was consistently heavy. One hundred and twenty-three bombers, or 7.2 per cent of the force despatched, failed to return and another 114, or 6.8 per cent, were damaged. Berlin remained a scarcely less formidable target than it had been at the beginning of 1943 and in some respects even in 1941, and these three actions, which were only the prelude to the massive and sustained Battle of Berlin, were not a happy augury for Bomber Command.

The tactics followed in each operation were approximately the same. The attacks were opened by *H2S* blind marking followed by backing-up and 'recentring'. Visual marking was not attempted, and though it is likely that some blindly aimed target indicators burst close to the aiming point, especially in the last attack on the night of 3rd September, large numbers of them undershot by several miles and they, in turn, were generally undershot by the backers-up. The 'creep back' of bombing was pronounced on each occasion and particularly so in the second attack on the last night of August, when the bombing eventually extended backwards for thirty miles along the line of approach.

In the first two operations all the bomber groups were called into action, but the pattern of the casualties told what was now becoming an increasingly familiar tale. While the Lancasters bore the brunt of the attack, the Halifaxes, and even more so the Stirlings, bore the brunt of the casualties. On the night of 23rd August the force despatched consisted of 335 Lancasters, 251 Halifaxes, 124 Stirlings and seventeen Mosquitoes. 5.4 per cent of the Lancaster force failed to return, but the corresponding figures for Halifaxes and Stirlings

<sup>1</sup> Daylight photographic reconnaissance showed that considerable damage was caused in the western part of the city. It was heaviest in the Charlottenburg, Schöneberg, Friedenau and Mariendorf districts. O.R.S.(B.C.) Nt. Raid Report, 31st Oct. 1943.

were 8.8 per cent and 12.9 per cent respectively. All the Mosquitoes, which were engaged in route marking, returned safely. In the second attack on the night of 31st August, the force was composed of 331 Lancasters, 176 Halifaxes, 106 Stirlings and nine Mosquitoes. 3.3 per cent of the Lancaster element was missing and the figures for the Halifaxes and Stirlings were 11.4 per cent and 11.3 per cent respectively. Once again all the Mosquitoes returned. In the last attack on the night of 3rd September and apart from the despatch of four Mosquitoes to carry out 'spoof marking' the entire attack was mounted by Lancasters. 6.3 per cent of them failed to return.<sup>1</sup>

The German night fighter force, rallying after the initial chaos caused by *Window* and assisted by the depth of the penetrations which Bomber Command had to make, operated under the running commentary system with great effectiveness and was responsible for the bulk of the British losses. In the first attack on the night of 23rd August, the zero hour was 2345 hours, but already at 2238 hours the German running commentary suggested that Berlin was the probable target. At 2304 hours all night fighters were ordered to Berlin. Returning Bomber Command crews reported seventy-nine interceptions, thirty-one of which had led to combats with night fighters. Twenty-three of these combats occurred within a hundred miles of Berlin and fifteen of them took place over the target itself. Of the thirty-one bombers which were damaged by enemy action it was evident that twenty had sustained their injuries from night fighters. Of the fifty-six bombers which failed to return it was likely that at least thirty-three had been shot down by night fighters. At least twenty of these were probably destroyed over Berlin, but three of them were shot down in the vicinity of route markers laid by Mosquitoes as a guide to the main force and, therefore, also to the German fighters. Flak at the target was not intense and searchlights were used to assist the night fighters more than the anti-aircraft guns. Only eleven of the returning bombers had been hit by flak, which on this night, therefore, did less damage than accidents not due to enemy action. Of the fourteen bombers 'damaged' by these so called 'other causes', four were in fact completely destroyed. Two of them collided over England, the third crashed on take-off and the fourth crashed on landing.<sup>2</sup> The German night fighters achieved their successes in spite of the fact that their effort was drastically curtailed in the later stages of the operation by the prevalence of fog at their bases.

In the second attack on the night of 31st August they came even more effectively into action. Flying from bases as widely separated

<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 23rd Oct. 1943, 29th Oct. 1943 and 31st Oct. 1943.

<sup>2</sup> The remaining ten owed their damage to a take-off accident, excessive stress during evasive action, engine failure, hits by British incendiary bombs (four aircraft), hits by British machine-gun fire (two aircraft) and a collision with a flock of birds.

as Grove in northern Denmark and Dijon in central France, they probably accounted for nearly all the forty-seven Bomber Command aircraft which failed to return. An even higher proportion of these kills than before occurred over Berlin itself and it seemed probable that about thirty bombers were destroyed by fighters while they were over the target. Returning Bomber Command crews reported ninety-eight interceptions which included forty-two combats in the target area, eighteen on the outward route and fifteen on the homeward route. The casualties would probably have been much higher if, as the Germans clearly expected, Bomber Command had returned, as it had done eight nights earlier, by the 'north about' route. The 'south about' return undoubtedly achieved its object on this occasion.

This second attack, like the first, showed that the Germans were relying predominantly upon their fighters. Though thirty of the returning bombers bore flak marks, the barrage at Berlin had been of only moderate intensity and the searchlights had once more been mainly used to help the fighters. Brilliant fighter flares, which were soon to become a familiar and disquieting sight to Bomber Command crews, were also used to assist the 'cat's eye' interceptions.

The success of the night fighters against the all-Lancaster attack on the night of 3rd September was more limited. Even so it seemed likely that ten of the twenty missing bombers had been destroyed by fighters.<sup>1</sup>

Thus, of the 123 bombers which failed to return from these three attacks on Berlin, at least eighty and perhaps more, had fallen to night fighters.<sup>2</sup> Though there could be little doubt that the losses and the incidence of damage would have been even higher in the absence of *Window* and that the bombing would have been even more inaccurate and dispersed in the absence of *H2S*, it was also apparent that these devices had not solved the Berlin problem, any more than in 1942, *Gee* had solved that of Essen. Moreover, the withdrawal of the Halifaxes and Stirlings and the use of the Lancasters alone in the last attack had failed to reduce the casualties below a level which was higher than Bomber Command could afford on a sustained basis. All these issues were about to be put to a further and much more drastic test in the great Battle of Berlin which was now impending, but a consideration of the evidence arising from the three attacks in August and September scarcely provided the grounds for an optimistic expectation as to the outcome.

Even, however, as this, the climax of the area offensive was

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Reports, 23rd, 29th and 31st Oct. 1943.

<sup>2</sup> In *Royal Air Force 1939-1945*, Vol. III, p. 13, it is stated that these raids 'cost' Bomber Command 125 aircraft. The word 'cost' is somewhat ambiguous. In addition to the 123 missing aircraft a further 114 were listed as 'damaged'. Among these there were eleven which were, in fact, totally destroyed. Thus, the ultimate 'cost' of the attacks may be said to have been 134 aircraft.

approaching, there were other possibilities which were gradually being opened to Bomber Command. On the night of 3rd November 1943 a force of 589 aircraft was despatched to Düsseldorf. The major object of the operation was to inflict further devastation in the centre of the town and the conventional tactics of *Oboe* ground marking followed by mixed incendiary and high-explosive area attack were followed. In this force there were, however, thirty-eight Lancaster II's of 3 and 6 Groups which had been equipped with the new radar aid known as *G-H*.<sup>1</sup> During the previous month *G-H*-equipped Mosquitoes had been operating over Germany, but this was the first time that the device had been used by heavy bombers in a major attack.<sup>2</sup> The crews were given as a special and precise aiming point the *Mannesmannröhrenwerke* which lay in the northern outskirts of Düsseldorf. Five of them made abortive sorties and two failed to return. In sixteen other cases, the *G-H* equipment failed and these aircraft followed the main force in the area attack. The remaining fifteen crews found that their equipment was working satisfactorily and they used it to carry out their orders. Though very little damage was done to the factory, the performance of *G-H* was seen to be most promising and another important stage in the development of precision-bombing techniques had been reached.<sup>3</sup>

It is true, of course, that much of the improvement which had taken place in the technique of area bombing was due to the increasing accuracy with which the target indicators could be dropped. In this sense area bombing was a form of precision attack but, as we have often seen, a concentration of markers within a mile of the aiming point in the centre of a large city could, and often did, lead to a highly destructive attack. If, however, the target was an individual building or group of buildings as in the case of the Skoda works, the research station at Peenemünde or the *Mannesmannröhrenwerke* at Düsseldorf, a much greater accuracy of aim was required. There was, thus, a difference in degree between the requirements of area and precision bombing and there was a difference in nature between the techniques which they demanded.

The development of precision bombing had, in fact, become a

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<sup>1</sup> Thirty-eight is the number given both in the O.R.S.(B.C.) Night Raid Report and in the Bomber Cmd. O.R.B. An O.R.S.(B.C.) Report of 7th November 1943, however, gives the number as thirty-six. The Lancaster II was similar to the Marks I and III except that in place of the four Merlins which powered the latter, it was equipped with four Hercules engines.

<sup>2</sup> In *Royal Air Force 1939-1945*, Vol. III, p. 14, it is stated that the Düsseldorf attack was the first in which *G-H* was used. Actually the first use was on the night of 4th October, when a *G-H* Mosquito was despatched to Aachen. On that occasion the equipment failed, but a second and more successful attempt was made against the same target three nights later. O.R.S.(B.C.) Nt. Raid Reports, 4th and 3rd Dec. 1943.

<sup>3</sup> O.R.S.(B.C.) Nt. Raid Report, 6th Jan. 1944, and O.R.S.(B.C.) Report, 7th Nov. 1943.

highly specialised process which necessitated the provision of particular training and particular equipment. It had even led to the formation of a special and *élite* squadron. The direct outcome of these developments was the destruction by highly rehearsed techniques of such minute and robust objectives as the Möhne dam in a night attack and later, the German battleship *Tirpitz* in a day attack. But the results were not confined to these and other almost equally spectacular achievements which were necessarily reserved for the few who possessed the experience, the skill and the courage to attempt them. They also pointed the way to new pathfinding techniques by which at least something of the extreme accuracy of the few could be communicated to the less skilful and less highly equipped many. It was in this way that Bomber Command had already been enabled to strike a heavy and by no means ineffective blow at the Peenemünde station and it was also in this way, in association with yet other factors, that the Command was presently to be able to strike at key points in the French railway system and later still at German oil plants and communications targets which, as will be recalled, had been so highly favoured by the Air Staff at the beginning of the war.

Thus, even as the great area Battle of Berlin was opening, the precision techniques being evolved in 617 Squadron and elsewhere were setting in motion a revolution which, in the course of 1944, was to transform the operational capacity of Bomber Command and which was, in fact, to make the seemingly unrealistic dreams of 1939 and 1940 come true. It is, therefore, these matters that must now be considered, before proceeding to the Battle of Berlin.

#### 4. The Dams raid and the development of precision bombing at night in 1943

On the night of 16th May 1943, the recently formed 617 Squadron went into action for the first time. The Möhne and Eder dams were breached to their foundations in the most precise bombing attack ever delivered and a feat of arms which has never been excelled was performed. 617 Squadron instantly leapt from the mysterious secrecy which had veiled its origins to a fame which was the foremost in Bomber Command. Afterwards 617 Squadron was forged into the spearhead of the bombing offensive. By its deeds, as also by its example, this single Squadron changed the operational possibilities which were open to the force.<sup>1</sup>

This was a gradual process, but its foundations lay in the famous dams raid of 16th May for which specific purpose 617 Squadron had been formed. It is here that the true significance of the breaching of the Möhne and Eder dams is to be found, for the effects of this brilliant achievement upon the German war machine were not, in themselves, of fundamental importance nor even seriously damaging. The sudden catastrophe which inundated the areas lying below the two dams was local, temporary and largely agricultural. The result might have been different if the whole aim, which included the breaching not only of the Möhne and Eder, but also the Sorpe, Lister and Schwelme dams, could have been achieved, but this was beyond the strength of the finest squadron which Bomber Command ever sent out. Though it took only eight bombs to breach the two dams, there were not enough aircraft to complete the operation after the German defences and the hazards of low-level attack had taken their toll. Nor, in the case of the Sorpe dam, was a suitable bomb available.

This failure to provide a larger force for the dams raid which might have made possible a more damaging blow at the Ruhr valley may appear to have been a serious blunder on the part of the Air Staff, but there is much to explain why it occurred. The bombs which broke the Möhne and Eder dams were by no means conventional. Enormous energy had to be released in order to shift a concrete-encased wall which, in the case of the Möhne dam, was more than a hundred feet thick at its base. No ordinary bomb or torpedo could do it and for that reason the plans for attacking the dam,

<sup>1</sup> The dams raid has been described by Wing Commander Gibson, V.C., in *Enemy Coast Ahead* (1946), by W. J. Lawrence in *No. 5 Bomber Group R.A.F.* and by Paul Brickhill in *The Dam Busters* (1951). The latter book is especially valuable and sketches the history of 617 Squadron from its formation until the end of the war in Europe. It is, however, marred by a large number of errors of detail.

which were considered before the war, had been shelved. It is, perhaps, hardly surprising that the designer, Mr. B. N. Wallis, had much difficulty in enlisting official belief in his bomb and that there was a certain reluctance to withdraw Lancasters from the line for the drastic modifications which were necessary if it was to be carried. Moreover, the bomb, even if it did work, would have to be aimed with such extreme accuracy and from such a low altitude that it was possible to doubt whether its use against a target in Germany was a feasible operation of war.

All these considerations tended to delay the advancement of the project, or at least to qualify the support which it received. Sir Arthur Harris was much disturbed. He was not convinced that the principle of the bomb's working was sound and he opposed the diversion of Lancasters which he feared its development might require. Writing to Sir Charles Portal on 18th February 1943, he reported that 'all sorts of enthusiasts and panacea-mongers' were 'careering' round the Ministry of Aircraft Production suggesting that about thirty Lancasters should be taken off the line and modified to carry a new and revolutionary bomb which, according to Sir Arthur Harris, existed 'only within the imaginations of those who conceived it'. He was 'prepared to bet' that this bomb was 'just about the maddest proposition as a weapon that we have yet come across'. He could not 'too strongly deprecate any diversion of Lancasters at this critical moment in our affairs on the assumption that some entirely new weapon, totally untried, is going to be a success'. Sir Arthur Harris also observed that 'attempt after attempt' had been made to execute low-level attacks with heavy bombers and that 'almost without exception' they had proved to be 'costly failures'.<sup>1</sup>

Sir Arthur Harris, after much experience, always tended to look for the thin end of the wedge and Sir Charles Portal was not entirely unsympathetic to his point of view. Though the latter did not feel inclined to refuse Air Staff interest in the new bomb, he assured the Commander-in-Chief that he would not allow 'more than three of your precious Lancasters to be diverted' until tests had shown that the bomb really would do what was claimed for it.<sup>2</sup> Already by this time, however, another consideration had introduced an element of urgency.

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<sup>1</sup> Letter Harris to Portal, 18th Feb. 1943. Sir Arthur Harris did not object to the 'enthusiasts being given one aeroplane and told to go away and play while we get on with the war'. In *Bomber Offensive* (p. 157) Sir Arthur Harris writes of the dams bomb, 'It was one of the weapons designed for the Command outside the official Ministry of Aircraft Production and Air Ministry organisation which produced the greater part of our armament; it could be taken almost as a rule that such weapons were successful, while those produced by the official organisation were too often failures.' This confidence in private enterprise inventions does not, however, appear to have inspired Sir Arthur Harris in February 1943.

<sup>2</sup> Letter Portal to Harris, 19th Feb. 1943.



If the attack on the dams was to produce the best results it would have to be carried out when the water levels were approximately at their highest or, in other words, before the end of May. Since, however, a moonlight night was required for the operation this meant that, if it was to be mounted in 1943 at all, it would have to take place in the middle of May. At the time when Sir Charles Portal was promising Sir Arthur Harris that he would not jump to conclusions, there were, therefore, rather less than three months in which to prove the bomb and produce it in adequate quantities, modify the aircraft and train the crews. This was not a simple proposition, but there were also other complications.

The bomb which Sir Arthur Harris had actually named in his letter of 18th February, was not, in fact, intended to be carried by Lancasters, but by Mosquitoes. Nor was it designed to breach the Möhne dam, but to sink the German battleship *Tirpitz*. There were, indeed, two entirely different projects, but though the *Tirpitz* bomb was much smaller than that intended for the dams, it worked on a strictly similar principle and it was obvious that if either one or the other was used independently it might alert the Germans as to the possibility of the other. Thus, for example, an attack by this means on the *Tirpitz* might result in a strengthening of the defences at the Möhne dam.<sup>1</sup>

The Air Staff were fully aware of this possibility and they recognised that the best solution would be to launch both the attacks simultaneously. All the same, they felt that the dams raid should in no circumstances be delayed beyond the high-water and full-moon period in May. If, however, the *Tirpitz* plan was the first to mature, it should, they thought, be delayed until the dams plan was also ready. This was not mere prejudice. The dams raid was to take place at night, but the *Tirpitz* attack, owing to the peculiar difficulty of sighting the target, was planned as a daylight operation. The Air Staff, therefore, believed that the dams raid was less likely than the *Tirpitz* attack to compromise the weapon. Moreover, they knew that the operational prospects of a successful attack on the dams were much better than those which existed in the case of the *Tirpitz*. In the former, the defences were light or non-existent and the attack would be at night. In the latter, the defences were extremely heavy and the attack would be in daylight. Though the Mosquito performance seemed to offer a chance of success, the Air Staff recognised that this chance would be 'problematical and, in any case, costly.'

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<sup>1</sup> In his letter of 18th February, Sir Arthur Harris seems to have confused the two bombs. The weapon he actually named was the Mosquito bomb, but the aircraft which he said was going to carry it was the Lancaster. In his reply, Sir Charles Portal named both the Mosquito and Lancaster bombs and showed that he regarded them as parts of the same development project.

If the dams raid had to wait on the *Tirpitz* attack, it was more than possible that it would never take place.<sup>1</sup> The Admiralty, however, were not easily convinced of the logic of this reasoning, and while the ultimate verdict was left to the Chiefs of Staff, both plans had to be pressed forward.

For this purpose, the Chiefs of Staff appointed, on 8th March 1943, a special committee whose chairman, it was eventually agreed, should be Air Marshal Bottomley.<sup>2</sup> On 1st April 1943, Air Marshal Bottomley, on behalf of the Committee, reported to the Chiefs of Staff and one of his conclusions was of fundamental importance to the dams raid which was to take place in just over seven weeks. He explained that orders had been given for the modification of twenty Lancasters to carry the special 'Wallis' bomb and he said that these should be adequate to deal with the dams. He added that nothing would be gained by ordering a larger number, because, after the initial attacks, which he expected might be spread over two or three days,<sup>3</sup> the Germans would be able to take steps which would make any further attacks 'completely ineffective'.<sup>4</sup>

This was a fateful, and as it turned out, a seriously restricting decision. Its consequences might, however, have been less severe if it had been possible to correct another error of judgment which was now clearly pointed out.

This concerned the relative significance of the various dams and their relationship to each other. The Air Staff seems initially to have been under the impression that the destruction of the Möhne dam alone would result in a major catastrophe for the Germans. Similarly, the Air Staff believed that the Eder dam was of almost equal importance. Now, however, at the beginning of April, the Ministry of Economic Warfare, as is more fully explained in Chapter XI,<sup>5</sup> pointed out that the destruction of the Möhne dam alone was likely to produce only limited results and that the Sorpe dam was of much greater importance than the Eder.

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<sup>1</sup> Air Staff Appreciation, 28th Feb. 1943. In the event, the special bomb involving such a low approach was never used against the *Tirpitz*. 618 (Mosquito) Squadron, which had been prepared to carry it, was eventually embarked on the escort carriers H.M.S. *Fencer* and H.M.S. *Striker* and on 31st Oct. 1944 sailed for the Far East. On 5th May 1945, however, H.Q. Air Cmd. South East Asia informed the Air Ministry that, in view of the restrictions placed upon the use of the weapon, there were unlikely to be any suitable targets for the squadron. Meanwhile, 617 and 9 Squadrons had finally disposed of the *Tirpitz* in a high-level attack.

<sup>2</sup> C.O.S. Mtg., 8th March 1943. The Admiralty had attempted to gain control of the committee. While Sir Charles Portal was not attending, Sir Dudley Pound secured the appointment of Rear-Admiral Renouf to the chair. After a protest from Sir Charles Portal he later withdrew and accepted the appointment of Air Marshal Bottomley. Letters Portal to Pound, 10th March 1943, and Pound to Portal, 11th March 1943.

<sup>3</sup> Presumably he meant nights.

<sup>4</sup> Memo. Bottomley for C.O.S., 1st April 1943. (Circulated on 3rd April 1943.)

<sup>5</sup> See pp. 288 ff.

This led Air Marshal Bottomley to suggest that the plan should be changed. Simultaneous attacks, he suggested, ought to be made on the Möhne and Sorpe dams and these should be followed, only if circumstances permitted, by an attack on the Eder dam.<sup>1</sup> The fact remained, however, that the bomb now being developed was suitable for the Möhne and Eder dams and unsuitable for the Sorpe.

At this stage it was, however, by no means certain that any of the dams could be attacked. Further trials of the bomb showed that it had an obstinate tendency to break up on impact with the water. The squadron which was destined to carry it was only just beginning to assemble at Scampton under the leadership of Wing Commander Gibson, and it had yet to be demonstrated that they could develop the necessary flying skill to make the operation possible. Moreover, the *Tirpitz* bomb was not making good progress, and if the dams raid was to take place in the middle of May it was becoming increasingly doubtful whether it would be possible to attack the *Tirpitz* at the same time. By 13th May this doubt had become a certainty, but the Vice-Chief of Naval Staff steadfastly refused to discuss with the Vice-Chief of the Air Staff the possibility of launching the dams attack independently.

Nevertheless, on 14th May 1943, this deadlock was broken and after an appeal from Sir Douglas Evill, Vice-Chief of the Air Staff, to Sir Charles Portal, the Chiefs of Staff in Washington authorised their deputies in London to proceed at once with the dams raid and not to wait until the *Tirpitz* plan matured.<sup>2</sup> This, owing to the remarkable fact that both the bomb and the operational technique by which it was to be dropped, had been perfected, was now possible, and on 15th May 1943, Wing Commander Gibson started briefing his crews for what was to be their ordeal and their triumph.

The nineteen crews who stood ready with their modified Lancasters and special bombs, were divided into three waves.<sup>3</sup> The first, consisting of nine aircraft, was to operate under the direct control of Wing Commander Gibson, and it was to attack first the Möhne, then the Eder and finally, if it had any bombs left, the Sorpe dam. The second wave, consisting of five aircraft, was to attack the Sorpe dam and the third wave, also consisting of five aircraft, was to act as a mobile reserve. It was to remain under the immediate control of 5 Group Headquarters which would direct it to follow up the attacks of the first two waves or to the Lister and Schwelme dams as might be appropriate.

<sup>1</sup> Min. Bottomley to Portal, 5th April 1943.

<sup>2</sup> Min. by Evill, 13th May 1943. The Vice-Chiefs of Staff were acting in London for the Chiefs of Staff since the latter were now in Washington for the *Trident* Conference. Evill to Portal, 14th May 1943, and C.O.S. (Washington) to C.O.S. Committee (London), 14th May 1943.

<sup>3</sup> Twenty-one crews had been trained but two could not operate owing to illness.

All the waves were to approach by their various routes at the lowest possible altitude and were in no case to exceed 1,500 feet.<sup>1</sup> By this means it was intended to deny the Germans their usual radar early warning and also to make it difficult or impossible for the German fighters to attack. As each aircraft of the first wave reached the Möhne dam its captain was to make contact with the leader, Wing Commander Gibson, by radio telephone. Wing Commander Gibson was then to attack and subsequently to direct further attacks until the dam was breached. He was then to fly with the remaining aircraft and repeat the same procedure at the Eder dam. In both these cases the attacks were to be delivered from the precise height of sixty feet and at the exact speed of 220 miles per hour. The Sorpe dam was to be attacked by the second wave and any aircraft of the first wave not required at the Möhne or the Eder, from the lowest practicable height and at a speed of 180 miles per hour. The results of each attack were to be instantly signalled to 5 Group Headquarters so that orders could be sent to the third wave.<sup>2</sup>

The fact that such orders could be given is illustrative of the extraordinary advance in bombing technique which had been brought about by the formation and 'working up' of 617 Squadron. This, as has already been suggested, was, in view of its later implications, the real significance of the dams raid. The need to carry out the whole operation and especially the actual attacks at an exceptionally low level, the need to aim the bombs with extreme precision and the need for the Squadron Commander to be able to command in the air at the crucial moments were the three fundamental requirements which accounted for the particular operational and technical developments which had taken place while, by the process of trial and error, 617 Squadron was 'working up'.

These developments were no less remarkable than the production of the bomb itself, but they were more important because the bomb had only a single night of triumph, whereas the Squadron endured and its tactics matured. The results are the outstanding example in the history of Bomber Command of what can be achieved when scientific and technical effort is directly applied to the needs, and immediately tested by the crews of a particular squadron.<sup>3</sup>

From the outset, the crews of 617 Squadron had been constantly rehearsed in low-level night flying by the light, or simulated light, of the moon. By the middle of May and without a fatal accident, they had all become proficient at this difficult and somewhat

<sup>1</sup> See map 9.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 30th Aug. 1943.

<sup>3</sup> Something similar had occurred before the war when, at the instigation of Sir Henry Tizard and with the full support of Sir Cyril Newall, a Fighter Command Squadron was made available for the development of radar interception techniques.

hazardous occupation, but this was less than half the battle. In the case of the Möhne and Eder dams, the bomb had to be dropped from precisely sixty feet. In all cases it had to be aimed with a hitherto unimagined accuracy. If the bomb was dropped from too high it tended to break up on impact with the water. If it was dropped too soon its force would be spent before it reached the target. If it was dropped too late it might strike the dam too hard and detonate on the surface. This would be unlikely to damage the target but almost certain to destroy the aircraft. The difference between all these possibilities was one of only a few yards, but a Lancaster could not be flown at exactly sixty feet either by judgment or the standard altimeter, nor could a bomb be aimed with anything like the necessary precision by any of the standard bomb-sights.

After various flying experiments, both problems were solved by the production of two remarkably simple devices. It was found that two spotlights fixed in the belly of the aircraft and set to intersect on the water when it was at sixty feet answered the first and that an uncomplicated wooden range-finder answered the second. With this equipment, and by making the bomb-aimer responsible for range, the engineer for speed, the navigator for height and the pilot for line, it was found by trials that the explosives could be deposited with almost the accuracy which would be achieved by military demolition engineers.

It will, however, have been noticed that the plan of attack also depended upon ready communication both between the individual aircraft and between the aircraft and 5 Group Headquarters. An elaborate W/T procedure ensured the latter with much greater certainty than in the very early days of the war when the same need had existed for the daylight formations of Wellingtons on their hunts for the German fleet. In those days, this indirect method had also been the only means of wireless contact between individual aircraft. It would have been less than adequate for the control which Wing Commander Gibson proposed to exercise. Nor, owing to interference, was the standard radio telephone satisfactory. Very high frequency radio telephones of the type used in Fighter Command were, therefore, hastily installed and these resulted in the establishment of instant contact in plain language between each of the aircraft.

External differences such as the absence of bomb doors and mid-upper turrets were, therefore, not the only distinguishing marks of the 617 Squadron Lancasters. Nearly all their special equipment had been devised or adapted in the light of the revealed and particular needs of the squadron and much of it had never before been used by Bomber Command. Though they made the operation possible these devices did not by any means guarantee its success. This, of course, ultimately depended upon the crews themselves. In this respect

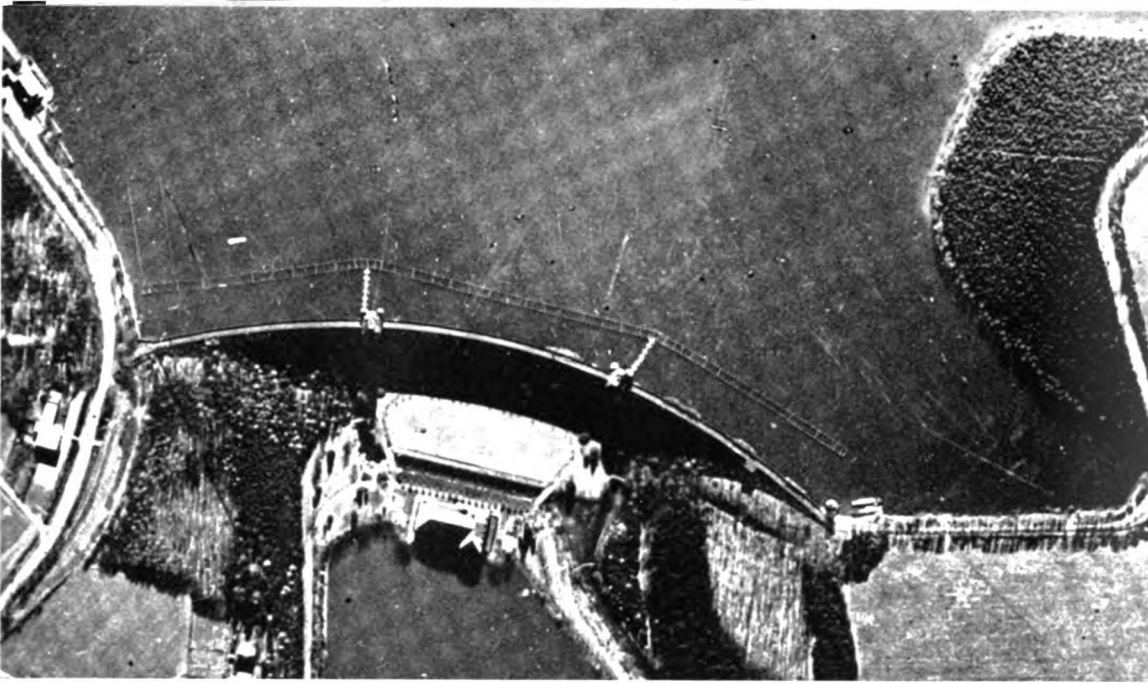


17. Kassel after the attack on the night of 22nd October 1943.

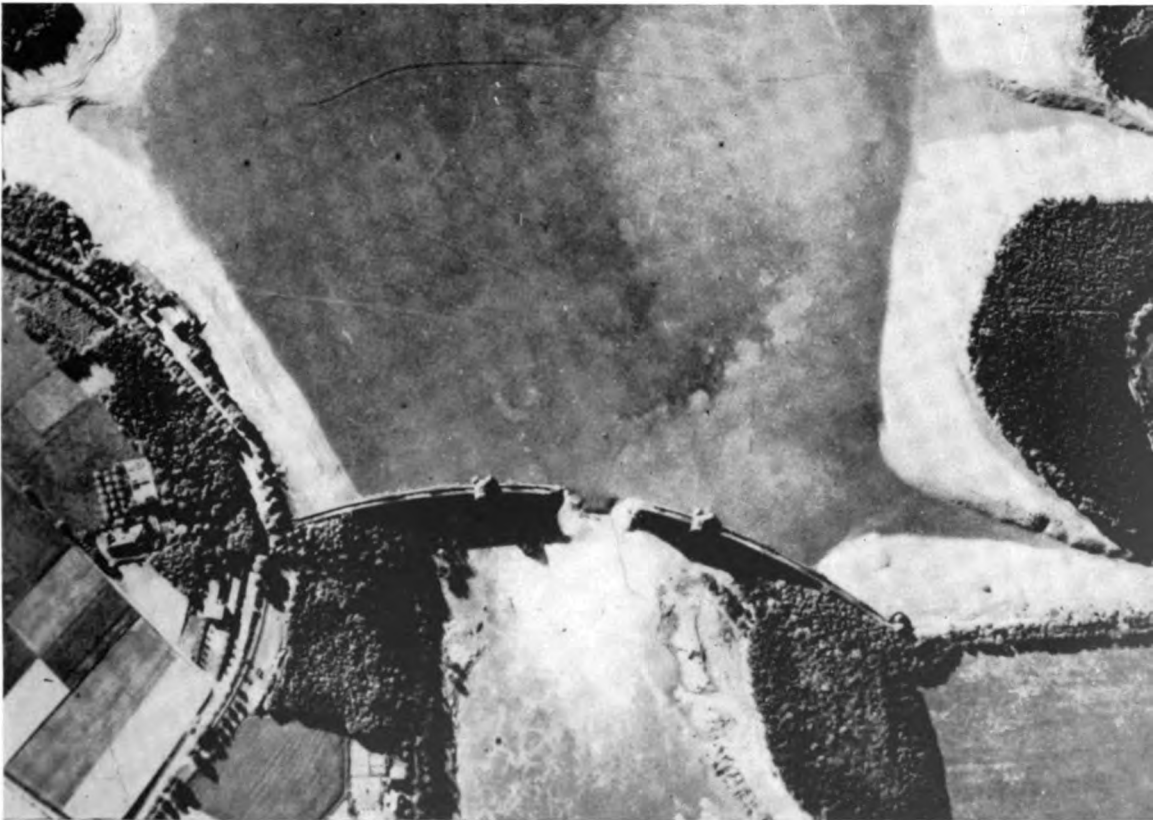


18. Kassel after the attack on the night of 22nd October 1943. *German photograph.*





19. The Möhne Dam before attack.



20. The Möhne Dam after attack on the night of 16th May 1943.



21. Wing Commander  
Guy Gibson, v.c.,  
D.S.O. and bar, D.F.C.  
and bar.



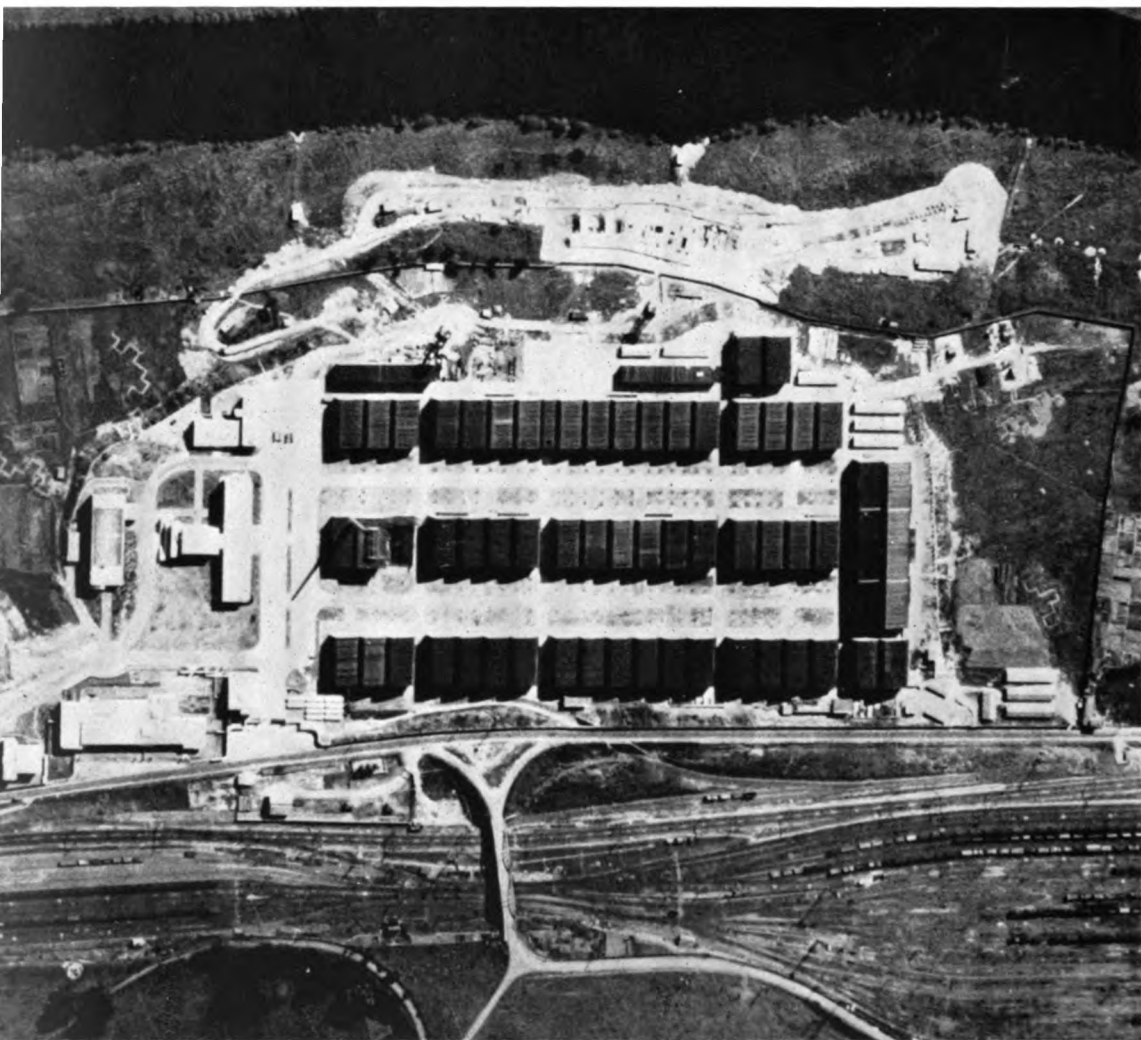
22. Wing Commander Gibson and his crew. Left to right are: Ft. Lieut.  
Trevor Roper, Sgt. Pulford, Ft. Sgt. Deering, Pilot Officer Spafford, Ft.  
Lieut. Hutchison, Wing Commander Gibson and Pilot Officer Taerum.



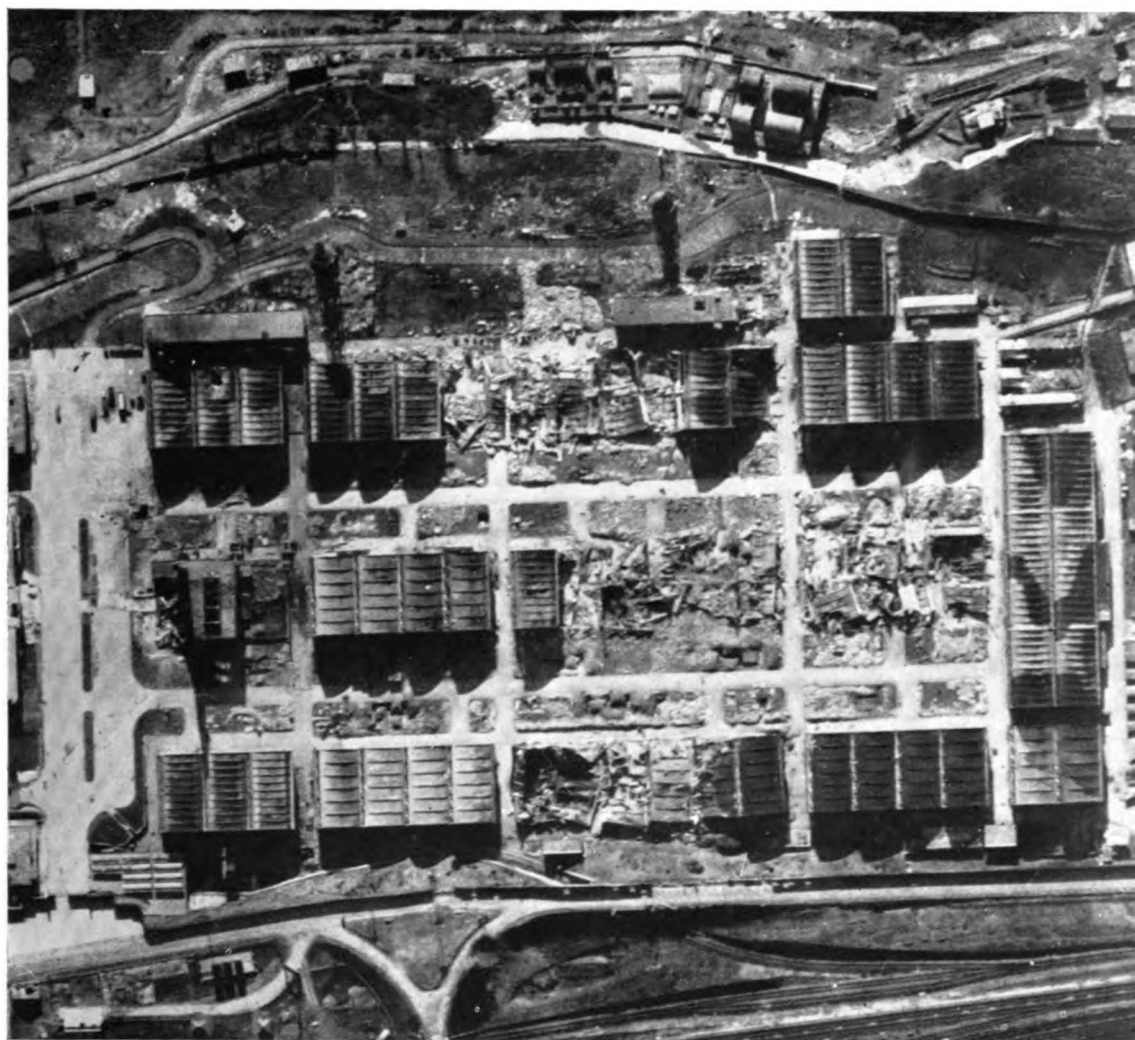
23. Squadron Leader  
H. B. Martin, D.S.O.  
and bar, D.F.C. and  
two bars, A.F.C.



24. Group Captain  
G. L. Cheshire, V.C.,  
D.S.O. and two bars,  
D.F.C.



25. The Gnome and Rhône works, Limoges, before attack.



26. The Gnome and Rhône works after the attack on the night of 8th February 1944.



27. Berlin on 8th March 1944.

28. Berlin, August 1943. *German photograph.*



also, as in that of equipment, 617 Squadron had enjoyed special privileges.

Sir Arthur Harris had decided that the squadron should be formed in 5 Group and he had given instructions that, as far as possible, it should be recruited from among those who had completed, or nearly completed, two tours of bomber operations in ordinary Squadrons.<sup>1</sup> Since it was rare to survive two tours of operations and still rarer to embark on a third tour, this meant that the crews of 617 Squadron were among the most experienced, the most skilful and the most lucky in Bomber Command. Wing Commander Gibson, already a famous figure and now about to become a legendary one, was the most distinguished member of the squadron. He had been operating in bombers and night fighters since the beginning of the war and he had only recently completed a tour of operations as commanding officer of 106 Squadron. He had, however, succeeded in surrounding himself at Scampton with a number of others who were hardly likely to disappoint his hopes. Outstanding among these was Flight Lieutenant H. B. Martin, who had already established himself as a pioneer of low-level tactics in Bomber Command. From the outset 617 Squadron was a *corps d'élite* and visits to it, before the great attack, by the Group Commander, Air Vice-Marshal Cochrane, the first Marshal of the Royal Air Force, Lord Trenchard and the Commander-in-Chief, Sir Arthur Harris, showed that the fact was recognised.<sup>2</sup>

In the Royal Air Force there had always been a prejudice against the official recognition of 'ace' pilots and 'crack' squadrons and this, as will be recalled, had caused difficulty when the creation of the Pathfinder Force was under discussion. Nevertheless, whether officially or not, 617 was a 'crack' squadron and most of its pilots would, in other air forces, have been described as 'aces'.<sup>3</sup> The vindication of this breach with tradition was now, however, at hand.

The dams raid began just before half-past nine on the night of 16th May when a Lancaster of the second wave took off from Scampton. It was closely followed by three more, and these four crews set course for what was to be an ill-fated attempt to reach the Sorpe dam. They went without their leader, Flight Lieutenant J. C. McCarthy, who had been delayed and could not get airborne until half an hour later.<sup>4</sup> Meanwhile, Wing Commander Gibson had led the first wave of nine Lancasters into the air and was on the way

<sup>1</sup> Memo. Bomber Cmd. to 5 Group, 17th April 1943. See also *The Dam Busters*, which contains an excellent description of the origins and early training of the Squadron.

<sup>2</sup> O.R.B. (617 Sqdn.) 30th April, 5th and 6th May 1943.

<sup>3</sup> 617 Squadron, unlike the P.F.F., was not founded with special rank and badge privileges.

<sup>4</sup> Flight Lieutenant McCarthy, though serving in the R.A.F., was an American citizen.

to the Möhne dam. The five aircraft of the mobile reserve took off about three hours later and so the whole available strength of 617 Squadron was committed to battle.

In the Sorpe wave, one of the aircraft struck the Zuider Zee east of Texel and, having had its bomb stripped off, was fortunate in being able to return to England. Another was damaged by flak at Vlieland and had its 'intercom' destroyed. It also had to return to England. The other two disappeared without trace, and of this force, only Flight Lieutenant McCarthy's aircraft following behind remained. Such were the hazards of a low-level approach towards the Ruhr. On their more southerly route, the crews of the Möhne wave were more fortunate, and at the target Wing Commander Gibson was able, by means of the radio telephone, to muster eight of his force. The ninth had been shot down on the way.

While his comrades waited and watched, Wing Commander Gibson settled his Lancaster at sixty feet over the Möhne lake and flew straight at the dam. Passing unhurt through the cannon fire which came from the target itself and from neighbouring batteries, his bomb aimer released the first bomb which fell accurately, worked properly and blew up correctly. The dam, however, did not breach, and Wing Commander Gibson called upon Flight Lieutenant J. V. Hopgood to deliver the second attack. As his Lancaster approached at sixty feet, it was hit by cannon fire and one of the engines burst into flames. The bomb overshot, struck the parapet of the dam and detonated on the surface. The aircraft flew on for a few minutes climbing fast and then crashed in flames.<sup>1</sup> Wing Commander Gibson now asked Flight Lieutenant Martin to attack, and as he did so, he once again turned his own Lancaster towards the dam in an attempt to divide the fire. Nonetheless, Flight Lieutenant Martin's Lancaster was hit. One of his petrol tanks was shattered, his ailerons were damaged and his bomb fell about twenty yards short. Even so, Flight Lieutenant Martin tried to draw the fire off Squadron Leader H. M. Young's aircraft as it approached to make the fourth attack, which appeared to be extremely accurate. Still, however, the dam did not breach and Flight Lieutenant D. J. H. Maltby was called upon to make the fifth attack. Once again the bomb seemed to find its mark, but once again, as the spray subsided, the dam appeared to be intact. Indeed, Wing Commander Gibson had already ordered the sixth attack when the dam suddenly gave way and released a flood. The news was instantly signalled to 5 Group Headquarters and Wing Commander Gibson, accompanied by the three aircraft which still

<sup>1</sup> The bomb aimer, Flight Sergeant J. W. Fraser, was later reported to be a prisoner of war and was repatriated after the war. Another member of the crew, Pilot Officer A. F. Burcher, who was then serving with the R.A.A.F., also escaped and subsequently joined the R.A.F.



had bombs and by Squadron Leader Young who was the deputy leader, set course for the Eder dam.

This was not easy to find as fog was piling up in the valley, but Wing Commander Gibson eventually marshalled his remaining force, once again by means of the radio telephone. There were no defences here, but the approach, owing to some nearby hills, was exceedingly difficult, and after Flight Lieutenant D. J. Shannon had made a number of unsuccessful runs, Wing Commander Gibson asked Squadron Leader Maudslay to attempt the task. He too made some unsuccessful runs, but at last his two spotlights intersected and could be seen skimming the water on the approach to the dam. Also, by the light of the moon, some object could be seen hanging beneath the aircraft. The bomb overshot, struck the parapet of the dam and detonated at once. Though Squadron Leader Maudslay's voice was momentarily and faintly heard, his aircraft must have been blown up in the explosion. Flight Lieutenant Shannon now returned to the attack and, at the second attempt, made a successful run. His bomb fell accurately but the dam remained and the last aircraft had to be called upon. This was flown by Pilot Officer L. G. Knight who, like the others, made many unsuccessful attempts to gain the correct height for the approach. He consulted Flight Lieutenant Shannon by radio telephone and then made the attack which brought the dam down and released a second flood.

The news of this second success was signalled to 5 Group Headquarters and it was soon known, even as far away as Washington, that the effort of the first wave had been crowned with a glorious victory. This effort was now, however, expended and Wing Commander Gibson had no more aircraft with which to attack the third target, the Sorpe dam. All that he and his surviving companions could now do was to regain their base. On the way, having accompanied his squadron commander on a final inspection of the Möhne dam, and after all that was going to be accomplished had been accomplished, Squadron Leader Young was shot down.

Meanwhile, Flight Lieutenant McCarthy, pursuing his lone struggle, had reached the Sorpe dam. Like the Eder, it was difficult to find in the thickening mist and, also like the Eder, it was difficult to approach because of hills on the bombing run. Flight Lieutenant McCarthy, nevertheless, pressed home his attack and when, at a quarter to one in the morning, his bomb detonated the earth which encrusted the concrete core of the dam crumbled along part of the crest. Three of the reserve aircraft, which had taken off about forty-five minutes earlier, were directed by 5 Group Headquarters to follow up this beginning, but only one of them, flown by Flight Sergeant K. W. Brown, succeeded in doing so and this, the second attack, was not sufficient to bring the dam down. Of the other two



aircraft one disappeared without trace and the other was unable to find its target. The remaining two Lancasters of the reserve wave were ordered respectively to the Lister and Schwelme dams. The latter was attacked without apparent effect by Flight Sergeant W. C. Townsend, but the other Lancaster, after acknowledging its diversion to the Lister dam, joined those which disappeared without trace.<sup>1</sup>

Thus, though the operation did not achieve complete success, a most brilliant victory was won and an entirely new standard of bombing both in accuracy and in destructiveness was established.<sup>2</sup> From the point of view of the Squadron, however, this victory had been painfully expensive. Of the nineteen Lancasters which had set out with their 133 men, eight did not return.<sup>3</sup> Five had crashed, or been shot down, on the way to their targets. Two had been destroyed while delivering their attacks and another had been shot down on the way home. Two more had been so badly damaged that they had to abandon their missions. The incidence of misfortune had fallen most heavily upon those who tried to reach the Sorpe dam. Success rested only with those who flew with their squadron commander in the first wave. For his deeds on this famous night Wing Commander Gibson was awarded the Victoria Cross and thirty-three other members of the squadron were also decorated.

Sir Arthur Harris' belief that a low-level operation with heavy bombers would be costly had been confirmed, but his original expectation that the bomb would not work had been belied by the breaching of the two dams. The lessons of a costly failure are by no means always, at any rate, immediately, self-evident, but those of a costly success, albeit from the purely operational point of view, are even more obscure. Indeed, it might be supposed that the lesson of the dams raid was substantially the same as that provided by the daylight attack on the M.A.N. Works at Augsburg which had been carried out a year earlier. Herein lay the dilemma which confronted those who now had to decide upon the future of 617 Squadron and so, as to a large extent it was to prove, upon the future of precision attack in Bomber Command.

Moreover, the problem was aggravated by the particular and severe handicaps under which 617 Squadron was found to be labouring on the morrow of its achievement. Nearly half of its

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<sup>1</sup> The foregoing is based upon O.R.B. (617 Sqdn.) 16/17th May 1943, O.R.S.(B.C.) Nt. Raid Report, 30th Aug. 1943, and also upon the published accounts given in *Enemy Coast Ahead*, *The Dam Busters* and *No. 5 Bomber Group R.A.F.*

<sup>2</sup> For an illustration of the success at the Möhne dam see the photographs following p. 174.

<sup>3</sup> The normal crew of a Lancaster was seven, but in the dams raid, for which mid-upper turrets were removed, front gunners were carried so that there were still seven men in each aircraft.

specially trained crews had been lost in a single night. The squadron was about to lose its great commander who was inevitably and rightly ordered to another sphere and, for a time, another hemisphere. Its aircraft and its surviving crews were adapted for a specialist task which, having been undertaken, could scarcely be repeated, at any rate while the Germans were on the alert at their dams. It was difficult to see how the squadron could be reinforced with men as good as those it had lost, and even if it could be, it was difficult to see how it could be employed without being annihilated.<sup>1</sup> It seemed that 617 Squadron would either decline to the level of an ordinary squadron or even be disbanded.

Sir Arthur Harris, however, had other ideas. The value of the new squadron had, he told his Group Commanders on 3rd June 1943, been fully demonstrated by the breaching of the dams. 'It is my intention', he announced, 'to keep this squadron for the performance of similar tasks in the future'. This was a decision of far-reaching importance and it was taken by Sir Arthur Harris despite his notorious dislike of *corps d'élite* and his often expressed confidence in the policy of general area attack. Though it may not have been possible to foresee it, it was this decision above all others which eventually was to result in a feasible solution of the problem of precision bombing.

Meanwhile, it did not solve any of the immediate problems confronting 617 Squadron. It did not, for instance, show how a technique of precision bombing could be evolved without incurring prohibitive casualties. Nevertheless, it did mean that 617 Squadron was not only to remain in being but that it was to remain as a *corps d'élite* designed for a specialist role. It, therefore, also meant that the problems of precision attack were to be further explored by the best crews which could be found in Bomber Command working in conjunction, as they had done before the dams raid, with the resources of the scientists and technicians. Sir Arthur Harris made it quite clear that 617 Squadron was not to become a part of the main force.<sup>2</sup> Thus, Wing Commander Gibson's supreme feat was to have a more enduring

<sup>1</sup> Air Vice-Marshal Cochrane informed Sir Arthur Harris on 2nd June 1943 that a fortnight's endeavour to reinforce 617 Squadron had ended in failure. In 5 Group, he said, only two crews suitable for the Squadron could be found and the other Group Commanders had told him that, between them, they could find no crews at all for 617 Squadron. The difficulty was that after two tours of operations with the main force, most men were 'tired and not fit to continue'. Letter Cochrane to Harris, 2nd June 1943.

<sup>2</sup> Letter Harris to A.Os.C. 1, 3, 4, 5, 6 and 8 Groups, 3rd June 1943. Sir Arthur Harris showed that the immediate needs of the squadron could be met if each Group Commander could post two crews to it who had completed or nearly completed two tours of operations. He thought it unlikely that 617 Squadron would be called upon to operate more than once a month, nor did he expect that its attacks would necessarily be especially hazardous. His main point was that they would need 'aircrews of great skill and experience for their successful performance'.

## *The Crews of the Dams Raid 16th/17th May 1943*

Aircraft Letter	Captain	Flight Engineer	Navigator	Wireless Operator	Bomb aimer	Front Gunner	Rear Gunner
G	Wing Cdr. G. P. Gibson	Sgt. J. Pulford	Pilot Officer H. T. Tacrum	Flt./Lieut. R. E. G. Hutchison	Pilot Officer F. M. Spafford	Flt./Sgt. C. A. Deering	Flt./Lieut. R. D. Trevor Roper
M	Flt./Lieut. J. V. Hoppgood	Sgt. C. Brennan	Flying Officer K. Earnshaw	Sgt. J. Minchin	Flt./Sgt. J. W. Fraser	Pilot Officer G. H. Gregory	Pilot Officer A. F. Burcher
P	Flt./Lieut. H. B. Martin	Pilot Officer I. Whittaker	Flt./Lieut. J. F. Leggo	Flying Officer L. Chambers	Flt./Lieut. R. C. Hay	Pilot Officer B. T. Foxlee	Flt./Sgt. T. D. Simpson
A	Sqdn./Leader H. M. Young	Sgt. R. Horsfall	Sgt. C. W. Roberts	Sgt. L. Nichols	Flying Officer V. S. MacCausland	Sgt. A. G. Yeo	Sgt. L. Ibbotson
J	Flt./Lieut. D. J. H. Malby	Sgt. J. Hatton	Sgt. V. Nicholson	Sgt. A. J. Stone	Pilot Officer J. Fort	Sgt. E. Hill	Sgt. D. Simmons
L	Flt./Lieut. D. J. Shannon	Sgt. R. Henderson	Flying Officer F. R. Walker	Flying Officer B. Goodale	Flt./Sgt. L. J. Sumpter	Sgt. B. Jagger	Pilot Officer J. Buckley
Z	Sqdn./Leader H. E. Maudslay	Sgt. J. Marriott	Flying Officer R. A. Urquhart	Sgt. R. Cottam	Pilot Officer M. J. D. Fuller	Flying Officer W. J. Tytherleigh	Sgt. N. C. Burrows
B	Flt./Lieut. W. Astell	Sgt. J. Kinnear	Pilot Officer F. A. Wile	Sgt. A. Garshowitz	Flying Officer D. Hopkinson	Sgt. F. Garbas	Sgt. R. Bolitho
N	Pilot Officer L. G. Knight	Sgt. R. Grayston	Flying Officer H. S. Hobday	Flt./Sgt. R. G. Kellow	Flying Officer E. C. Johnson	Sgt. R. Sutherland	Sgt. H. E. O'Brien
W	Flt./Lieut. K. L. Munro	Sgt. F. Appleby	Flying Officer F. G. Rumbles	Sgt. P. E. Pigeon	Sgt. J. H. Clay	Sgt. W. Howarth	Flt./Sgt. H. Weels
T	Flt./Lieut. J. C. McCarthy	Sgt. J. Radcliffe	Flt./Sgt. D. A. McLean	Sgt. R. Eaton	Sgt. G. L. Johnson	Sgt. R. Batson	Flying Officer D. Koeber
H	Pilot Officer G. Rice	Sgt. H. Smith	Flying Officer R. MacFarlane	Sgt. G. B. Gowrie	Flt./Sgt. W. Thraasher	Sgt. T. Maynard	Sgt. S. Burns
K	Sgt. V. A. Byers	Sgt. A. Taylor	Pilot Officer J. H. Warner	Sgt. R. Wilkinson	Sgt. A. Whittaker	Sgt. R. Jarvic	Sgt. H. McDowell
E	Flt./Lieut. R. N. C. Barlow	Sgt. S. L. Whillis	Flying Officer P. S. Burgess	Flying Officer C. R. Williams	Sgt. A. Gillespie	Flying Officer H. S. Glinz	Sgt. D. Liddell
C	Pilot Officer W. H. T. Otley	Sgt. R. Marsden	Flying Officer J. K. Barrett	Sgt. J. Guterman	Flt./Sgt. L. Johnston	Sgt. R. Tees	Sgt. H. Strange
S	Pilot Officer L. J. Burpee	Sgt. G. Pegler	Sgt. T. Jaye	Pilot Officer L. G. Weller	Sgt. R. Arthur	Sgt. N. Long	Flt./Sgt. J. G. Brady
O	Flt./Sgt. W. C. Townsend	Sgt. D. J. Powell	Pilot Officer C. L. Howard	Flt./Sgt. G. Chalmers	Sgt. C. E. Franklin	Sgt. D. E. Webb	Sgt. J. Wilkinson
F	Flt./Sgt. K. W. Brown	Sgt. H. B. Fenceron	Sgt. D. P. Heal	Sgt. H. J. Hewstone	Sgt. S. Oancia	Sgt. D. Allatson	Flt./Sgt. G. MacDonald
Y	Flt./Sgt. C. T. Anderson	Sgt. D. Paterson	Sgt. L. Nugent	Sgt. D. Bickle	Sgt. S. Green	Sgt. A. Ewan	Sgt. R. Buck

Source: 617 O.R.B.

effect than the comparable deed which had been performed by Squadron Leader Nettleton.<sup>1</sup>

Nevertheless, the operations of 617 Squadron during the rest of 1943 gave little encouragement to the hope that a new and practicable technique of bombing had been introduced by the dams raid. On the contrary, they seemed simply to add support to the point made on 18th February 1943 by Sir Arthur Harris to the effect that low-level operations with heavy bombers were 'almost without exception, costly failures'. The most painful demonstration of this was given on the night of 15th September 1943, when eight Lancasters of 617 Squadron attempted to breach the banks of the Dortmund-Ems canal by substantially the same tactics as had been used against the dams. The force was led by Squadron Leader G. W. Holden and the intention was that he should control the attack, as three months earlier Wing Commander Gibson had done, by radio telephone. Also as on the earlier occasion, the approach was to be made at an extremely low level and the attacks were to be delivered with delay-action fused 12,000-lb. bombs dropped from 150 feet.

The plan began to miscarry before the target was reached when Squadron Leader Holden's aircraft was hit by light flak and crashed to the accompaniment of the explosion of its huge bomb.<sup>2</sup> Shortly afterwards disaster overtook the deputy leader, Flight Lieutenant Allsebrook, and three of the other aircraft, one of which was flown by Flight Lieutenant Knight whose bomb in the earlier attack had breached the Eder dam.<sup>3</sup> With characteristic determination Flight Lieutenant Martin assumed control and marshalled the two aircraft which, in addition to his own, were all that survived. The visibility at the target was, however, extremely poor and the crew of one of the Lancasters was unable to locate it, and had to return home without attacking. After persistent efforts and in the face of frightful hazard both Flight Lieutenant Martin and Flight Lieutenant

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<sup>1</sup> Squadron Leader Nettleton, it will be recalled, was awarded the Victoria Cross for leading the low-level daylight attack on the M.A.N. Works at Augsburg.

<sup>2</sup> Squadron Leader Holden had succeeded Wing Commander Gibson as Squadron Commander. Wing Commander Gibson's crew perished with the Squadron Leader on this occasion, though neither Flight Lieutenant Trevor Roper nor, as is stated on p. 120 of *The Dam Busters*, Sergeant Pulford, were still flying with it. Flight Sergeant Pulford, as he had then become, was, however, killed in a flying accident near Chichester on 13th February 1944. Wing Commander Gibson, himself, was killed in action on the night of 19th September 1944.

<sup>3</sup> Flight Lieutenant Knight was killed but most of his crew escaped by parachute. Two of them were made prisoners of war and three others were later reported to have reached Gibraltar. On the previous night 617 Squadron had made an abortive attempt to reach the canal, but owing to bad weather the operation had been called off while the aircraft were over the North Sea. Squadron Leader Maltby and the crew with which he had breached the Möhne dam crashed into the North Sea. All that could be recovered by the rescue launches directed by Flight Lieutenant Shannon who circled the spot for two hours was the body of Squadron Leader Maltby. Such was the fate of three of the crews who so recently had returned from the Möhne and Eder dams.

Shannon succeeded in dropping their bombs. One fell into the canal and the other struck the towing path, but the bank did not burst. Of the eight Lancasters which set out, three returned and 617 Squadron had again been shattered, this time in one of the most gallant failures of the war in the air.<sup>1</sup>

Six Mosquito fighters of 605 and 418 Squadrons had been in the target area throughout the attack. Their purpose was to provide fighter cover for the heavy bombers and to divide the fire of the light flak batteries. All of them returned safely to England, but the moral of their immunity was not yet applied to the problem of 617 Squadron though eventually it was to provide the solution.

It was now obvious that low-level operations in Lancasters against defended targets in Germany were scarcely a feasible proposition of war. The low-level attack carried out on the following night against the Anthéor viaduct in the extreme south of France showed, however, that when the defences were negligible, the prospects were quite different. This attack was pressed home from between three hundred and three hundred and fifty feet by a force composed of six Lancasters from 617 Squadron and six Lancasters from 619 Squadron. Only one of these failed to return, but though there was some most accurate bombing the viaduct was not demolished.<sup>2</sup> It remained as the target for two further attacks, both of which also failed to destroy it, but each of which led to important developments in the 617 Squadron technique of precision bombing.

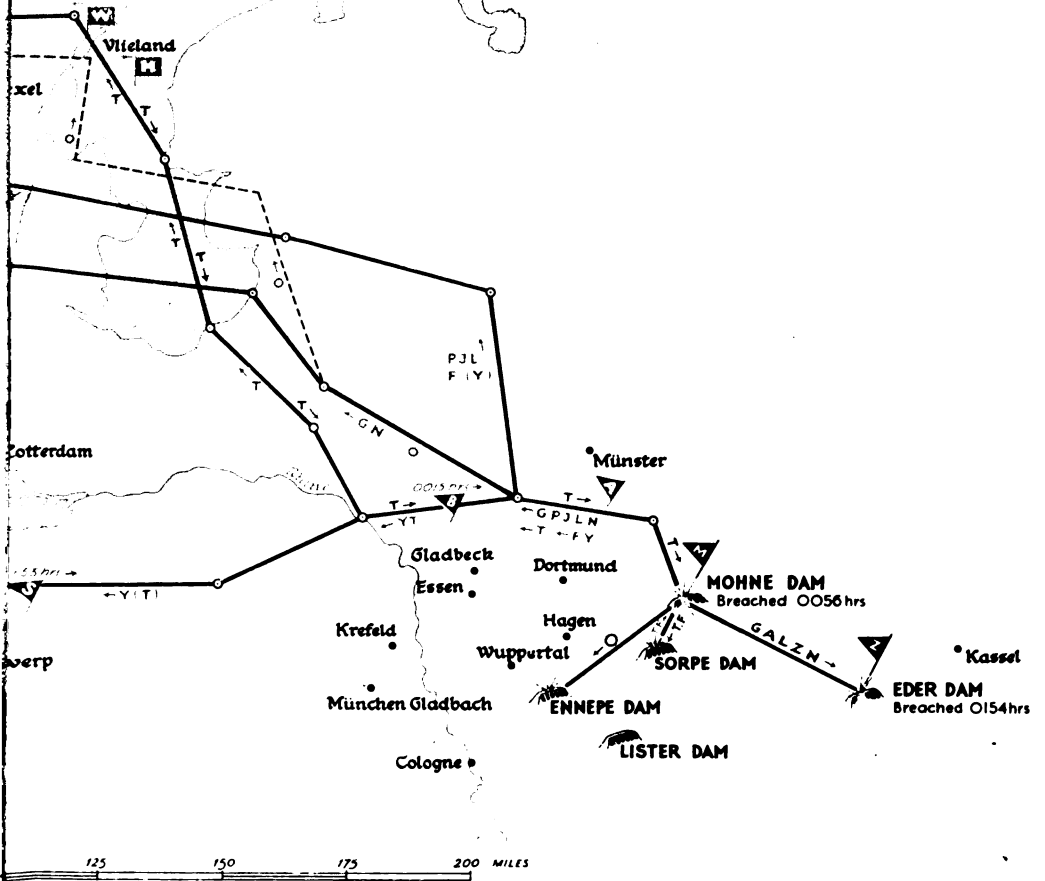
The second attempt on the Anthéor viaduct was made on the night of 11th November 1943 by ten Lancasters led by Squadron Leader Martin who, only the day before, had handed over the command of his squadron to Wing Commander G. L. Cheshire. By this time the viaduct was protected by a number of light guns and by searchlights. A low-level attack was not attempted and the aircraft taking part had been equipped with the new stabilised automatic bomb-sight. This, the Group Commander had told Sir Arthur Harris earlier, was 'absurdly easy to work' and he saw 'no difficulty whatever in obtaining errors of fifty yards or less from 10,000 feet after a little practise'.<sup>3</sup> This, no doubt, was true provided the target could be correctly identified and sighted, but, on the night of 11th November the Anthéor viaduct was by no means clear to the crews who dropped their 12,000-lb. bombs from heights which varied between about six thousand and ten thousand feet. Six of them, in fact,

<sup>1</sup> O.R.B. (617 Sqdn.) 15/16th Sept. 1943, O.R.S.(B.C.) Nt. Raid Report, 16th Jan. 1944. Flight Lieutenant Martin was immediately given the temporary command of the Squadron and was, a few days later, promoted to the rank of Squadron Leader.

<sup>2</sup> O.R.B. (617 Sqdn.) 16/17th Sept. 1943 and O.R.S.(B.C.) Nt. Raid Report, 14th Jan. 1944. Photographic reconnaissance showed two bomb craters which were, respectively, fifteen and twenty-five feet from the target.

<sup>3</sup> Letter Cochrane to Harris, 3rd Oct. 1943.

# 14th-17th May 1943



Estimated position at which aircraft were destroyed

- (a) if outward bound.....
- (b) if at target.....
- (c) if homeward bound.....

Approximate positions from which aircraft returned early

**TARGETS**



mistook the target and aimed at what proved to be a railway bridge near Cannes. The other four found the right target, but it survived the attack. All the Lancasters flew on and landed safely at Blida airfield in North Africa. The visibility at the target was 'not good enough', one of the pilots reported, 'for individual identification from the height briefed'.<sup>1</sup>

Thus, it seemed that the 617 Squadron experiment had travelled the full familiar and vicious circle which had surrounded the whole night offensive since it began, and which had resulted in the policy of area bombing. If the aircraft flew low enough to be sure of finding and hitting small targets, the casualties sustained were liable to be devastating. If they flew high enough to avoid the deadly effect of light flak, only a few of them were likely to find, and still fewer were likely to hit, the correct target if it was no more than a pin-point. Yet, even to attempt either task required not only highly experienced crews and specially equipped and modified aircraft, but also specialised flying and bombing training. It might well be doubted whether the 617 Squadron experiment was worth pursuing.

There was, however, a powerful incentive to perseverance. Launching sites were springing up along the French coast from which, it was obvious, the Germans would presently begin the bombardment of London and England and, perhaps, also of the allied armies as they concentrated for the invasion of Europe. These were scarcely profitable targets for the conventional tactics of area bombing, nor were several of them, by virtue of their heavy concrete protections, vulnerable to conventional bombs. Yet the explosive power to destroy them and all manner of other redoubtable targets was almost at hand, for Mr. B. N. Wallis had perfected another masterpiece known as the *Tallboy* or 'earthquake' bomb.

This formidable weapon weighed 12,000 lb. and was designed to bury itself in the ground near its objective which it was intended to destroy from underneath by a subterranean explosion akin to an earthquake. Whether this bomb could be effectively used or not, depended upon whether or not the means of planting it with sufficient accuracy and without prohibitive casualties could be devised. It was not a question, like the dams raid, of finding the means of delivering one attack, however expensive it might be. It was a question of initiating and sustaining a precision offensive against a whole series of pin-point targets. Casualties sustained were, therefore, as important as accuracy achieved.

A further attempt to harmonise these two apparently opposing factors was made during December 1943 by allying the bomb-aiming skill of 617 Squadron with the marking experience of the

<sup>1</sup> O.R.B. (617 Sqdn.) 11/12th Nov. 1943 and O.R.S.(B.C.) Nt. Raid Report, 19th Jan. 1944.



Pathfinder Force. A launching site near Abbeville was the scene of the first of these experiments which was carried out on the night of 16th December. The plan was that the aiming point should be marked with target indicator bombs by *Oboe* Mosquitoes of the Pathfinder Force and that it should be bombed by nine Lancasters of 617 Squadron each carrying a 12,000-lb. bomb. The 617 Squadron crews, led for the first time by Wing Commander Cheshire, were ordered to attack from between twelve thousand and fifteen thousand feet and they were to aim, by means of their stabilised automatic bomb-sights, purely at the Pathfinder Force marking. This they did with considerable accuracy. No bomb fell more than 150 yards from the markers and two were within thirty yards. The average bombing error in relation to the markers was ninety-four yards, but the markers were themselves 350 yards from the target and because the latter measured only three hundred by two hundred and fifty yards, it was not even damaged.<sup>1</sup>

Another attack on the same target, carried out on the night of 30th December, failed for the same reason, and, in two other attacks on different but almost equally small targets, attempted on the nights of 20th and 22nd December, the 617 Squadron Lancasters had to return to base without bombing because the Pathfinder Force marking was invisible beneath cloud.<sup>2</sup> In the two attacks on which the ground marking was visible, the performance of the Pathfinder Force would, by normal standards, have been judged to be most accurate. Against a large area target it would have given the main force an excellent opportunity of delivering a concentrated and, by those standards, accurate assault. Against such a small precision target it was, however, much less than adequate. These, and the somewhat similar experiences which followed in January 1944, showed that 617 Squadron could not find the solution of its problem in the high-level radar-directed marking technique of the Pathfinder Force, and it was this conclusion which led to the development of its own marking technique by the Squadron itself.

A spectacular success, signalled by a congratulatory telegram from the Chief of the Air Staff, crowned the first endeavour when, on the night of 8th February 1944, the Gnome and Rhône aero-engine factory at Limoges was the target for a force of twelve Lancasters of 617 Squadron. Wing Commander Cheshire, flying the first aircraft, approached the factory at an extremely low level and, from

<sup>1</sup> O.R.B. (617 Sqdn.) 16/17th Dec. 1943 and O.R.S.(B.C.) Nt. Raid Report, 16th Feb. 1944. The 12,000-lb. bombs used in these attacks, like those used against the Dortmund-Ems canal and the Anthéor viaduct, were conventional. They should not be confused with the 'earthquake' bomb, also weighing 12,000 lb., which had not yet come into service.

<sup>2</sup> O.R.B. (617 Sqdn.) 20/21st, 22/23rd and 30/31st Dec. 1943 and O.R.S.(B.C.) Nt. Raid Reports, 21st Feb. and 22nd March 1944.

a height of two hundred feet, he dropped a load of thirty-pound incendiary bombs right on the aiming point. Squadron Leader Martin reinforced this initial marking a few minutes later from just above seven thousand feet and the remaining ten crews, using their stabilised automatic bomb-sights dropped one-thousand- and twelve-thousand-pound high-explosive bombs on it from heights varying between eight thousand and just over ten thousand feet. The accuracy of the attack was amazing. The factory was shattered, and, as was equally satisfactory, no damage whatsoever was done to the nearby French residential areas.<sup>1</sup> All the Lancasters returned safely and undamaged to base, but there were no defences covering the factory at Limoges.<sup>2</sup>

This lack of defences was the only qualification which had to be applied to the brilliant success which had been achieved, but the second experiment, carried out four nights later, showed how serious it was. The target was once again the Anthéor viaduct, of which 617 Squadron already had unhappy memories. Wing Commander Cheshire and Squadron Leader Martin made a number of determined efforts to mark it from a low level, but the conditions were very different from those which had prevailed over the factory at Limoges. Each time the leader or his deputy approached they were caught and dazzled by searchlights or subjected to such intense fire that they had to draw off. Eventually it was Squadron Leader Martin who, with superb skill and fearless courage, manœuvred his Lancaster into position for a low approach to the target. At the end of the run and at the crucial moment when the bomb-aimer, Flight Lieutenant Hay, was on the point of releasing the markers, that gallant officer was killed by a shell which struck the nose of the aircraft. Squadron Leader Martin was only able to stagger away to the nearest friendly territory.<sup>3</sup> Wing Commander Cheshire's further efforts to make a low approach were all frustrated by the intensity of the defences, and eventually he was compelled to drop his markers from seven thousand feet. They fell on the beach about a hundred yards from the viaduct.

The nine Lancasters which had been orbiting near by during

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<sup>1</sup> For an illustration of the results of this attack see the photograph following p. 174.

<sup>2</sup> O.R.B. (617 Sqdn.) 8/9th Feb. 1944 and O.R.S.(B.C.) Nt. Raid Report, 1st May 1944. The remarkable photograph taken from Wing Commander Cheshire's Lancaster and recording his brilliant feat is reproduced in *The Dam Busters* opposite p. 129.

<sup>3</sup> Flight Lieutenant Hay, like Squadron Leader Martin, was an Australian. He had been the bombing leader of 617 Squadron since its formation. Squadron Leader Martin executed a brilliant landing in Sardinia under conditions which, in view of the state of the aircraft, could scarcely have been more difficult or more dangerous. This was the last operation which he carried out in 617 Squadron, but he subsequently returned to battle over Germany in a Mosquito night fighter.

Squadron Leader Martin, though not the most famous, was certainly one of the greatest bomber pilots who ever set course from British bases. His genius for flying was unsurpassed and his relentless determination in the face of any hazard was unquenchable.

these desperate attempts to establish a clear aiming point now approached with their 12,000-lb. bombs at about ten thousand feet. Using the radio telephone, Wing Commander Cheshire warned their bomb-aimers to make an allowance for the error in the position of the marking, but the difficulty was more than could be overcome. Several bombs fell near the viaduct and one of them burst within fifteen yards of it, but the bridge was not destroyed and the attack had failed.<sup>1</sup>

These operations showed, as Air Vice-Marshal Cochrane had expected they would, that extremely accurate aiming could be achieved with the stabilised automatic bomb-sight from 10,000 feet and above. This, however, in the case of small precision targets, was only likely to be useful if the aiming point, in fact, coincided with the objective of the attack. At the same time experience had shown that the necessary degree of marking accuracy could only be obtained by low-level visual aiming and that 617 Squadron, if it was to have an effective future as a medium-altitude or high-level force, needed its own low-level marking component. This lesson, which had largely arisen from the pioneering activities of Squadron Leader Martin and Wing Commander Cheshire, was now clearly recognised by the latter.

The Lancaster was, of course, by far the best aircraft in service as the actual instrument of bombing. It alone could carry the largest bombs which were necessary for the destruction of the strongest targets, but for low-level operations it was, as Sir Arthur Harris had expected and as 617 Squadron experience had confirmed, quite unsuitable and disastrously vulnerable. The Lancaster was not, however, necessary for the marking role. Target indicator bombs or sufficient numbers of incendiaries could easily be lifted by a much smaller aircraft with much greater manoeuvrability and far superior performance, such as the Mosquito, or as was later to appear, the Mustang. This too had been recognised by Wing Commander Cheshire, and on 27th March 1944 he flew to Colby Grange 'to have instruction on Mosquito aircraft'. Three days later he flew one solo and on the night of 5th April 1944 he carried out his first low-level marking operation in a Mosquito.<sup>2</sup>

The significance of this experiment was to be far-reaching and its initiation marked what was, perhaps, the most important stage in the development of night precision bombing. Operations like that involved in the breaching of the Möhne dam could only be executed on rare occasions by specialist crews, but aiming from higher levels at markers was the stock in trade of the whole of Bomber Command. The development of marking techniques was, therefore, of much wider significance than the development of complex bombing

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<sup>1</sup> O.R.B. (617 Sqdn.) 12/13th Feb. 1944. See also *The Dam Busters*, pp. 152-163.

<sup>2</sup> do. 27th and 30th March and 5/6th April 1944.

techniques, and because the most efficient markers were so much lighter than the most destructive bombs the operational possibilities of precision marking were greater than those which existed in the case of precision bombing. Thus, the experience of 617 Squadron had shown the fundamental validity of the pathfinder principle but it had also, and for the purposes now in mind, shown the inadequacy of the Pathfinder Force. Indeed, it was the relative inaccuracy of the marking and not the bombing error in aiming at the markers which was the operative factor in delaying the progress of 617 Squadron and, in a less refined degree, in denying to the main force of Bomber Command the ability to hit precision targets, either with consistency or reasonable economy of force.

The bearing of this problem had been strikingly illustrated by the results of three attacks carried out in June and July 1943 against specific buildings at Le Creusot, Friedrichshafen and Montbéliard. The marking, or as was the case in the Le Creusot attack, the illumination, was provided on each occasion by the Pathfinder Force and the major weight of the bombing was delivered by ordinary squadrons of the main force which were not equipped with the stabilised automatic bomb-sight or any other special devices. All three operations were carried out in good weather when the moon was at least eighty per cent of full and the attacks were delivered from between five thousand and fourteen thousand feet in the face of defences which were not formidable. Of the 541 heavy bombers despatched only seven failed to regain their bases.<sup>1</sup>

Careful analysis of the reconnaissance photographs indicated that the main force had achieved an average 'random' bombing error of between four hundred and six hundred yards.<sup>2</sup> This showed that, under the conditions prevailing during these attacks, a high proportion of main-force bombing could be concentrated on a relatively small area, but the effectiveness of this depended upon the extent to which the mean point of impact of the bombing coincided with the selected aiming point. In the case of the Le Creusot attack this mean point could not be determined, but in the Friedrichshafen operation it was four hundred yards from the aiming point and in that at Montbéliard the distance was nine hundred and thirty yards. These displacements arose from a combination of the systematic bombing error and the marking error.<sup>3</sup> At Friedrichshafen the

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<sup>1</sup> The bombing heights were: Le Creusot 5-10,000 feet, Friedrichshafen 10-14,000 feet and Montbéliard 6-10,000 feet. After the Friedrichshafen attack the aircraft landed at Maison Blanche in North Africa.

<sup>2</sup> The 'random' error represented the distance between the bomb-burst and the centre of the bombing concentration or mean point of impact.

<sup>3</sup> The 'systematic' error represented the average distance by which all bombs aimed at the same point missed that point. A common cause of this was an incorrect wind setting on the bomb site.

systematic error was two hundred yards and at Montbéliard it was three hundred and fifty yards. In the former case the marking error was also two hundred yards, but in the latter it was nearly seven hundred yards. In each case the markers had been visually aimed by Pathfinder Force crews sighting the target by the light of flares dropped by *H2S* aircraft also belonging to the Pathfinder Force.

All this made it clear that the marking error was the most important limitation upon the effectiveness of the attacks. Indeed, it was positively undesirable to reduce the bombing error while this sort of marking error persisted, because the bombing error tended to compensate for the marking error, at least to some extent. The greater the concentration upon an inaccurate marker the less was the likelihood of the destruction of the target. The difficulty could not, however, be overcome by eliminating the marking and providing only the illumination. This, in fact, was done on the Le Creusot attack when each bomb-aimer was instructed to make a visual identification of the aiming point. The result was that less than a third of the force aimed at the correct point. In the other two operations nearly two-thirds of the force aimed at the markers.<sup>1</sup> Greater marking accuracy was the indispensable prelude to precision bombing.

Such then was the significance of the experiment upon which Wing Commander Cheshire was now embarking. Its outcome would rule not only the operational prospects of the single, specialist and heroic squadron which he himself commanded but also, in a large measure, those which might be opened to the whole of 5 Group and, perhaps, in due course, to all Bomber Command. Thus, within a year of its formation as a specialised bomber force, 617 Squadron showed signs of becoming the spearhead of the main force and of extending the operational limits of night bombing which had hitherto dictated the policy of area attack.

These possibilities, which were certainly not yet certainties, did, however, contain their own limitations. Though the Mosquito was undoubtedly a much more promising low-level proposition than the Lancaster, the extent to which it would be able to run the gauntlet of really formidable defences was yet to be seen. Against heavily defended targets well covered by light flak and searchlights low-level visual marking was by no means the certain, nor even the probable

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<sup>1</sup> O.R.S.(B.C.) Report, 25th Oct. 1943, O.R.S.(B.C.) Nt. Raid Reports, 5th Sept., 11th Sept. and 5th Oct. 1943. The Friedrichshafen attack, on which sixty Lancasters were despatched, had a particular interest not only because it was a 'shuttle' raid but because it was directed by a 'Master Bomber' using W/T control and because some of the attacks were directed at 'off set' marking. This was a 5 Group technique by which the markers were purposely displaced so that they would not be obscured by explosions. The bomb-aimers aimed at these markers with a calculated overshoot. There is an excellent account of the attack in *No. 5 Bomber Group R.A.F.*, pp. 139-144.

successor of the high-level radar-assisted technique of the Pathfinder Force. The introduction of *G-H*, the further development of *Oboe* and the extension of its range by the use of 'repeater' aircraft in addition to the continued application and improvement of *H2S* were factors leading not only to the improvement of area bombing but also to an important contribution to the development of precision tactics such as had been foreshadowed by the famous attack on Peenemünde in August 1943.

Nevertheless, the significance of all these developments which were so powerfully felt in the last year of the war, should not be over-rated, or, above all, pre-dated. There were, as we shall see, many other factors contributing to the greater versatility and effectiveness of strategic air power. Meanwhile, it is evident that the possibility of sustained precision attacks upon major targets had continued to elude Bomber Command throughout 1943. The surviving pre-occupation of the force with area bombing was, therefore, hardly attributable to a weakening control by the Air Staff and certainly not to the whim of the Commander-in-Chief. It still arose from the operational limitations of the period. Moreover, even in the development of area bombing, all was not steady progress especially, as will now be seen, in the case of Berlin.

## 5. The Battle of Berlin, November 1943–March 1944

'We can wreck Berlin from end to end if the U.S.A.A.F. will come in on it. It will cost between us 400–500 aircraft. It will cost Germany the war.' Such, it may be recalled, was the phrase with which, on 3rd November 1943, Sir Arthur Harris had sought to convince the Prime Minister that the decisive phase of the strategic air offensive was at hand.<sup>1</sup> A fortnight later, on the night of 18th November 1943, the first of sixteen major operations carried out against Berlin between then and the night of 24th March 1944, was launched. This was the heart of a massive campaign which presently became famous as the 'Battle of Berlin'.

It was the greatest assault which had hitherto ever been launched against a single target. It involved the despatch of over nine thousand sorties, the overwhelming majority of which were carried out by four-engined bombers. More than seven thousand of them were flown by Lancasters.<sup>2</sup> This tremendous effort, involving at the least a round flight of one thousand one hundred and fifty miles, was mounted almost exclusively by the Royal Air Force Bomber Command. The United States Army Air Forces did not 'come in on it' until nearly the end, but their non-intervention was virtually inevitable and must have been foreseen by Sir Arthur Harris, as by others, at least after the Schweinfurt operation on 14th October 1943. The United States Eighth Bomber Command was neither equipped nor trained to undertake massive night operations, nor, as dismal events had shown, was it capable during the greater part of this period of sustaining daylight operations of deep penetration. It was, in fact, not until March 1944, when the Battle was nearing its end and when at last the extended range of P-51 Mustangs had brought Berlin within the reach of fighter cover, that the Eighth Air Force undertook its initial attack on the German capital. This was an aspect of the revolution which had occurred in the development of United States strategic air power and, as such, was of fundamental importance. The American contribution was not, however, a significant part of the Battle of Berlin.<sup>3</sup>

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<sup>1</sup> Min. Harris to Churchill, 3rd Nov. 1943.

<sup>2</sup> The actual total of sorties despatched in these sixteen major attacks was 9,111. 7,256 were by Lancasters, 1,643 by Halifaxes, 162 by Mosquitoes and fifty by Stirlings. In addition, there were sixteen minor harassing attacks on Berlin involving the despatch of 186 Mosquito and twenty-two Lancaster sorties. O.R.S.(B.C.) Nt. Raid Reports.

<sup>3</sup> It may be recalled that in September 1942 Sir Charles Portal had believed that if the Eighth Bomber Command was to become a night force by the beginning of 1944, the decision to convert it would have to be taken before the end of 1942. No such decision was taken, either before the end of 1942 or at any other time while the Eighth Air Force remained in Europe, though General Eaker did, as will have been noticed, occasionally







Though Sir Arthur Harris' earlier suggestion of an appeal for American participation in the attack on Berlin was, therefore, unrealistic, the actual assault which materialised as a result of the unaided effort of his own Command was certainly no less than that which he seems to have envisaged as a result of a combined Anglo-American attack. Even assuming that the Commander-in-Chief did not expect the casualty rate to exceed five per cent, he cannot have anticipated the despatch of more than eight to ten thousand sorties by Bomber Command and the Eighth Air Force between them because he had clearly stated that the operations would cost 'between us 400-500 aircraft'.<sup>1</sup> Actually, as we have just seen, the purely British effort against Berlin generated over nine thousand sorties, but as the Royal Air Force bombers carried more than twice the average bombload of the United States Army Air Forces aircraft, it seems not unreasonable to suppose that the weight of attack brought to bear on Berlin by Bomber Command alone was, in fact, substantially greater than that envisaged by Sir Arthur Harris for the joint Anglo-American attack which he had suggested on 3rd November 1943.<sup>2</sup> Nevertheless, considerable as the destruction was, Berlin was not 'wrecked from end to end', nor did the operations against it 'cost Germany the war'.

The heart of the Battle was not, however, its greatest part, for while these gigantic efforts were being made against Berlin an even greater number of sorties were despatched against a dozen other leading German towns.<sup>3</sup> More than eleven thousand Bomber Command sorties were, in fact, so directed in nineteen major area attacks on these targets and over seven thousand of them were flown by Lancasters.<sup>4</sup> Thus, the Battle of Berlin, in its broader but strictly

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despatch small numbers of his aircraft on night operations with the R.A.F. Bomber Command. It is interesting to note, however, that the later B.29 offensive against Japan was converted from day to night in a remarkably short time.

<sup>1</sup> It is most probable that Sir Arthur Harris did expect the casualty rate for attacks on Berlin to exceed five per cent. This was the loss rate which, a month later, he said he expected for all his major attacks on German towns. Letter Harris to Air Min., 7th Dec. 1943. At the Air Ministry, A.C.A.S. (Ops.) (Air Vice-Marshal Coryton) had expected a much higher loss rate on Berlin. If the Anglo-American attack materialised, he thought the Eighth Air Force would lose sixteen per cent of its sorties and that the Bomber Command losses would amount to ten per cent of the effort. This estimate postulated the despatch of not more than four thousand British and American sorties. Min. Coryton to Portal, 5th Nov. 1943.

<sup>2</sup> The average bombload of R.A.F. bombers was 6,903 lb. in 1943 and 8,250 lb. in 1944. The corresponding figures for U.S.A.A.F. bombers in the same years were 3,220 lb. and 3,980 lb. respectively. *B.B.S.U. Strategic Air War Against Germany 1939-1945*, pp. 42-43.

<sup>3</sup> These towns, attacked between the nights of 18th November 1943 and 30th March 1944, were Ludwigshafen, Leverkusen, Frankfurt (four times), Stuttgart (four times), Leipzig (twice), Stettin, Brunswick, Magdeburg, Schweinfurt, Augsburg, Essen and Nuremberg. O.R.S.(B.C.) Nt. Raid Reports.

<sup>4</sup> The actual number of sorties despatched on these nineteen major attacks was 11,113. 7,396 of these were by Lancasters. Of these attacks:

4 involved the despatch of more than 800 aircraft

3 " " " " between 700 and 800 aircraft (Cont. on p. 192)

German sense and without reckoning the many minor and harassing attacks, involved the despatch of 20,224 sorties, 19,914 of which were carried out by four-engined bombers. The Lancaster contribution to this effort, which, it must be repeated, refers only to major area attacks on German towns, amounted to 14,652 sorties.

Now it may be recalled that in an official letter to the Air Ministry of 7th December 1943, Sir Arthur Harris had suggested that the Lancaster element of his Command alone could, under certain conditions, bring about the capitulation of Germany by 1st April 1944. Among the conditions which he mentioned was the need to launch 3,421 Lancaster sorties per month against major German towns and the preparedness and the ability to sustain losses which he estimated would amount to 171 Lancasters per month.<sup>1</sup> The application of these conditions to the period of the Battle of Berlin, which occupied the space of four and two-fifths months, therefore, called for the despatch of 15,052 Lancaster sorties and postulated the loss of some 752 of these aircraft. Setting aside the not inconsiderable Halifax effort, setting aside the whole Mosquito contribution, excluding all minor attacks and all attacks outside Germany itself and reckoning only the Lancaster contribution to the major area attacks on major German towns, 14,652 sorties were, as has just been noticed, actually despatched, and from these 681 aircraft failed to return.<sup>2</sup>

Thus, Sir Arthur Harris' conditions as to the effort which ought to be launched in the Battle of Berlin were virtually fulfilled. Nevertheless, on 1st April 1944 a long and painful struggle still awaited the allied air forces, as also the allied armies and navies. On that date Germany had not been brought to the point of capitulation and, indeed, only two nights before, Bomber Command had suffered the most severe disaster in its entire history. On the night of 30th March 1944, 795 aircraft were despatched to Nuremberg. Ninety-four of

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2	involved the despatch of between 600 and 700 aircraft
4	" " " " " 500 " 600 "
1	" " " " " 400 " 500 "
2	" " " " " 300 " 400 "
2	" " " " " 200 " 300 "
1	" " " " " less than 200 aircraft

<sup>1</sup> See above, p. 54, where this letter is printed in full.

<sup>2</sup> The Halifax contribution was, perhaps, somewhat greater than Sir Arthur Harris had expected. In his letter of 7th December 1943, he had said that the help which the Halifaxes could give the Lancasters 'cannot be rated very highly, and is most unlikely in practice to do more than offset diversions . . .' In fact, however, during this period he despatched 1,643 Halifax sorties to Berlin alone. The cost of this effort was, nevertheless, extremely high. 111 of the Halifaxes failed to return and 199 were damaged, including twenty-five beyond repair. These figures may be compared with the Lancaster effort amounting to 7,256 despatched, 376 missing and 745 damaged, including sixty-nine beyond repair. It is also instructive to note that 215 of the Halifax sorties were reported by the crews to have been abortive and a further forty-six to have been directed against alternative targets. The corresponding Lancaster figures were 522 abortive and 171 alternative targets. O.R.S.(B.C.) Nt. Raid Reports.

them failed to return and a further seventy-one were damaged, among which there were twelve which were totally destroyed.<sup>1</sup>

The expectations of the Commander-in-Chief had not been fulfilled and by that standard the Battle of Berlin had been a failure. The attacks on the capital itself had not 'cost Germany the war' nor had the broader Lancaster offensive brought the enemy to, or, as events were to show, anywhere near, the point of capitulation on 1st April 1944. Moreover, in the operational sense, the Battle of Berlin was more than a failure. It was a defeat. The disastrous Nuremberg operation, in which the missing rate was no less than 11.8 per cent, brought the Bomber Command tactics of massed and concentrated attack against major targets to a dead stop and they were not again resumed until the entire air situation over Germany had been radically altered. Neither the greatly increased size and improved quality of Bomber Command, nor the introduction of *Window* and many other radio counter-measures, now practised by a special Group, nor the even more ingenious measures of evasion and deception had in the long run been able to prevent what was now rapidly becoming the mastery of the night fighter over the night bomber.

This desperate situation was readily apparent to Sir Arthur Harris. In April 1944, the month by which he had earlier believed the bombing offensive would have reduced Germany to capitulation, he told the Air Ministry 'that the strength of German defences would in time reach a point at which night bombing attacks by existing methods and types of heavy bomber would involve percentage casualty rates which could not in the long run be sustained'. He added that the 'tactical innovations' which had postponed this outcome 'are now practically exhausted. Remedial action', he continued, 'is therefore an urgent operational matter which cannot be deferred without grave risk'. The 'remedial action' for which he called was the 'provision of night fighter support on a substantial scale'.<sup>2</sup>

In these clear and urgent terms, Sir Arthur Harris gave his operational verdict on the Battle of Berlin. The implication was equally clear. The German fighter force had interposed itself between Bomber Command and its strategic object, at any rate in so far as the latter involved sustained operations of deep penetration. Thus, as for some time the Air Staff and, in particular, its Deputy Chief, Air Marshal Bottomley, had feared, the night offensive was brought to a situation dangerously similar to that which had already checked the day offensive of the United States Eighth Bomber Command.

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 4th July 1944.

<sup>2</sup> Letter Harris to Air Min., 7th April 1944.

The operations against Schweinfurt and Nuremberg became famous as isolated disasters, but their real significance lay in the fact that they marked the culminating points, the former in the day and the latter in the night offensive, of two rising tides of insupportable casualty rates. These made the relevance, if not the means of application, of the *Pointblank* intermediate objective abundantly clear not only to those charged with the preparations for *Overlord* but also to those responsible for the continuation of the strategic air offensive or, in the code of the time, the *Pointblank* ultimate objective. This was because they had destroyed the American theory that formations of heavy bombers would be able to defend themselves in daylight and because, equally, they had shown that the British night offensive could not be indefinitely sustained by the tactics of evasion, deception and radio counter-action alone. It was as well that they also introduced, only partly in the relationship of cause and effect, the era of the long-range fighter which, fortunately, was no longer an insoluble technical problem. Schweinfurt and Nuremberg and the dates 14th October 1943 and 30th March 1944 marked, then, not the destruction of the strategic air offensive, but, on the contrary, the origin of an effective and ultimately victorious combined bomber offensive. Such, for Germany, was the irony of the war in the air at its crucial stage.

The two most important factors in the comparative failure of the Battle of Berlin were the high casualty rate sustained and the relative inefficiency of attack achieved.<sup>1</sup> In both these cardinal respects the Battle of Berlin compared unfavourably with the preceding Battles of the Ruhr and of Hamburg and the campaign on the road to Berlin. In the first of these three phases of the offensive 4·7 per cent of the sorties despatched on major operations failed to return. In the second phase, this missing rate fell to 4·1 per cent, but in the thirty-five major actions of the Battle of Berlin, for which 20,224 sorties were despatched, 5·2 per cent did not come back.<sup>2</sup> Moreover, none of these thirty-five actions, nor the sixteen of them which took place over Berlin, resulted in anything approaching the standard of concentrated devastation which had been inflicted on Hamburg and the

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<sup>1</sup> The word 'failure' should not be taken to suggest that the Battle of Berlin had no effect on Germany. Vast damage was, in fact, achieved both in Berlin and elsewhere. 'Everyone should pay a visit to Berlin.' Field-Marshal Milch told his Staff on 23rd February 1944, 'It would then be realised that experiences such as we have undergone in the last few months cannot be endured indefinitely. That is impossible. When the big cities have been demolished, it will be the turn of the smaller towns.' An attempt to assess its consequences is made in Chapter XI.

<sup>2</sup> In March 1944 the average front-line strength of Bomber Command, that is, the average number of aircraft available with crews for operations, was still less than 1,000. This serves as a reminder of the fact that in despatching, for example, 20,224 sorties, the same crews, reinforced by those who replaced the missing, were used again and again. A tour of operations amounted to thirty sorties.

standard of efficiency in the Battle as a whole compared most unfavourably with that which had characterised the Battle of the Ruhr and especially the series of effective attacks upon Essen. Thus, in the third Battle, which was to have been the climax of the offensive, a greater effort mounted by a higher proportion of Lancasters, cost more and achieved less than the two earlier campaigns. Geography, the German defences and the weather were the keys to this disappointing, but hardly surprising result.

The generally deep penetration of the actions in the Battle of Berlin gave the German fighters more time in which to act. The high proportion of effort devoted to Berlin itself, gave them opportunities to concentrate. These factors, in association with further developments in German night-fighting techniques, more than redressed the advantage which *Window* had initially conferred on Bomber Command and were the principal explanation of the larger numbers of missing aircraft. The conditions of unbroken cloud which so often prevailed over Berlin and many of the other targets between November 1943 and March 1944, coupled with the exceptionally heavy gun and searchlight defences at Berlin, made it almost consistently impossible for Bomber Command to concentrate its attacks on the correct aiming points. The Battle of Berlin produced no solution to the problem of how to mark a heavily defended target which lay beyond the range of *Oboe* and which, unlike Hamburg, possessed no salient *H2S* characteristics.

In the face of all these difficulties and hazards it may seem that Bomber Command, in the Battle of Berlin, was driven dangerously near the limit of its endurance. This certainly seemed to be the case in the opinion of Air Vice-Marshal Bennett, the Commander of the Pathfinder Force, and the only Group Commander in Bomber Command who had any substantial personal experience of bombing operations in the Second World War. When he came to look back upon the Battle a year after it had begun, Air Vice-Marshal Bennett reached the conclusion that it represented the second occasion on which the aircrews had ‘‘balked at the jump’’. The first of these cases, he said in his official communication to Bomber Command, occurred at Essen in 1942, where, he said, ‘a long series of most unproductive and highly expensive attacks were carried out with virtually no results. The reason for this,’ he suggested, ‘was that the opposition was intense, the casualty rate was high and the difficulties of hitting the target without Pathfinders were enormous. The net result’, Air Vice-Marshal Bennett believed, ‘was a state of mind amongst crews which automatically reduced the chances of success to negligible proportions. Crews openly admitted’, he said, ‘that it was useless going on throwing away crews when there was little chance of success. Moreover,’ he added, ‘the continued nature of

these raids under precisely the same conditions caused them to lose their enthusiasm in the majority of cases.'

Air Vice-Marshal Bennett thought that the Battle of Berlin, though to a lesser extent, had produced a somewhat similar state of mind among the aircrews. 'There can be no doubt', he said, 'that a very large number of crews failed to carry out their attacks during the Battle of Berlin in their customary determined manner'. He referred to 'enormous numbers' of reports each night about bombs being jettisoned in the North Sea or over Denmark and he said that the reports of Pathfinder crews 'consistently shewed that the amount of bombing on the markers which they dropped was negligible. I feel quite sure in my own mind', Air Vice-Marshal Bennett concluded, 'that many bombs were wasted *en route* in an effort to increase aircraft performance and that, unfortunately, the Command suffered from many "fringe merchants"'.<sup>1</sup> Great damage', he admitted, 'was undoubtedly done in Berlin, but', he said, 'the effect of each individual raid decreased as time went on.'<sup>2</sup>

These severe reflections not only upon the morale of the Bomber Command aircrews but also, by implication, upon the handling of the force by the Commander-in-Chief, do not appear to have drawn any protest or denial from High Wycombe. The Deputy Commander-in-Chief, Air Marshal Saundby, confined his comments to those parts of Air Vice-Marshal Bennett's letter which dealt with plans for future attacks on Berlin about which he was anxious to convene a Group Commanders' conference. Sir Arthur Harris' minute consisted only of the following words:

'Noted. I suggest you call the conference. A.T.H.'<sup>3</sup>

Silence in this case did not by any means amount to consent. Air Vice-Marshal Bennett's views were susceptible neither to proof nor to disproof. He had undoubtedly adduced some evidence suggesting a decline in the morale of Bomber Command which showed itself in a declining efficiency of attack. There were, however, many factors other than morale which bore upon the question of efficiency. High morale, for example, does not cause men to see through cloud. The inaccuracy and scattered nature of nearly all the Pathfinder Force marking at Berlin, which itself was obviously due more to a lack of technique than to low morale, was probably a much more important cause of the 'negligible' amount of bombing 'on the markers' than low morale in the main force. The high and sustained casualty rate, amounting in the whole of the Battle to more than the daily average

<sup>1</sup> Permitted bomber all-up weights were increased at this time and, as Air Vice-Marshal Bennett observed, 'aircraft performance suffered accordingly'.

<sup>2</sup> Memo. Bennett to Bomber Cmd., 3rd Nov. 1944.

<sup>3</sup> Mins. Saundby to Harris and Harris to Saundby, 5th and 6th Nov. 1944.

strength of the Command during the period, meant, obviously, that an increased proportion of the Bomber Command crews were inexperienced. This trend was more than likely to reflect itself in the efficiency of the force.<sup>1</sup> However this may have been, there was not at the end of March 1944, even on the day after the Nuremberg operation, any sense of defeat in the Bomber Command squadrons. New crews still sprang eagerly forward to take the places of those who had been lost, and many of these gained a lasting inspiration from the example of those who had fought in the Battle of Berlin. This was undoubtedly due in no small measure to the vigorous leadership of the Commander-in-Chief.

Nevertheless, the operational prospects of this battle were really never much better than the eventual results. Certainly, there was little foundation for the apparent optimism which Sir Arthur Harris had shown at the beginning of November and again at the beginning of December 1943. Earlier phases of the offensive had begun with striking new tactical and technical advances. In March 1942, when the assault on Essen was about to begin, *Gee* had just been introduced, the Lancaster was entering upon its operational career and the technique of incendiarism had been adopted. A year later, the Battle of the Ruhr began soon after the introduction of *Oboe* and the development of a new Mosquito marking technique. The revolutionary factor in the Battle of Hamburg was the release of *Window*, but the attack also signalled the most rewarding employment of *H2S*. The Battle of Berlin, on the other hand, began and continued without corresponding new advantages. Moreover, the experience of nearly a year had strongly suggested that the existing techniques were inadequate to the task.

*Oboe*, of course, did not extend beyond the Ruhr and *H2S* had already shown itself to be a poor substitute, especially over the larger targets of which Berlin was the largest of all. The declining protection afforded by *Window* had become apparent and the weather after November was likely to get worse and not better. The prospects of achieving in the Battle of Berlin anything comparable to what had been achieved in the Ruhr and above all in Hamburg depended almost exclusively upon the larger force which was now in the front line of Bomber Command and the higher proportion of that force which was represented by the Lancaster element.

<sup>1</sup> From the thirty-five major actions of the Battle of Berlin 1,047 bombers failed to return. Another 1,682 were damaged. The daily average of aircraft with crews available for operations during the period was:

November 1943	864
December 1943	834
January 1944	856
February 1944	930
March 1944	974

Bomber Cmd. O.R.B.



These, no doubt, were important factors in leading Sir Arthur Harris to undertake the campaign which had so long been desired by the Prime Minister. Another factor which cannot have been without influence was the decision, which had already been reached, to set the closing date of the *Pointblank* offensive at 1st April 1944. The period of the Battle of Berlin thus appeared to be, and in the event was, the last opportunity for decisive strategic air action before the direct preparations for, and then the launching of, operation *Overlord*.<sup>1</sup>

In the course of this, the greatest battle which Bomber Command had yet fought, the handling of the force was repeatedly punctuated by brilliant manoeuvres, which, at least on some occasions, threw the German defences into confusion. The missing rate in the attacks on Berlin itself was about half what it had tended to be in far less sustained attacks at earlier stages of the war. Even so, it did amount to 5.4 per cent of the despatched sorties, which was identical with the missing rate suffered during the 1942 attacks on Essen. Though Air Vice-Marshal Bennett had not mentioned this significant coincidence, there was, thus, a common factor which exactly linked the two campaigns in which he believed that the morale and the efficiency of the force had declined.<sup>2</sup>

Moreover, the missing rate in the nineteen major actions of the Battle of Berlin against targets other than the German capital was not much less, and amounted, in fact, to five per cent of the despatched sorties.<sup>3</sup> These losses, in addition to the large number of aircraft which were damaged, and extending over a period of more than four months, imposed a severe strain both upon the resources and the stamina of Bomber Command.<sup>4</sup> The force, nevertheless, showed itself capable of withstanding the test. Indeed, the overall missing rate in the thirty-five major actions of 5.2 per cent was only slightly in excess of the estimate of five per cent which Sir Arthur Harris had given on 7th December 1943 after less than three weeks of the Battle had passed, but the ability of the Command to surmount this seemingly crippling casualty rate owed much to the vigour of the

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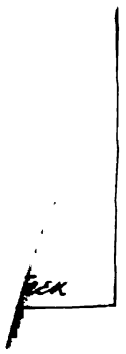
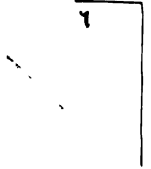
<sup>1</sup> Sir Arthur Harris had resisted the Prime Minister's appeals for attacks on Berlin in 1942 on the grounds that neither the size nor the quality of the front line justified them at that time. The Prime Minister had, nevertheless, continued to take a great interest in the possibility. In August 1943 Sir Charles Portal had shown that he too placed a high value upon a massive assault against Berlin. See above, p. 31 fn. It is notable that Stalin's few agreeable comments upon the war effort of his western allies were often prompted by Bomber Command attacks on Berlin.

<sup>2</sup> 1942 attacks on Essen. Sorties despatched 3,724. Missing 201. Sixteen major attacks on Berlin 1943/1944. Sorties despatched 9,111. Missing 492.

<sup>3</sup> These nineteen operations involved the despatch of 11,113 sorties. 555 aircraft failed to return.

<sup>4</sup> In the sixteen major attacks on Berlin, 954 aircraft were damaged, among which ninety-five were destroyed. In the nineteen major attacks on other German targets, 728 aircraft were damaged.





Commander-in-Chief himself. Sir Arthur Harris' forthright and urgent demands for greater Lancaster production and for a more efficient repair organisation had not passed unheeded at the Air Ministry where they had made a great impression upon the Secretary of State, Sir Archibald Sinclair.<sup>1</sup> Sir Arthur Harris, like all great commanders, also had an instinctive insight into the temper of his men and at this crucial time his judgment did not betray him.

Nevertheless, in the later stages of the Battle, as will presently be shown, the casualty rate was only contained at the expense of the major strategic object. The alarmingly high losses sustained in February and March 1944 when the latter was still pursued were undoubtedly the cause which led Sir Arthur Harris to doubt whether the offensive could indefinitely be sustained by the 'existing methods and types of heavy bombers.'

It was already much too late to contemplate any radical change in the front-line composition of Bomber Command, but the performance of the Mosquitoes in the Battle of Berlin continued to suggest some of the advantages which might have followed from an earlier decision to qualify the 'all heavy' bomber policy. Throughout the generally rising casualties of the Battle of Berlin, the Mosquitoes continued to enjoy an almost unchallenged superiority over the German defences, which made an astonishing comparison with the fate of the heavy bombers, including the Lancasters. Flying sometimes with the main force as markers or bombers, but more often in small groups on independent harassing or precision attacks, or on 'spoo' marking and other diversionary activities, 2,034 Mosquito sorties were despatched to German targets at night during the Battle of Berlin. Ten of them, representing 0.4 per cent of the total, failed to return.<sup>2</sup> The Mosquito casualties were almost uniformly low regardless of whether they were out alone over Germany as, for example, on the night of 10th January 1944 when, without loss, ten of them were sent to Berlin, seven to Solingen, two to Coblenz and one to Krefeld; whether they operated in company with the main force as, for example, on the night of 2nd January 1944 when twelve of them were sent, again without loss, to Berlin to take part in a major attack; or whether they operated as a diversionary force as, for example, on the night of 5th February 1944 when thirteen of them, with the loss of one which crashed on take-off, were sent to Berlin while the main force attacked Stettin.

The versatility of the Mosquitoes and above all their ability to

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<sup>1</sup> Sir Arthur Harris constantly had to make these demands. These particular ones were included in his letter of 7th December 1943.

<sup>2</sup> Eighty-nine (4.3 per cent) were damaged, including five (0.2 per cent) beyond repair. The 2,034 sorties are exclusive of the Mosquito night fighter *Serrate* effort and also of reconnaissance operations.

survive over the most formidable targets, even though they were often operating in small groups or even singly, and, therefore, without protection from *Window* which could only be used defensively in a substantial 'bomber stream', conferred an immeasurable tactical advantage upon Bomber Command. Not only could the night offensive against Germany be more or less constantly sustained whenever the weather made flying possible, but opportunities for splitting and sometimes completely confusing the German fighter force were frequently presented.

The operations on the night of 5th February 1944, which have just been mentioned, provide a striking example of what could be achieved. On that occasion a force of 358 heavy bombers was despatched to Stettin, a distant and dangerous target. They were routed along a northerly track so that when they eventually turned onto a southerly heading they pointed not only at Stettin but also at Berlin. While the German controllers assembled their night fighters over Rügen, an independent force of Mosquitoes was approaching Berlin on a track, parallel but about a hundred miles to the south of that followed by the main force. Twenty-five minutes before the zero hour at Stettin the German controllers ordered their forces to Berlin and two minutes later the Mosquitoes began to drop target indicators and some high-explosive bombs there.

The deception was almost complete. Some German pilots unfortunately happened to see the beginning of the action at Stettin and went there against the directions of the controllers. The majority, however, went to Berlin where extensive lanes of fighter flares were laid. No fighter flares were dropped at Stettin until the attack was nearly over and of the fifteen heavy bombers which failed to return it was probable that less than half were shot down by night fighters. Meanwhile, the Mosquitoes, having successfully drawn the formidable German fighter force upon themselves, suffered no ill consequences from their achievement. They all returned without loss other than that occasioned by a crash on take-off which destroyed one of their number and killed the crew.<sup>1</sup> On other occasions these diversionary tactics were much less successful, but there can be no doubt that in addition to enjoying a negligible casualty rate themselves, the Mosquitoes made an important contribution towards reducing the much more severe losses inflicted on the heavy bombers. Finally, it has to be remembered that the threat of the Mosquitoes was by no means an empty one. Despite its small size this aircraft could carry a surprising weight of bombs and was even capable of taking a 4,000-lb. bomb to Berlin. Moreover, as has been already noticed when the use of the Mosquito bomber as a diversionary

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<sup>1</sup> O.R.S.(B.C.) Nt. Raid Report, 27th March 1944.

tactic began to exhaust itself, it was to the Mosquito as a long-range fighter that Sir Arthur Harris looked for salvation.

Though the value of the Mosquito bombers was out of all proportion to their numbers, it was, nevertheless, strictly limited by the fact that they were so few. It was not until March 1944 that the Mosquito bomber components showed signs of a further expansion, and in that month the average number of these aircraft available with crews for operations was no more than fifty-eight. Meanwhile, the Wellington component was disappearing so that in the Battle of Berlin the ideal, dating back to 1936, of an 'all heavy' bomber force found its ultimate expression, if not its vindication.<sup>1</sup>

Bearing enormous loads of bombs and petrol, these heavy aircraft, both because of their weight and on account of the need to conserve fuel for the long hours of endurance, travelled, by comparison with the German night fighters, very slowly, making an airspeed of perhaps 180 knots on the way out and 210 knots on the way home. Though they could perform the famous 'corkscrew' manoeuvre by which they sought to evade or at least to present a more difficult target to the fighters, their manoeuvrability was, nevertheless, far inferior to that of their smaller and more speedy opponents. Restricted to .303-calibre machine-guns, they were substantially outshot and completely outranged by their cannon-equipped enemies. Their armour plating was progressively removed, until little remained, to increase their bomb-lifting capacity. Belching flame from their exhausts as well as radar transmissions from their navigational and fighter warning apparatus made them all too apparent to those who hunted them. Once engaged in combat, they had little chance of victory and not much of escape, while the large quantities of petrol, incendiary bombs, high explosives and oxygen with which they were filled often gave spectacular evidence of their destruction. Outpaced, outmanoeuvred and outgunned by the German night fighters and in a generally highly inflammable and explosive condition, these black

<sup>1</sup> The average numbers of bombers available for operations during the Battle of Berlin were:

	<i>Light</i> (Mosquito)	<i>Medium</i> (Wellington)	<i>Heavy</i> (Lancaster, Halifax, Stirling)
<i>1943</i>			
November	50	16	882
December	50	11	811
<i>1944</i>			
January	45	7	839
February	45	6	938
March	58	—	985

After this the Mosquito element began gradually to expand towards the peak of 203, which was reached in April 1945. By that month the daily average of available heavy bombers had also reached its peak of 1,440. During the Battle of Berlin the proportion of four-engined bombers in the force was higher than at any previous or subsequent stage of the war. Bomber Cmd. O.R.B.

monsters presented an ideal target to any fighter pilot who could find them, and it was the night fighters which caused the overwhelming majority of the losses sustained by Bomber Command in the Battle of Berlin.

It will be recalled that after the introduction of *Window* at the beginning of the Battle of Hamburg in July 1943, the Germans had been compelled to vary their tactics of night interception and that for a time their new technique of 'running commentary' control and 'free lance' activity had been markedly less effective than the earlier system of individual ground control which *Window* had made difficult and sometimes impossible. It will also have been noticed how, in the course of the late summer and autumn of 1943, their new methods began to produce more effective results despite the continued use of *Window* by Bomber Command. This, in turn, had led to the introduction by Bomber Command of further protective measures. Diversionary attacks and feint routing of the main force had become almost standard tactical methods since the last week in September 1943 and at the same time further radio counter-measures had been devised and adopted. These included the jamming of the frequency used by the German controllers to broadcast their 'running commentaries' which went by the code name of *Tinsell*. Another jamming measure, known as air *Cigar*, was designed to disrupt radio telephone communication with the German fighters, and a third device, called *Corona*, was used to give misleading instructions to the German pilots.

All these measures enjoyed some success. *Corona* instructions, for example, successfully led to most of the German night fighter force landing during the attack against Ludwigshafen on the night of 17th November 1943 and only one of the British bombers failed to return from it. Nevertheless, the value of these methods was more or less restricted to their surprise element and was less evident in their lasting effectiveness. *Tinsell*, for example, was largely neutralised by an increase in the strength of the German transmissions.<sup>1</sup> Even so, the individual control of night fighters continued for the Germans to be a most unreliable means of directing their forces, and it was this which led them to concentrate upon the technique of mass control by running commentary, which, in its rudimentary form, they had first used during the Battle of Hamburg.

During October 1943 it became apparent that this technique was maturing almost to refinement. In that month there were occasions when practically the entire night fighter force was under the direction of a single controller, who, provided he could predict the course of the main bomber stream with reasonable accuracy, therefore, had

<sup>1</sup> O.R.S.(B.C.) Report, 16th Dec. 1943.

the opportunity of concentrating a devastating attack upon it. This placed a premium upon the Bomber Command tactics of Mosquito diversions and ambiguous routing of the main force to which reference has already been made. Nevertheless, what was done at the target itself could not be concealed, and for that reason it remained as the area of greatest danger to the bombers. Clearly, however, the more rapidly the attack could be completed the less was the chance of the German fighters reaching the target in time or, if they did, the less was the time in which they could inflict their destruction. This was why, in October, the concentration in time over the target was 'drastically stepped up'. No attack during that month was planned to last for more than twenty-six minutes.<sup>1</sup>

These measures and counter-measures produced for Bomber Command reasonably satisfactory results during October 1943 and the missing rate in major operations against German targets during that month did not amount to more than 3.9 per cent of the despatched sorties. On the night of 2nd October, the attack on Munich was almost completely over within nine minutes of the time at which the German fighter controller first correctly diagnosed the target. Though five of the seven bombers which failed to return were probably shot down by fighters, the missing rate was only 2.3 per cent. In the operation against Kassel on the following night the losses were higher and amounted to 4.4 per cent of the despatched sorties. Nine of the twenty-four missing bombers were, however, almost certainly destroyed by flak, eight by causes unknown and only seven were the probable victims of night fighters. This lack of fighter success was due to the effective confusion created in the mind of the German controller who sent his fighters first to Hanover and then to Brunswick before he realised that the target was Kassel. On the night of 7th October, the controller was led by Mosquitoes to believe that the target was Munich and by the time he had got the fighters to Stuttgart the attack on that place was virtually over. Only four, or 1.2 per cent of the despatched Bomber Command sorties, failed to return, though three of them were probably brought down by the belated night fighter effort. All the same, even at this time, the German night fighters did secure two major successes. On the night of 8th October they probably accounted for twenty-one of the twenty-seven bombers which failed to return from the attack on Hanover, and on the night of 22nd October it seems likely that they shot down thirty-two of the forty-two missing aircraft in the attack on Kassel. Such, on the eve of the Battle of Berlin, was the portent of what was to come.<sup>2</sup>

<sup>1</sup> This, of course, increased the incidence of collision as also of hits from 'friendly' bombs falling from above, but the losses from either cause never, in fact, reached significant proportions.

<sup>2</sup> O.R.S.(B.C.) Report, 6th Dec. 1943.



Nevertheless, it was a portent which was by no means fully realised during the opening phase of the great battle. In the four major attacks on Berlin carried out in November 1943 the missing rate reached only the surprisingly low proportion of four per cent of the despatched sorties and in all the major attacks on German targets, including Berlin, it was no more than 3·6 per cent. Indeed, during the initial action at Berlin on the night of 18th November, when 444 bombers were despatched and only nine failed to return, it is likely that German night fighters scored no successes at all. This, no doubt, was largely due to the fact that they were at the time heavily engaged in destroying the majority of the twenty-three bombers which failed to return from the simultaneous attack on Mannheim-Ludwigshafen. All the same, the night fighters did not, in November, achieve any spectacular successes and for that reason the Bomber Command losses remained comparatively low. This, Sir Charles Portal told the Prime Minister, was 'particularly encouraging' and Mr. Churchill commented that it was 'all very good' and added 'I congratulate you all.'<sup>1</sup>

This satisfaction was, however, somewhat premature, for already by the time of its expression a very different state of affairs was beginning to prevail. One of the principal causes of the low losses in November had been the appalling weather which was equally unfavourable to fighter interception and to accurate bombing. In December, though the weather continued to be bleak, the German night fighter force greatly increased its efficiency. In most of the big attacks, which included four more on Berlin, it succeeded in intercepting the main bomber stream while it was still outward bound and before it reached the target. The losses increased appreciably and the missing rate in Berlin attacks rose to 4·8 per cent of the despatched sorties. In the first attack of the month on the capital it amounted to 8·7 per cent when night fighters were especially active and probably accounted for the bulk of the forty bombers destroyed.<sup>2</sup>

The situation became much worse in January 1944 and in that month, when Bomber Command launched nine major operations, six of them against Berlin and the others against Stettin, Brunswick and Magdeburg, the scales tipped decisively in favour of the German night fighter force which was also supported by somewhat more effective anti-aircraft fire. In the six Berlin operations the missing rate was 6·1 per cent of the despatched sorties and in the actions against Stettin, Brunswick and Magdeburg it rose to the even higher level of 7·2 per cent. The lowest missing rate of the month was

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<sup>1</sup> O.R.S.(B.C.) Report, 27th Dec. 1943. Mins. Portal to Churchill, 22nd Dec. 1943, and Churchill to Portal, 27th Dec. 1943.

<sup>2</sup> O.R.S.(B.C.) Report, 2nd Feb. 1944, and do. Nt Raid Report, 9th Feb. 1944.



which showed little activity on the southern route which was followed by part of the surviving force on the way home.

It was this which led Bomber Command to change not only its tactics but also, and in the process, its strategy. The attack on Berlin was almost broken off. In fact, there was only one further major operation against the capital in this phase of the campaign and that did not take place until the night of 24th March. Meanwhile, a much greater proportion of the effort was brought to bear against towns in the southern part of Germany and these were generally approached by southerly routes. The number of route markers, which served to guide the night fighters as well as the night bombers, was severely reduced, the attacks were often divided into two waves which approached by different ways and struck at different times, and a much greater effort was thrown into diversionary operations.<sup>1</sup> Thus, Bomber Command was compelled, largely by the German night fighter force, to draw away from its primary target, Berlin, to disperse its effort and to pursue its operations by apparently less efficient means than hitherto. This situation, in view of the fact that Berlin was by no means destroyed, meant that the Germans had already won the Battle of Berlin.

It did also, however, lead to an immediate reduction in the Bomber Command casualties. In the attack on Stuttgart which took place on the night after the Leipzig disaster, Bomber Command suffered a missing rate of only 1.5 per cent, the double attack on Schweinfurt four nights later produced a missing rate of 4.6 per cent and a second double attack, aimed at Augsburg on the night of 25th February, one of 3.6 per cent. From these three operations, all of which were carried out by the southern route and which involved the despatch of 1,307 sorties, sixty-three bombers failed to return as compared with the 120 missing from the 1,691 sorties despatched earlier in the month to Berlin and Leipzig by the northern route.<sup>2</sup>

The analysis of these results did not, however, produce an optimistic impression upon the Operational Research Section at Bomber Command where it was felt that the German night fighter force would soon fill the vacuum in the south and show itself capable of meeting attacks from any direction.<sup>3</sup> This, indeed, is what presently happened.

In the final month of the Battle of Berlin, the pressure against Germany was somewhat reduced for the attacks on French targets in preparation for *Overlord* began in March to assume considerable

<sup>1</sup> O.R.S.(B.C.) Report, 31st March 1944, and do. Nt. Raid Report, 25th April 1944 (Leipzig).

<sup>2</sup> O.R.S.(B.C.) Report, 31st March 1944.

<sup>3</sup> This was perhaps not surprising in view of the fact that the report was dated 31st March 1944.

proportions. They had the advantage of being virtually unopposed and from the 1,947 heavy bomber sorties despatched on these operations only eight failed to return. All the same, there were signs that the Germans were redeploying their night fighter strength with a view to making interceptions over France and the effect of this was presently to be seen when the approach to the target was by way of France or, later still, when the target was in France. Meanwhile, the change in direction of Bomber Command attacks continued for most of March to have a curbing effect on casualties. From a force of 557 despatched to Stuttgart on the night of 1st March, only four bombers failed to return. A second attack on the same target a fortnight later was more costly, largely as a result of increased fighter activity, but even so the missing rate did not exceed 4.2 per cent. Two attacks were also made on Frankfurt by the southern route without serious casualties. In the first, on the night of 18th March, the fighters made contact with the bomber stream but, perhaps because of cloud, they failed to do much execution, and the Bomber Command missing rate was 2.5 per cent. In the second attack four nights later, diversionary operations at Hanover, Dortmund, Oberhausen and Berlin, as also minelaying in Kiel Bay, successfully confused the fighter force for a time. Nevertheless, the missing rate was 4.1 per cent and about two-thirds of these losses were due to fighter action.

The final attack of the Battle against Berlin took place on the night of 24th March 1944. It was an extremely expensive operation and resulted in a missing rate of 9.1 per cent. Diversionary activities failed to draw the German fighters, but unpredicted winds scattered the bombers over a wide area, and in the words of the report by the Operational Research Section denied the German fighters 'the assistance of a well defined stream'. The same cause, however, carried the bombers over innumerable heavily defended areas and gave the anti-aircraft gunners an unusual opportunity which they exploited to the full. More than fifty of the seventy-two missing aircraft seem to have been destroyed by flak.<sup>1</sup>

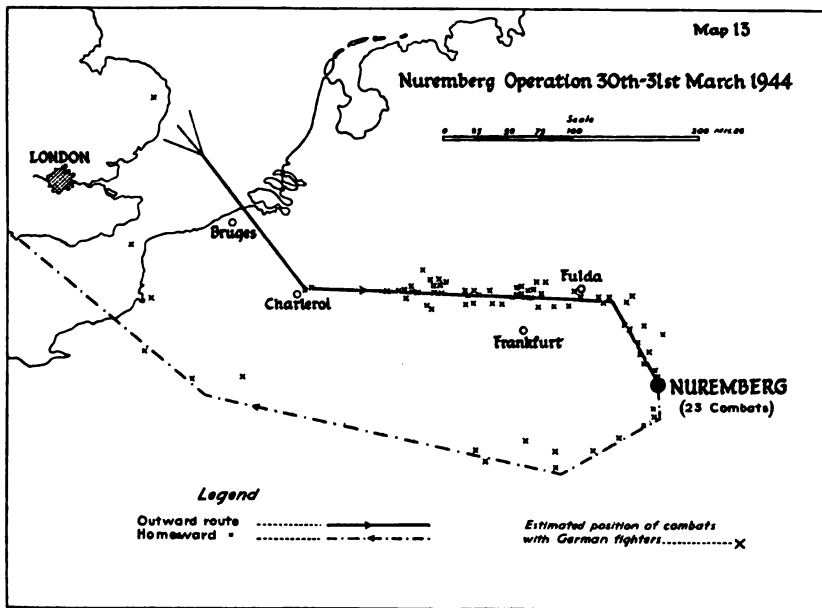
This temporary check to the fortunes of the German night fighter force was further and even more clearly illustrated by a highly successful return to Essen on the night of 26th March 1944. On this operation 705 bombers were despatched and nine failed to return,<sup>2</sup> but the Nuremberg action four nights later showed the extent to which Bomber Command's position was precarious.

This, indeed, was a curious operation. The force of 795 aircraft was routed outwards to cross the enemy coast near Bruges and thence

<sup>1</sup> O.R.S.(B.C.) Report, 3rd May 1944, do. Nt. Raid Reports, two for Stuttgart, two for Frankfurt, and one for Berlin.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 26th June 1944.

to continue to the vicinity of Charleroi. From there the track lay in a straight line pointing due east and continuing for nearly two hundred and fifty miles until Fulda, lying to the north-east of Frankfurt was reached. From this point the final run in to Nuremberg was made from a north-north-westerly direction. The long straight leg of this track took the force close to the known positions of two night fighter beacons and no extensive diversionary operations were undertaken on account of, according to the Bomber Command night raid report, 'conditions over the North Sea'.<sup>1</sup> The moon, on the night of this attack, was expected to reach half of its full strength.



The plan of action, therefore, abandoned most of the fundamental tactical precepts which for a long time had governed Bomber Command operations and the need for which had been particularly emphasised by the Leipzig action in the previous month. The normal ruses seemed to give way to a straightforward declaration of intention and the German fighter force was presented with a unique opportunity.

This opportunity was, however, further increased by the weather conditions which had not been accurately appreciated in the forecast submitted to Bomber Command. As they bore undeviatingly across Germany the Lancasters and Halifaxes flew in clear weather for the greater part of their outward journey. They found little of the

<sup>1</sup> Which did not, however, prevent mining operations off Texel and in the Heligoland Bight or Mosquito operations at Kassel and in the Ruhr.

expected layer cloud which might, at least to some extent, have masked them from their attackers. Moreover, they also left dense condensation trails behind though they were below the height at which these guides to fighters were usually produced.<sup>1</sup>

In these conditions the German night fighter force was easily fed into the bomber stream where it wrought a fearful execution and accounted for the vast majority of the ninety-five Bomber Command aircraft which failed to return. A high proportion of these kills occurred on the long and unvarying track between Charleroi and Fulda in the first hour and a half after midnight and the German communiqué scarcely exaggerated when it announced that 'our air defences achieved their greatest success while warding off British terror raids on Nurnberg. They prevented concentrated attacks being carried out and', it was said, 'destroyed 132 4-engined bombers. . . .'<sup>2</sup>

In the Nuremberg action Bomber Command suffered the ill consequences of unusually bad luck and uncharacteristically bad and unimaginative operational planning which, at any rate in combination, was hardly likely to be repeated. On the other hand, the performance of the German fighter force was, as earlier events had shown, more than a flash in the pan. It was generally held, and particularly so by the Commander-in-Chief, Bomber Command, that the outcome endangered the future prospect of sustained and massive long-range operations, at least in the absence of radical 'remedial action'.

Thus, at the very time when the German fighters were beginning to lose control of the air over Germany in daylight, the night fighter force appreciably strengthened its grip on the situation during the hours of darkness. This achievement, though no more than a fluctuation in a struggle of constantly changing fortunes, was enough to drive Bomber Command away from Berlin, away from the northern route and, in the end, to make the prospect of massive and concentrated long-range operations by any route appear extremely bleak. The basic tactics of Bomber Command which had been pursued with vigour and increasing effectiveness since March 1942 were now, at last, in March 1944, severely checked by the hitherto unparalleled ascendancy of the German night fighter force.

This, however, as a result of an earlier decision, was also the time at which the *Pointblank* offensive was due to end and the phase of direct preparation for *Overlord* to begin. Indeed, operations against the French railway system in connection with the latter aim had already begun. Thus, by a coincidence, which was, perhaps, as

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<sup>1</sup> The forecasts did not include predictions about condensation trails which were not common beneath about 26,000 feet.

<sup>2</sup> O.R.S.(B.C.) Report, 3rd May 1944, do. Nt. Raid Report, 4th July 1944, and B. Ops. 2(a) folder.

fortunate as it was fortuitous, the focus, though not the whole of the Bomber Command offensive, was shifted after the Nuremberg operation from Germany to France. The approach of spring and the shorter hours of darkness would in any case soon have restricted Bomber Command to a much shallower penetration than that which had characterised the Battle of Berlin. Nevertheless, before this natural factor became operative and before the *Overlord* 'diversion' became dominant, the Battle of Berlin had demonstrated a growing superiority of the night fighter over the night bomber and had raised in the mind of the Commander-in-Chief well-founded doubts as to the practicability of maintaining the long-range Bomber Command offensive against Germany in a concentrated and a sustained form.

Moreover, the actual destruction and damaging of Bomber Command aircraft was not the only contribution made by the German night fighters and anti-aircraft guns to the indecisive conclusion of the Battle of Berlin. These air defences did, as we have noticed, eventually break the major concentration of aim in the Battle, but their harassing, as well as their lethal effect, was also an important factor in the relative inefficiency of most of the operations against Berlin and many of those against other targets. In the Nuremberg action it is probable that only a small proportion of the force reached the target at all.<sup>1</sup> This inefficiency of attack was the second principal factor in the indecisiveness of the Battle of Berlin, but the German air defences were by no means its sole explanation. Another, and from this point of view, an even more important difficulty was the operational limitation which the combination of range and darkness continued to impose upon Bomber Command, especially in the case of larger targets and under the conditions of winter weather. Nearly all the major actions of the Battle of Berlin, and especially those against the German capital itself, tended to result in inaccurate marking and widely scattered bombing. Often severe destruction was caused, but it never amounted to the concentrated havoc which could, almost at will, be achieved in the Ruhr within *Oboe* range. The most successful attack which took place in the whole period of the Battle of Berlin was undoubtedly the operation against Essen on the night of 26th March 1944. Though the main force dropped its bombs through unbroken cloud on this, as on so many other occasions, the concentrated glow of accurately placed *Oboe* markers was adequate to draw a heavy and well-concentrated attack upon the centre of Essen.<sup>2</sup> In operations farther afield this concentrated aiming

<sup>1</sup> None of the night photographs showed the target area though thirty-four of them were within three miles of the centre of Schweinfurt. O.R.S.(B.C.) Nt. Raid Report, 4th July 1944. This no doubt was due primarily to unpredicted winds which scattered the force over a wide area. Nevertheless the evasive action which became necessary when fighters were about made accurate navigation very difficult if not impossible.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 26th June 1944.

point was seldom, if ever, provided and the main force attacks were accordingly dispersed over much wider areas.<sup>1</sup> The six further actions of an effectiveness compared with those in the Battle of Hamburg about which Speer was apprehensive did not take place in the Battle of Berlin.

Despite the vigour, courage, resolve and endeavour which have made the Battle of Berlin famous in the annals of Bomber Command, a greater deployment of strength achieved results which were less effective than those which, at the cost of lower casualty rates, had followed the Battle of the Ruhr and particularly the Battle of Hamburg. This was due primarily to the operational limitations which continued to beset the force at long range and to the increasing effectiveness of the German air defences and especially the night fighter force. Though Berlin had felt the weight of war, the consequences were less severe than Sir Arthur Harris had hoped. From this point, however, Bomber Command went forward, not to defeat or to neutralisation, but in alliance with other forces in the air and on the ground, to increasing, and presently decisive, success.

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<sup>1</sup>O.R.S.(B.C.) Nt. Raid Reports, Berlin, 18/19th Nov. 1943, Nuremberg 30/31st March 1944.





CHAPTER XI

THE  
COMBINED BOMBER OFFENSIVE:  
APPRECIATIONS AND RESULTS

1. The economic basis of the Combined Bomber Offensive
2. The expansion of German armament production and the response to the Combined Bomber Offensive
3. Appreciations and results of general area bombing
4. Appreciations and results of attacks on specific target systems

'It is better to cause a high degree of destruction in a few really essential industries or services than to cause a small degree of destruction in many industries.'

*Report of the Committee of Operations Analysts,*  
8th March 1943

'I would tell the front. Germany itself is the real front line and the mass of fighters must go to its defence.'

FIELD-MARSHAL MILCH, 25th August 1943

## 1. The economic basis of the Combined Bomber Offensive

**T**HE basic problem of the Combined Bomber Offensive, as will be apparent from the previous two chapters, was to harmonise the intention of the Eighth Air Force to carry out precision attacks upon key points in the German war economy with the operational practice of Bomber Command, which resulted in area attacks upon whole towns. But the issue was not between precise and imprecise bombing. Both forces naturally strove to be as accurate as possible. It was between selective and general attack.

The principle of selective attack, which could be pursued both by precision attacks upon individual factories or by area attacks upon particular towns, is expressed in the first of the mottoes to this chapter. The principle of general attack, so often expressed by Sir Arthur Harris, was based upon the belief that there really were no vulnerable key points in the German war economy other than the industrial cities as a whole, and that even if there were, the results of the destruction of any one of them would certainly be neutralised by the use of substitute or alternative materials, the consumption of stocks and measures of dispersal.

The theory, if not always the practice, of the Combined Bomber Offensive was, however, based more upon the selective than the general principle of attack. The Eighth Air Force, as has been shown, was supposed to make precision attacks upon the key points and Bomber Command was increasingly urged to carry out area attacks upon the associated towns. This strategic decision has been discussed in Chapter IX. In this section the economic appraisal upon which it largely depended and by which the actual selection of key points and associated towns was made, is considered.

The plan for the Combined Bomber Offensive was made primarily by the United States Army Air Forces advised by its own special departments set up for that purpose. But, as was indicated at the end of Chapter VIII, it owed a great deal to the continuous study of the problems involved which had been made in Britain during the war years and its final form was considerably influenced by the criticisms of M.E.W. During 1942 there had been close co-operation between United States and British economic departments, and, while they had sometimes come to different conclusions on difficult problems, in nearly all cases these differences could be resolved by further study and discussion. But when the Eighth Air Force was to be committed to a strategic offensive against Germany which all knew would be extremely hazardous, it was essential that its targets should receive

new consideration in the United States. Indeed, the amount of the United States aircraft production which could be assigned to this aspect of the war had to be determined to a large extent by the objectives to be chosen, the probability of a successful attack upon them and the results of such air attack on the ability of Germany to resist the planned invasion in the West. It is true that a directive had been drawn up at Casablanca at the beginning of 1943 which designated certain target systems for attack. But this had been hastily made with little reference to the character of the Eighth Air Force or to United States information on the German economy. There was no real agreement on the best targets for precise attack or for the area attacks of Bomber Command if the latter was to be combined with the precision bombing of the Eighth Air Force so as to produce the maximum effect on German industry. In any case no combined offensive was possible before June except that directed on the submarine bases and construction yards because the Eighth Air Force was not yet ready to take part in it. There was thus time to prepare a comprehensive plan and collect economic information from many quarters in the United States.

The planning was begun by the Committee of Operations Analysts which General Arnold appointed in December 1942. It was directed to make a plan for the strategic bombing attack on Germany and to estimate how long it would take to soften Germany sufficiently to make possible an invasion in the West.<sup>1</sup> This Committee was formed by adding a number of civilian advisers to some of the planning officers of the United States Air Staff. The former were men of wide outlook and training rather than possessed of any special technical or economic knowledge. Two, Messrs. Elihu Root Jnr. and Thomas W. Lamont, were members of financial firms which had wide connections with industry. A third, Professor Edward M. Earle, was a historian of military and diplomatic affairs. Two others, Messrs. Fowler Hamilton and Edward S. Mason, represented the Board of Economic Warfare and the Office of Strategical Services. The Committee had thus easy facilities for obtaining information and advice both from the most important firms in the United States and also from the United States agencies which were in close touch with M.E.W. and other offices in London. It worked with great energy, setting up a number of sub-committees to study various target systems which reached the number of nineteen when the report was completed. In January, four of its members came to London to consult the staff of the Eighth Air Force and the economic division of the United States Embassy and through them the departments in Britain which had been studying the same problem. The Committee also

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<sup>1</sup> Extract printed in *The Army Air Forces in World War II*, Vol. II, p. 353.  
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obtained a good deal of information from United States specialists in engineering and construction, who in some cases had helped to build the plants about to be attacked, and the estimates made by the Committee of the vulnerability of the targets seem to have been largely derived from this source.<sup>1</sup> But the report was certainly also much influenced by the studies already made by M.E.W. on the target systems suitable for precision attack and selective area bombing.

As has been seen, M.E.W. had paid a great deal of attention in 1942 to the problem of discovering 'bottle neck' targets which could be bombed with advantage, and had been encouraged to do so by certain sections of the Air Ministry. But its latest report, made at the request of the Air Intelligence Branch, was based on rather different principles from that of the United States team.<sup>2</sup> The information had been called for because of the necessity of finding the best methods of carrying out the Casablanca directive which, it will be remembered, placed submarine construction and the aircraft industry as the first priorities in its rather vague instructions. M.E.W. recognised the necessity of attacking the aircraft industry but repeated the old objections of its widespread character. It might, therefore, be better to concentrate on some one part of the industry such as the assembly plants of single-engine fighters or aero-engine construction and the primary targets for such purposes were attached. On the whole, M.E.W. preferred an attack on the former rather than the latter since the effect would be more immediate. But the report also attempted to prove that a better way of attacking the aircraft industry was by destroying some indispensable component, the manufacture of which was concentrated in a few plants and of which large stocks did not exist. The prime example of this target system was the ball-bearing industry which had for some time been that most favoured by M.E.W. for selective attack. In addition, M.E.W. thought that similar though not such great advantages were offered by components of internal combustion engines such as fuel injection pumps and electrical apparatus, aircraft propellers and rubber tyres. It was more difficult to find any such components for the submarine construction industry, but accumulators were added for that purpose though admittedly a much less vulnerable target system. Lists of the principal targets for all these industries were, therefore, included. The submarine construction industry itself, M.E.W. thought, was not a very rewarding target because the yards were difficult to destroy and easy to rebuild quickly.

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<sup>1</sup> The work of the Committee is described in some detail in Chapter 11 of *The Army Air Forces in World War II*, Vol. II, which states that 'Much of their information came from qualified experts in private industry' (p. 355). We discussed the report with the late Professor Earle.

<sup>2</sup> Memo. M.E.W./E.I.2 to A.I.3c(1), 4th Feb. 1943

Hardly any of the primary industries could qualify for a place, since a large proportion of their output was directed to non-military uses, and there were in most cases large stocks. The only ones which in the opinion of M.E.W. merited further consideration were aluminium and synthetic rubber, both of which had a highly concentrated production, were in short supply and possessed no idle plants.

Finally, in the field of heat, light and motive power, the industries were all too widespread and not devoted exclusively enough to military needs to be worth attacking. Only oil was a possible exception, owing to the stringency of the supply position, but enough was not yet known of the probable development of its synthetic production in 1943 to determine whether an attack was worth while. Still, to complete the schedule the main targets of these last three systems were also listed. All these target systems were in a sense competitive with one another since a completely successful attack on any one of them would make any other attacks unnecessary.

These objects, M.E.W. admitted, were in many cases only to be obtained by precision bombing such as might be carried out by the Eighth Air Force, but it added that in others, where a town was highly specialised in some particular industry, 'area attack may be an essential factor in the interruption of activity in this industry.' Schweinfurt, which specialised in the ball-bearing industry, was such a town though it was not specially mentioned in the discussion. But a list of such towns in Germany and Italy was included alongside the towns in the primary lists.<sup>1</sup> This paper was thus a further contribution to the problem of linking up the precision attack which might be expected from the Eighth Air Force with the area bombing of Bomber Command.

The report of the United States Committee of Operations Analysts was made primarily for the Eighth Air Force. It was founded on the principle of selective attack, and in applying this principle to its problem, the Committee took into account a number of factors which were much the same as those used by M.E.W., though described in rather different terms. The nineteen target systems mentioned in the report had all at one time or another been considered by M.E.W., and in most cases the American conclusions were the same though in many cases founded on data which conflicted with those considered more authoritative in London. The Committee had necessarily to put the opposing aircraft in the first category, because to attack the enemy's air force as a preliminary to all else had also been a main principle

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<sup>1</sup> 'The towns specified in Column 2 are those of sufficient size to be suitable for area attack and of sufficient specialization in the industry concerned to give reasonable prospects of interrupting its activity by general dislocation.' Memo. M.E.W./E.I.2 to A.I.3c(1), 4th Feb. 1943.

of United States theory.<sup>1</sup> They agreed with M.E.W. in placing single-engine airframe plants before aero-engines and for the same reason. What must have been even more satisfactory to M.E.W. was the placing of the ball-bearing industry second in priority to aircraft, a result no doubt partly due to its own persistent advocacy. The time lag between the destruction of the target and the effect on military production was estimated to be only one month, while M.E.W. had not ventured to predict less than three months because of stocks in the pipeline. Oil was given third place. Moreover, the effect on the supply of aviation spirit by the destruction of the synthetic plants was pointed out, if not emphasised. There were, however, some reservations as to whether the effect would be immediate enough to warrant such a high place, and the importance of Ploesti was pointed out.

These judgments were almost the same as those of M.E.W., but then came a radical departure; for the grinding-wheel industry was placed fourth in the list, a target system which had long ago been considered and discarded by M.E.W. Non-ferrous metals were placed fifth, a position which also was altogether too high for M.E.W., but synthetic rubber, the second bottleneck of M.E.W., was given the sixth place. There was no mention of propellers or the other components which M.E.W. had singled out.

The Committee took the same view as M.E.W. of the difficulty of producing any effect on the submarine campaign by bombing its yards, though, for the reason that the time-lag would be so long. It gave it only seventh place. The next two places were given to transportation, one of the target systems of the Casablanca directive. But the Committee shared the view of M.E.W. that the transportation system as a whole was far too widespread for any effective attack to be made on it. Only when the invasion was imminent was such an attack advisable, and then it would be on a limited area for tactical reasons. Until then better results would be obtained by attacking the motor-vehicle industry which was concentrated in a smaller number of plants in France and Germany, but this would produce no immediate effect since production was small in relation to stocks.

It is not necessary to consider the analysis of all the other ten target systems since they were more or less rejected as primary objectives. But it may be pointed out that the connection between the chemical, oil, rubber and explosive industries was not recognised as important, though the fact that the destruction of the nitrogen plants would have a disastrous effect on synthetic oil production was noted. But so much nitrogen was directed to fertilisers that the commodity was put in the penultimate place in the list. The report did nothing, therefore, to

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<sup>1</sup> The order is that given in the report where, however, it is said that for reasons of security it is not that of priority. But there was an understanding that this was not so and M.E.W. and other commentators always assumed that the order was one of priority.

correct the analysis of this target system which had been made in London, and its estimate of nitrogen production was, in fact, based on very inadequate information as was soon pointed out there. Similarly, though no attack on the machine-tool industry was recommended, the United States planners shared the same illusions as experts in London on the position of the machine-tool industry in Germany. The electric power plants were excluded for the same reasons as had influenced M.E.W.

Finally, as has been noted in Chapter IX, it should be emphasised that the plan was for a combined offensive of both the Eighth Air Force and Bomber Command. The Committee, therefore, included in its report a list of 'related' towns such as had already been drawn up by M.E.W. and was, no doubt, derived from that source. Close correlation in the selection of the target of the two forces was, it was stated, of primary importance and had influenced the Committee in its selection. This could be obtained because of the close relationship already established between the Eighth Air Force, Bomber Command, the Air Ministry, the Economic Warfare Division of the United States Embassy and M.E.W. The Eighth Air Force should be given all the information collected in the United States, some of which had not previously been conveyed to it. But it was in close touch with British sources of information and it was better to leave the selection of the targets within a wide directive to be determined by the commanders of the two forces on the advice of their own staffs, operational and economic, who would be in continual communication with each other. There was thus meant to be co-operation in the selection of the targets as well as in the other aspects of the offensive.

The report was well received in Washington and forwarded to London for discussion with the British authorities and the Eighth Air Force which set up a special committee to consider it. There also it received warm praise, but, in addition, a good deal of criticism. M.E.W. were able to agree with the Committee on most of its primary objectives, preferring, however, their own select components to the grinding-wheel industry or non-ferrous metals. They also agreed on the low priorities given to transportation and submarine construction and were even less favourable than the Committee to an attack on the motor-vehicle industry. They had many criticisms of the information on which the report on other targets was based, but this did not matter since the conclusions were the same as their own. They were especially critical of the estimate of the nitrogen situation, but their observations did nothing to bring the whole subject into better focus.<sup>1</sup>

The criticism of the Economic Division of the United States

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<sup>1</sup> Letter and Memo., Vickers to Portal, 3rd April 1943. App. 22.



Embassy was less inhibited and more severe. It gave warm praise to the presentation of the fighter-aircraft industry, which was one 'that we can be proud to exhibit to our British colleagues'. But it considered that many of the sub-committees had failed to associate their conclusions with any estimate of the effect likely to be produced on German armaments. The report on nitrogen was characterised as 'absurd'.<sup>1</sup>

These criticisms show how much of the economic planning always depended on assumptions which could not be verified in the circumstances of the time. But while the discussion continued, a plan had to be made, and this was done by a board of United States officers to which was added, at General Eaker's request, Air Commodore Bufton, the chief advocate of selective bombing in the Air Ministry. Its primary task was to assess the total force required and the manner in which it could be built up in the light of the operations of the Eighth Air Force during the last nine months. Nor could it base its choice of target systems entirely on the analysis of the experts. Thus, in spite of the adverse opinions of the United States and British experts, submarine yards and bases were put first among the primary objectives, doubtless because the Board realised that, in the precarious condition of the Battle of the Atlantic, no plan was likely to be accepted by the Joint or Combined Chiefs of Staff unless an attack on the German submarines were given a prominent position in it. But, by an ingenious device, the fighter industry was given a special position by terming it an 'intermediate' target on the destruction of which the whole success of the offensive depended and the rest of the aircraft industry was placed on equal terms with the submarine industry as a primary objective. The other primary targets were the result of the discussions of the experts. Thus, ball-bearings retained its position immediately after submarine and aircraft construction, and it was stated that the destruction of the targets selected (seventy-six per cent of the total production) 'will have immediate and critical repercussions on the production of tanks, airplanes, artillery, diesel engines—in fact upon nearly all the special weapons of modern war'. This was further than M.E.W. had yet ventured to go. Moreover, an immediate attack on the industry was planned in the first stage of the offensive when all the other targets selected needed only shallower penetration. The fourth primary objective was oil, but the necessity of an attack on Ploesti as well as on German plants was indicated and it was not given the same support as ball-bearings. Two other target systems were made secondary objectives to be attacked in force only at the later stages of the offensive. In the first of these, rubber and rubber tyres reflected the opinion of the experts, but the second,

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<sup>1</sup> Memo. Kindleberger to Hughes, 7th April 1943.

military motor transport vehicles, had not received great support from the Committee of Operations Analysts and had been decisively rejected by M.E.W. It was, perhaps, included in order to provide suitable targets in France for bad weather and freshmen crews. Finally, the plan was presented as a combined offensive of both the Eighth Air Force and Bomber Command and included in the maps of the target systems was the list of towns recommended by M.E.W.<sup>1</sup>

The report was taken by General Eaker to Washington for submission to the Joint Chiefs of Staff, but in a letter to General Arnold, Sir Charles Portal stressed the British contribution to it and that it had been drawn up 'in close consultation with the Ministry of Economic Warfare'. The economic side of the report was accepted without criticism by the Joint Chiefs of Staff. Their discussions concerned only the possibility of obtaining the necessary forces to achieve these objects in competition with demands from other theatres of war. The report was, indeed, rearranged a good deal in order to make it a more suitable paper for discussion, and in the process the references to the co-operation of Bomber Command were couched in somewhat less peremptory terms, as has already been noted in Chapter IX. But the maps with the list of 'related' towns were retained, and it was stated as an obvious fact 'that when precision targets are bombed by the Eighth Air Force in daylight, the effort should be complemented and completed by R.A.F. bombing attacks against the surrounding industrial area at night'. This joint attack was, indeed, the assumption on which the economic experts had based their estimates of the possibility of inflicting sufficient damage on the industries concerned to allow an invasion to be made with prospect of success.<sup>2</sup>

In the discussions of the Combined Chiefs of Staff at the *Trident* Conference the only economic point considered was the question of oil. Sir Charles Portal was not prepared to accept it as a target system unless an attack on Ploesti was thought to be feasible. General McNarney, representing General Arnold who was ill, assured him that it was. No reference was made to the question of aviation spirit. In the translation of the document into the *Pointblank* directive the same economic priorities were given, though, as has also been noted in Chapter IX, a clause meant to lay even greater emphasis on ball-bearings was not included in the final version.

The validity of the estimates in these plans will be considered in sections 3 and 4 of this chapter in connection with the results of the bombing. But it should be noted here that the close co-operation of the economic departments in London envisaged in the report continued throughout the war. In this period, indeed, though they were

<sup>1</sup> The Combined Bomber Offensive from the United Kingdom, (C.B.O. Plan), 12th April 1943.

<sup>2</sup> Letter Portal to Arnold, 15th April 1943. C.B.O. Plan, 14th May 1943. App. 23.

in close touch with one another, the machinery to utilise their advice with practical effect was still largely lacking. In the final stage of the war, as will be seen, this system was improved mainly by the use of sub-committees which reviewed the various target systems on which both economic departments were always represented. The Eighth Air Force also received all the estimates made by the British agencies of the results of the bombing and advice on their targets in addition to the information already incorporated in *The Bomber's Baedeker*. Their main target system, the aircraft industry, had been for long specially studied in the Air Intelligence Department. A special joint committee to select the targets for *Pointblank* was known as the Jockey Committee, but this dealt almost exclusively with the targets of the Eighth Air Force.

Even more close was the co-operation of the two forces on the vital question of photographic reconnaissance and the interpretation of the photographs of the results of bombing attacks. The information obtained by the Royal Air Force during previous years was naturally placed at the disposal of the United States Army Air Forces including their classified records. Thus, though the Eighth Air Force began to organise its own reconnaissance units so that its commanders could plan the reconnaissance necessary for their own attacks, the interpretation of the photographs of damage always remained centred at Medmenham. There the United States had its own team which was initially trained by the experienced staff at Medmenham and then could transmit its knowledge to its reinforcements. But only one establishment existed until the end of the war and in no sphere was allied co-operation more long-standing and successful. This was fortunate, for if there had been two centres of interpretation of damage to targets, which were often attacked at close intervals by both forces, much friction and confusion would certainly have ensued. As it was, this indispensable part of the machinery of the strategic offensive was able to serve both forces with great and growing efficiency.<sup>1</sup>

All this information was checked by the United States economic warfare department as well as by advices from Washington. Naturally there were sometimes differences of view on details, but in the main the economic estimates of the effect of the combined offensive on the aircraft industry and ball-bearings represented a joint view. As has been seen, however, this economic appreciation had little effect on Sir Arthur Harris until a late stage in the offensive, and M.E.W.,

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<sup>1</sup> A.H.B. Narrative, *Photographic Reconnaissance*, Vol. II, pp. 73-81. The co-operation was threatened in 1944 when a new Reconnaissance Wing was formed under Lt.-Col. Eliot Roosevelt to co-ordinate all the sources of the United States Army Air Forces including its 9th Air Force destined for service on the Continent. But fortunately this attempted breakaway did not succeed so far as operations from Britain were concerned. The Tactical Air Forces on the Continent, however, necessarily developed separate interpretation units.

R.E.8 and J.I.C. had to devote much of their attention to surveying the results of the general area offensive on the whole range of German industry. This difficult task needed much technical knowledge, and in April 1943 a special Armaments and Engineering section was set up in M.E.W. which by the middle of 1944 had become a large department.

The effect of the offensive in any case obviously depended on how German industrialists and German workers responded to the problems caused by the weight of bombs that was poured upon their cities and factories, and this is the theme of the following section.

## 2. The expansion of German armament production and the response to the Combined Bomber Offensive

In 1943, it has been calculated, about 200,000 tons of bombs were dropped on Germany, nearly five times as many as in 1942. Between March 1943 and March 1944 200,000 people were killed and a much larger number injured. In 1943 over 212,000 buildings were destroyed or so seriously damaged as to be beyond repair.<sup>1</sup> In the spring the Ruhr was heavily attacked and many of its cities heavily damaged; in the summer Hamburg was devastated in a manner never before known and never equalled subsequently in Europe except in the case of Dresden at the end of the war; in the autumn and winter months Berlin was subjected to an almost continuous assault both by heavy bombers and by Mosquitoes and many of its most important factories were seriously injured. In these three main battles of Bomber Command many other cities were attacked and often with great success. The Eighth Air Force made only a small contribution to the onslaught on Germany in the first half of the year 1943, but from June to October it concentrated on the factories producing fighter aircraft with considerable, if disappointing, results, while its renewed attack in February 1944 caused consternation among those directing German armament production. It was natural that those in Britain who surveyed this unprecedented destruction should think that German armaments production must have been sensibly reduced and the morale of the German people, perhaps, fatally undermined.

In fact, however, armaments production was not only maintained but much increased during the first half of 1943. It remained at that level, with a slight fall at the end, during the second half and then rose steeply again in the first half of 1944, reaching its peak in about the middle of that year. The workers, both native and foreign, endured the ordeal to which they were subjected without any widespread demoralisation. The first result was due to the reorganisation of German methods of production by Albert Speer, the ablest of all Hitler's lieutenants, the second to the measures taken to deal with the effects of the bombing, the strong controls which could be employed in a totalitarian state and the capacity of men and women to endure far greater ordeals than either military men or civilians had thought possible, if they were given the necessary help and leadership. The stoicism and, indeed, in many cases the heroism of the German people may be considered to have been mistaken, but, whatever the consequences, the refusal to accept defeat through anguish and terror

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<sup>1</sup> The figures are approximate.

must command respect and admiration. Albert Speer, himself, paid tribute to the workers when, still apparently full of hope for the future, he surveyed the last eighteen months in July 1944: 'What happened from 1943 to July 1944 in ever increasing measure', he said, 'can really not be described otherwise than as a miracle: the Armament Miracle, as we call it, since none of us would have dared to state in 1943 that, after the destruction, first of all experienced by Hamburg, then in Berlin, Frankfurt, Munich, Stuttgart, Schweinfurt and the Ruhr district on the same scale, an organised armament production could again be built up. This Armament Miracle is again mainly, and one can almost say entirely, due to our German worker, who after every attack even after his own dwelling had been heavily damaged, was again at his place of work within two or three days at the most.' <sup>1</sup>

(i) *The Armament Miracle*

Speer's tribute was given when he was demanding even greater efforts in the future and he was no doubt aware that it was an over-statement. Cases can be cited when the response was by no means so good as he averred, especially from the women workers. Still it was in a large measure true. But the miracle, if impossible without the co-operation of the workers, was mainly due to the reorganisation of German armaments production which Speer had almost completed by July 1944. He had by that time obtained for himself the direction and control of the whole of it and much else besides. He had, he informed Hitler in a Conference on 5th June 1944, succeeded after two years' effort in merging the equipment of the three services into a single entity. 'My aim in this matter', he said, according to the record, 'is to have it clearly understood that the main responsibility for everything in Armaments and War Production—including labour—rests in fact as well as in theory with me'. <sup>2</sup> He had, indeed, by that date, a very different position from that which he had held in 1942. His success in that year, if only partial, had caused Hitler to turn to him when the Stalingrad disaster showed that a new and prolonged effort would be necessary to win the war. His new title of Minister for Armaments and War Production expressed his real position. He gradually assumed control over all aspects of it. Until his illness in January 1944 he had the entire confidence of Hitler, who rarely refused any of his demands. His reports were carefully composed to produce the desired effect, though, of course, it was Hitler himself who decided what weapons should have priority. <sup>3</sup> Armed with the

<sup>1</sup> Speech by Speer, 28th July 1944, Speer Docs. (Hamburg Series). Only a fragment of the speech is in his papers, but its purpose was to urge further co-operation between his department and industry, especially the smaller firms.

<sup>2</sup> Notes on Confs. with Hitler, 3rd-5th June 1944, Speer Docs. (Hamburg Series).

<sup>3</sup> Speer used photographs when necessary to enforce his point. Thus, by this means he showed Hitler the injury to the submarine pens at St. Nazaire by bombing and the

Fuehrer's orders, obtained for the most part in conferences in which the whole range of armaments was surveyed, he was able to transform the methods of a large part of German production, utilise far more economically and resourcefully the scarcer raw materials and employ to much greater effect a labour force in which the proportion of foreign workers, both conscript and volunteer, grew ever larger as the years went on.

The support of the Fuehrer was needed, for throughout this period Speer was no favourite of the old guard of the Party and the Gauleiters, who saw their own control of economic matters threatened by his activities. Funk, the Minister of Economics, was, indeed, conscious of his own defects, easily surrendered all that Speer demanded and even offered more. With other 'technical' ministers, as Speer called them, such as Backe (Agriculture), Dorpmueller (Transport), Schwerin von Krosigk (Finance), he found it the more easy to co-operate since they were mainly concerned with the efficiency of their own departments. But as his power grew, Speer found himself in conflict with prominent leaders who were jealous of his position.

Chief among these was Bormann, who had succeeded Hess as head of Hitler's Party Chancellery. By increasing vigilance, sycophancy and energy, he had by the end of 1942 built up for himself one of the most powerful positions in the Reich. He was in effect Hitler's private secretary or *Chef de Cabinet* and in addition handled much of his private finance. He never left Hitler's side and became indispensable to him; Hitler's 'permanent shadow', Speer called him. At first he backed Speer conspicuously, but as soon as Hitler began to praise the success of his brilliant architect in his new position Bormann saw in Speer a threat to his own power. He had established a dominating control over the Gauleiters who were only allowed to approach Hitler through himself. He even insisted that their correspondence with the Ministers of the Reich should be channelled through his office which was staffed by young and energetic men. Most Gauleiters who resisted him, he managed to get Hitler to remove or reinforce by a deputy of his own choosing. The Gauleiters always claimed that they took orders only from Hitler himself and Bormann's were nearly always issued in the name of the Fuehrer. The Ministers had to deal with them as equals and, if their orders were disobeyed, had little remedy except an appeal to Hitler himself. Thus, Bormann could always, if he wished, cause great difficulties for any Minister whom he disliked.<sup>1</sup>

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necessity of strengthening the concrete. No doubt he, like others sometimes, when it suited his purpose, described as 'Fuehrer orders' what were merely casual remarks in the course of the conversation.

<sup>1</sup> This description of his relations with Hitler's subordinates is largely derived from Speer's own account (Speer interrogations, June and July 1945), but it is in the main confirmed from other sources. The account given in Professor H. R. Trevor-Roper's *The*

Lammers, the head of the Political Chancellery, also hoped to make himself a sort of deputy to Hitler and in 1943 worked with Bormann to that end. But he was a weaker man and fell under Bormann's influence. Keitel, the Chief of *O.K.W.*, one of the weakest characters at Headquarters, also found it convenient to work with him.

Attempts were made to undermine the position of this sinister man but without avail. Goebbels, whom Speer described as 'the most intelligent of our leaders', combined with Speer in 1943 in an effort to reassert the power of the Ministers against Bormann, Lammers and Keitel, 'the three wise men from the East', as he called them. They hoped to use Goering for this purpose and revive the Reich Council of Defence, of which he was Chairman, to control domestic policies. As co-ordinator of relief measures Goebbels had an interest in those beyond his own sphere and he enlisted the support of Funk and other ministers besides Speer.<sup>1</sup> But Goering was too weak and inconsequent to play the role assigned to him and his reputation had declined. Thus, Goebbels himself, who was above all a Party man, went over to Bormann's side, and shared with him the control of domestic policy. He was, like Speer, an advocate of total war and that brought them together in 1943. But Goebbels disliked Speer's method of working through private industry and consequently did not wish to increase his power. Speer and the 'technical' Ministers helped one another as much as possible, but were never an organised group. Speer was their leader, so far as they had one, because he alone of them had access to Hitler. 'It was not', he said, 'an easy task to be a "specialist minister" in this war; bombed by the enemy, not respected by the "big shots" of the Reich, without any backing and bitterly denounced for every mistake. However, relatively speaking I was better off than the others.'

Two other Ministers were of importance to Speer. With one, Sauckel, the Plenipotentiary of Labour, he was in continual conflict. Sauckel was on good terms with Bormann and was thus able to fight a not unequal battle with his opponent. The other Minister was Himmler, who as head of the S.S. tried to set up a rival armaments organisation in his Concentration Camps, partly for power, partly for money. He had to be conciliated with the promise of special treatment for the S.S. Divisions in the Army. He also aimed at the succession, but in this period he seems to have been holding his hand,

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*Last Days of Hitler* (1947) of Hitler's court is largely based on them. See also Alan Bullock: *Hitler A Study in Tyranny* (1952), pp. 669-670, where, however, the importance of Sauckel is not perceived. Speer suggested that Bormann had been influenced by the career of Stalin and hoped to build up his own position in the same way.

<sup>1</sup> *The Goebbels Diaries*, Translated and edited by Louis P. Lochner (1948), pp. 196-203, 236-237. Speer Interrogations, June and July 1945, where this account is confirmed. Speer in his interviews with Hitler also supported Goebbels at this time, e.g. in Goebbels' attempt to take over propaganda in the army from the military authorities. Notes on Confs. with Hitler, 13th-15th May 1943, Speer Docs. (Hamburg Series).



though he became a dangerous enemy of Speer in the later stages of the war.<sup>1</sup>

With the fighting services Speer succeeded in establishing very cordial relations. They realised that he was producing the weapons that they needed, though they might complain at times that these were insufficient. Keitel, the Chief of Staff, was no more than a secretary and Speer despised him. Nor did he pay great attention to Jodl, the Chief of the Operations Staff. At Hitler's headquarters he did his technical work largely with General Buhle, Chief of the Army Staff of *O.K.W.* at Field Headquarters, who was used by Hitler for his technical work.<sup>2</sup> But he preferred to establish direct relations with the Army leaders, such as Fromm, Zeitzler and Manstein, whose talents he respected. He paid many visits to the fronts, to find out exactly what was most needed, a duty neglected by Hitler and his staff. He thus remained on good terms with the Army leaders most of the time.

In Raeder's time the German Navy would have no interference by Speer. But Doenitz, who replaced Raeder as Commander-in-Chief of the Navy in the spring of 1943, was quite ready to entrust to Speer the construction of the new U-boats necessary to win back the initiative in the submarine war. Thus, Speer was able to apply prefabrication methods to their construction and overcome the opposition of the established shipbuilding firms to such methods.

It was a different matter with the aircraft and aero-engine production which Goering for long refused to hand over to Speer. Their relations had been outwardly good for when he was appointed Speer handled the Reichsmarschall with great tact.<sup>3</sup> He even thought, as has been seen, of using him against Bormann. But he soon discovered his incapacity and lack of resolution. Moreover, it was essential for him to get control of aircraft production not only because he believed it to be inefficiently managed, but also because, without control of it, he could not complete his rationalisation of the armament industry, which was continually being complicated by the claims of the *Luftwaffe*. Speer's relations with Milch seem to have been cordial, but the

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<sup>1</sup> Speer described him 'as a combination of a schoolteacher and a crank'. When asked whether he was a sadist Speer said that he had heard him tell Hitler that it was a good thing to put criminals in charge of concentration camps. Himmler never received the percentage of armaments which he had been promised. Speer Interrogations, June-July 1945. *Trial of German Major War Criminals, Proceedings of the International Military Tribunal Sitting at Nuremberg, Germany*, Pt. 17, p. 18. Later Speer was to protest against Himmler consigning all recaptured escaped prisoners of war to his own camps in order to increase his labour force.

<sup>2</sup> In May 1944 a Colonel von Below was made liaison officer between Hitler and Speer. Notes on Conf. with Hitler, 22nd and 23rd May 1944, Speer Docs. (Hamburg Series).

<sup>3</sup> Thus he had accepted a position in the Four Year Plan which in theory made him subordinate to Goering but in practice made little difference (*The Trial of German Major War Criminals*, Pt. 17, p. 6). It enabled Goering to assert himself occasionally and satisfy his *amour propre* (Letter Goering to Speer, 5th Nov. 1942, Speer Docs. (Hamburg Series)).

latter could not but be aware that he, in a subordinate position, was unable to give the same impetus to production as Speer by the utilisation of men outside the industry to enforce modern methods. It is possible, as was often asserted, that the Speer organisation denied to the *Luftwaffe* their due share of raw materials and components, though Speer himself denied it and no convincing evidence of it has been found. But Speer certainly helped Milch at times by obtaining from Hitler directions to prevent undue interference in production by Goering and his incompetent favourites.<sup>1</sup> It is easy to understand, however, why Milch, when the crisis came in February 1944, gladly handed over control of fighter production to a man who controlled the main resources of the Reich and could command the services of the best directors of war production.

Meanwhile, Speer had been with more ease extending this control over other parts of production. He acquired from Funk in the spring of 1943 the direction of all production which had been left in the hands of the Minister of Economics.<sup>2</sup> Thus, from September 1943 he had control of raw materials and, though it was too late to expand the basic industries, he could more easily adjust them to the particular needs of armament. He had many other offices. He was director of building construction, of roads, of water and of power. He was Plenary General for the repair and rehabilitation of bombed cities for which he could use his position as head of the Todt Organisation. He also extended his empire into the occupied territories, though not without a struggle with Sauckel. He had a plan for using their production for consumer goods, thus releasing workers in Germany for armaments, and he, therefore, instituted 'blocked industries' in France and the Netherlands for this purpose, where workers would be protected from Sauckel's attempts to recruit them for work in Germany itself. In spite of Sauckel's protests he had considerable success, but Bormann's support of Sauckel and the opposition of the Gauleiters made the effect in Germany less than he had hoped. He made other attempts to invade Sauckel's sphere. The battle extended to their subordinates and Ley joined in at times in his capacity as head of the Labour front. This struggle undoubtedly reduced the effective use of the labour force which became, as the war went on and the demands of the armed forces became more insistent, a main limiting factor in the production of armaments. Still, Speer's control over the labour force continually increased. By August 1944, he said at Nuremberg,

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<sup>1</sup> Notes on Conf. with Hitler, 11th-12th Sept. 1943, Speer Docs. (Hamburg Series). Speer's anxiety to attain control of aircraft production was no doubt increased by the fact that, according to Wagenfuhr, without it overall planning of the components parts industry was impossible. Dr. Rolf Wagenfuhr: *Rise and Fall of German War Economy*.

<sup>2</sup> In return, Funk was given a position on the Central Planning Board but he hardly ever attended. *Trial of German Major War Criminals*, Part 17, p. 80.

he had perhaps thirty to forty per cent of all the workers in the Reich under his direction.<sup>1</sup>

During all this time Speer always had a political battle to fight. But he had the great advantage of constant access to the Fuehrer, where the centre of decision lay. Moreover, Speer himself became a vigorous propagandist. He made a number of speeches not only to those concerned with armaments but to the Gauleiters and their subordinates, editors and Nazi organisations such as the Hitler Youth. In these speeches he proudly surveyed the great advances in production made under his directions, quoting figures carefully selected for their purpose, though in essence true enough. He continually insisted on the necessity of subordinating local interests and the consumer industries to the needs of armaments production. He also organised his own press campaign and was specially successful with the technical press over which Goebbels had less control. Stalingrad had also had an effect on the industrialists and even on the Gauleiters so that Speer could apply more ruthlessly the policy of rationalisation and mass production which he had instituted in 1942. He did not hesitate in 1943 to tell the Gauleiters that the continuation of the production of semi-luxury goods was obtained by the bribery of officials—and he did not exclude them from the charge made.<sup>2</sup>

Some astonishing results were produced. There were spectacular rises in the number of tanks and, after February 1944, of fighter aircraft. The production of weapons of all kinds could, indeed, be increased in this way and mounted more or less rapidly in each category according to the priorities which Speer laid down at Hitler's behest.<sup>3</sup> Since Hitler was mainly interested in the campaign in eastern Europe, offensive army weapons such as tanks, dive bombers and other aircraft for the army took precedence in the earlier part of 1943 over the weapons needed to defend the Reich itself, but, as the strategic bombing attack developed, more and more production had to be devoted to defence. Basic materials such as nitrogen could only slowly be increased. Thus, the increase in ammunition did not keep pace with the increase in weapons, though efforts were made to develop its production in occupied Europe. This was one of the

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<sup>1</sup> In 1942, Speer said, he had 2,600,000 workers under him, after spring 1943, 3,200,000, after September 1943, 12,000,000 and finally, after all aircraft production had been transferred, 14,000,000. *The Trial of German Major War Criminals*, Pt. 16, pp. 389–390. These were statistics for the Reich only and at this time the total labour force was about 36,000,000, of which nearly 20 per cent was foreign. *U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), Table 5, p. 206. But Speer could only claim in June 1944 that 300,000 workers had been transferred from consumer goods industries to armaments production. Conf. of Speer, 9th June 1944, Speer Docs. (Hamburg Series).

<sup>2</sup> Speech by Speer, 6th Oct. 1943, Speer Docs. (Hamburg Series). The bribery consisted in allowing them to purchase such articles as refrigerators which were not in general supply.

<sup>3</sup> See the indices of the production of various weapons, App. 49 (i) and (ii).

weakest links in the armament production. Even more dangerous was the position of the supply of oil. New oil plants were, indeed, being built, but they grew slowly. Electric steel production was substantially increased, though it was still in short supply, but there was sufficient steel of other kinds to meet essential needs.<sup>1</sup>

Some United States investigators thought that there was nothing miraculous in this increased production. It was simply the natural result of the application of mass production to an economy which had hitherto made little use of it. They pointed to the even more spectacular results in the United States and it is also true that even in Britain, if measured by weight, aircraft production was greater than that of the Reich.<sup>2</sup> Wagenfuehr, in his post-war review, found a number of weaknesses in Speer's planning, such as the failure to see that the manufacture of components corresponded with the weapon supply and the inadequate statistics so that there was no real index of production and no one knew how many man hours were used on each weapon. Germany had after the First World War established a better system of industrial statistics than any other country. But it had been so extended and arbitrarily applied by the production departments of the services that it had become over-elaborated, understaffed and untrustworthy.<sup>3</sup> Speer was determined to destroy the red tape in which he found the German system entangled by the officers who had previously managed it.<sup>4</sup> His subordinates were encouraged to adopt rough-and-ready methods instead of the elaborate forms and questionnaires which had hitherto been used. No doubt this helped to produce a more rapid rise in the production of weapons urgently needed at some particular time and enabled crises produced by bombing to be handled with brilliant success. But it also meant that there was sometimes a lack of co-ordination and consequent waste or delay. This was especially true of the allocation of raw materials and the supply of components which became increasingly important as mass production increased. More of some things were produced than were needed or could be used, while others were in short supply. It is probable that Germany would have been better off if more production had been devoted to oil, including underground

<sup>1</sup> *U.S.S.B.S. Effects of Strategic Bombing*, p. 10. Speer himself claimed that the amount of electric steel used was the best measurement of armament production and tried to show in this way that German armaments exceeded those of the United States. Speech by Speer, 3rd Aug. 1944, Speer Docs. (Hamburg Series).

<sup>2</sup> *B.B.S.U. The Strategic Air War*, Table 28, p. 100.

<sup>3</sup> Wagenfuehr: *Rise and Fall of German War Economy*.

<sup>4</sup> Speer often made sarcastic remarks on this subject. Thus he told the Main Committee for Munitions that production had never been reduced when administrative offices were destroyed by bombing, but only when factories were injured. Speech by Speer, 11th Aug. 1944, Speer Docs. (Hamburg Series). He gave directions that bombed-out plants were not to be worried to produce statistics but allowed to get on with the work of recuperation. Speer Interrogations, 30th May 1945, see App. 37 (i), para. 15.

production, and less to aircraft. There was, in fact, a lack of balance in the effort which was partly due to Speer's methods, though also to the system which he inherited and the arbitrary interference of Hitler. He was aware of these defects himself but there was not time to correct them before the overwhelming attack of 1944-45 made everything but improvisation impossible.

Speer also, like all such men, tried to exercise influence on strategy when the opportunity came. He was a foremost advocate of the construction of an East Wall, strongly supporting Zeitzler and other generals who wished to construct one. He tried to get the *Luftwaffe* to bomb Russian electric power stations. He was supported in this by important officers, but it may be doubted if the *Luftwaffe* could have accomplished very much in this sphere even if Hitler had allowed them to try. Speer even set up an engineering committee to advise the *Luftwaffe* on the bombing of Britain.<sup>1</sup> Such activities, though they had little result, may have increased the jealousy of those who regarded his growing influence with alarm. At any rate during his long illness which began early in 1944 his position was, as we shall see, to some extent undermined.

It must be remembered also that Speer had always to contend with many difficulties which derived from the nature of the National-Socialist régime. He could never overcome the opposition of the Gauleiters to a drastic reduction of consumer goods, especially those made in their own Gaus. Almost to the end of the war large quantities of unnecessary goods and semi-luxuries were being produced in Germany.<sup>2</sup> He failed to obtain the compulsory service of German women who could have been used with effect in mass production as they were in Britain. He could never be certain that some arbitrary decision by Hitler would not frustrate or at least damage his own plans.

But, whatever doubts he may have felt even in this period, he and his principal subordinates proved themselves equal to their difficult task. They reorganised armament production in such a manner that

<sup>1</sup> Notes on Confs. with Hitler, 30th May and 26th June 1943, 22nd and 23rd May 1944, Speer Docs. (Hamburg Series). Speer Interrogations, 1st Aug. 1945. According to General Koller, who in September 1943 became Director of Operations in the Air Staff, his chief, General Korten, who succeeded Jeschonnek, had made elaborate plans for the strategic bombing of Russia but was prevented by Hitler from carrying them out. Comments by General Koller, 26th Oct. 1945.

<sup>2</sup> In a sardonic speech to the Gauleiters in October 1943 Speer gave some illustrations. There were still being produced each year 120,000 typewriters, 13,000 duplicating machines, 50,000 addressing machines, 30,000 calculating and book-keeping machines, 200,000 wireless receivers, 150,000 electric cushions, 3,600 electric refrigerators, and 300,000 electric counting machines. Such waste occurred in all sections of industry. As General Inspector of Water and Power, Speer himself had stopped a yearly production of 200,000 gas, 300,000 electric and 200,000 water meters. The *Wehrmacht* was one of the principal offenders. They ordered each year 512,000 pairs of riding boots, 312,000 pairs of officers boots, 360,000 service bags for women signal assistants, 364,000 spur straps and 2,300 rucksacks. There were even 800 tons of piano wire made for the services each year. Speech by Speer, 6th Oct. 1943, Speer Docs. (Hamburg Series).

it was able to meet the urgent needs of the Reich. They coped successfully with the crises caused by shortages of raw materials or bottlenecks due to imperfect planning or a failure in some part of their widespread industrial domain.<sup>1</sup> In spite of the enormous losses of equipment of all kinds the defeats of the Reich in this period were not due to Speer's failure to supply its armies with weapons, its airmen with aircraft or its cities with anti-aircraft defences. And the difficulties caused by the unprecedented and unexpected bombing attack were met with exceptional energy and resource.

But, as Wagenfuehr and others have emphasised, even in this period the character of the weapons changed a good deal. Priorities began to be given to weapons of defence, fighter aircraft, anti-aircraft artillery and tank destroyers at the expense of bombers, army guns and even tanks. At the same time, it must be remembered, Speer was planning a new submarine fleet which might transform the naval situation. There was also hope that the balance might be redressed by the new weapons which were in process of construction, though Speer himself never placed as much trust as some other leaders in these new secret devices and thought that they absorbed production facilities which might better be directed to conventional weapons.<sup>2</sup>

This great increase in armaments was produced without a corresponding increase in the production of basic materials. It was accomplished by insisting on due economy in their use, as Speer and his assistants overcame the wasteful habits which had hitherto prevailed and obtained knowledge of the large stocks which had accumulated here and there in the hands of the manufacturers and of the services themselves. These were forced to use up their reserves as a contribution to the common effort. This process, however, could not go on indefinitely and the stocks had been much reduced when the situation became acute owing to the invasion in the West and the progress of the Russian armies in the East. Even in 1943 the armies were short of some kinds of weapons and of essential equipment for signals and other services partly as a result of the bombing. As the defeats continued weapons were used up more quickly than they could be made. Thus, though the official stock figures rose in this period the ratio of stocks to total output begins to decline sensibly towards the end of it. Thus, a part of the cushion which had mitigated the effects of the bombing was destroyed.

The efficiency of industry was also made to depend more than ever on the efficiency of the *Reichsbahn* because of the methods of dispersal

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<sup>1</sup> There is a list of forty to fifty such shortages in January 1944. Most of them are raw materials, but certain types of ball-bearings are included. They were divided into unit categories of priority and referred for urgent action to the committees and rings. List of Chief Bottlenecks (undated). Speer Docs. (Herford Series).

<sup>2</sup> *The Trial of German Major War Criminals*, Pt. 17, p. 55.

which had been applied to such weapons and components as aircraft, ball-bearings and submarines. It was still functioning well and, as the front in the East came nearer the Reich, there was some alleviation of the strain on it. But it had become an even more important target system than in previous years, if the means could be found to attack it with success.

These weaknesses were to be revealed in the course of the year 1944-45. But meanwhile great advances had been made. As was usual, the sudden rise in production in the first half of 1943 was followed by a period of comparative stability at the same level in the second half of 1943. For this halt in the advance there were also special reasons. One of them was certainly the effect of bombing, especially in the aircraft industries. There were also other special difficulties in the production of aircraft which will be considered in Section 4 of this chapter. Naval production was reduced by the necessity of developing new types of U-boats as the British and United States fleets and aircraft began to obtain an ascendancy over the older types. But such levelling off after a steep rise is characteristic of armament production and the figures rose again sharply in 1944. Thus, while the value of armaments and ammunition produced in October 1942 was 1,432 million Reichsmarks, in May 1943 it was 2,158 million, while that of December 1943 was slightly below this figure.<sup>1</sup> The most spectacular increase was in tank production, which was about 600 a month in the last three months of 1942 and nearly 1,250 a month in the last three months of 1943. The rise continued in 1944 until by March of that year it was nearly 1,500 a month. Moreover, heavier tanks (the Panthers and the Tigers) were being produced and the rise is even more spectacular if measured by weight, in spite of the fact that tank production was affected by area bombing more than the average of armaments. Thus, under an unprecedented hail of bombs, Speer had increased the rate of armament production by nearly fifty per cent in 1943 and had made preparation for greater increases in 1944. The rise would have been even greater had it not been for bombing, and in the next two sections an attempt is made to estimate what that effect was.

(ii) *The ordeal by fire*

The bombing attack which began in 1943 and lasted until the end of the war, with an interval of partial relief from April to September 1944, was more destructive of life and property than any other of its kind except that to which Japan was subjected in the closing stages of

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<sup>1</sup> U.S.S.B.S. *Effects of Strategic Bombing*, (No. 3), Tables 80 and 81, p. 145. The figures were corrected for changes in price. By July 1944 the monthly total had risen by another 950 million Reichsmarks. Such estimates are very approximate and should be only taken as a general indication of the trend of production.

the conflict. It is necessary to remember, however, that during the same period Germans were inflicting even worse horrors on other peoples, including the exploitation of the conquered territories in the East and the merciless treatment of many Russian prisoners of war. Forced slavery, starvation and death by such methods as were used by the S.S. are more cruel and degrading than death and mutilation by fire and high-explosive bombs. Ruthless requisitioning, looting and devastation in retreat destroy property to as great a degree as a successful bombing attack. Such horrors are incapable of being compared in a nicely balanced account, but it can be said that Germans killed many more civilians than were killed in Germany by bombing and damaged the property of her enemies at least as much as they damaged hers. Once the concept of total war is accepted the only criterion that can be applied with any realism is whether more death and damage was inflicted than the objective of the attacks necessitated or whether in the circumstances of the time other and less cruel and destructive methods could have attained the same ends. Judged by this standard, Germany's record is far worse than that of the Western Powers in the strategic bombing offensive.

The area attack of this period was deliberately aimed at the destruction of the principal cities of Germany. The object was, as has been seen, to destroy in the centre of the cities, the housing, public utilities and communications to such an extent that their inhabitants would not be able to go on working. Though, on occasion, individual factories or groups of factories were designated as the centre of the target and it was also hoped that many would be destroyed or seriously damaged by the overspill of the area attack, it was the destruction of the living quarters of the towns which was the main object of the attack. The worker was to be deprived of the means of working by the devastation of his environment. Though the destruction of the will to work had in this period been made secondary to the destruction of the means to work, yet there was in the minds of some in Britain the thought that such demoralisation would be caused as to result in a general refusal to work under such conditions.

Neither of these consequences followed and, as has been seen, at the end of the period it became apparent to many of those most closely studying the results that this objective could not be achieved by this method alone. If the comparative lull that followed while the strategic bombing force was mainly engaged in the attack on communications necessary to enable the invasion to succeed, gave Germany some little relief, this also made new forms of attack possible which supplemented and in a sense transformed area bombing.

The nature of the experience is well known and it is not necessary to do more here than indicate its general character. Some cities in Britain had to endure great hardship, though for a much shorter



period. But there was not in Britain anything comparable to the long-drawn-out ordeal which many cities in Germany had to undergo. The attack was, of course, distributed over a wider area, and this fact meant that long intervals for recovery were enjoyed by most towns attacked. The cities were supported by a larger agricultural population in whose villages and small towns refuge could be found. But in this period some seventeen or eighteen cities with over 100,000 inhabitants received damage much greater than that inflicted on any city in Britain. In one case, that of Hamburg, two-thirds as many people were killed by bombing in a single week as in the whole of Britain during the whole war. A fire storm such as that which devastated Hamburg occurred in Darmstadt and Kassel and something approaching it in other cities during this period. The numbers killed were often less than might have been expected. Nevertheless, the totals steadily mounted and in such towns reached an even greater percentage of the population than in Hamburg.<sup>1</sup> When the fire storms occurred seventy per cent of these deaths were due to carbon monoxide poisoning and only about fifteen per cent due to burns and inhalation of hot gases.<sup>2</sup>

The destruction of housing was also far greater than anything that occurred in Britain except in one or two towns. The numbers of homeless people grew into millions. Moreover, when the Mosquitoes began their sporadic raids over Germany the number of night alarms was much increased and in some cities became almost a regular feature. These conditions were trying enough. They became almost unportable when a heavy concentration and destruction of the water mains by high-explosive bombs caused the fires to get out of hand. In the case of Hamburg the devastation was such that nearly a million people fled the city. Of Hamburg we have more detailed official accounts than of any other city, for the special nature of its ordeal produced a series of reports from its authorities to the National Socialist leaders. These were no doubt meant to show how well they had coped with the terrible conditions created by the raids of 24th July-3rd August, but the main facts are not in doubt and are

<sup>1</sup> Statistics of the number of people killed by bombing in Britain are to some extent disputed, but the most authoritative figure is 51,509. T. H. O'Brien: *Civil Defence* (1955), App. II, p. 678. The figures for Germany are much more disputable since many records were destroyed and in the later stages of the war were difficult to compute. But about 43,000 were reported killed in the raids on Hamburg of 24th July to 3rd August out of a population of about 1½ millions. Wuppertal had over 5,200 killed in two raids of May and June 1943 out of a population of about 300,000 and Darmstadt 8,500 in the raids of September 1944 out of a population of about 100,000. *U.S.S.B.S., A Detailed Study of the Effects of Area Bombing on Hamburg*, (No. 32), p. 1. do. on Wuppertal (No. 33) and Darmstadt (No. 37), p. 12, and Table 4, p. 9a.

<sup>2</sup> These figures are little more than an intelligent estimate based on interviews with doctors of the cities. No statistics could be accurate. Even of the numbers of dead, it is possible that the statistics are much too low. Many people believed that the number in Hamburg was much greater than the official figure. *U.S.S.B.S. Fire Raids on German Cities*, (No. 193), p. 40.

supported by a wealth of statistics, charts and photographs. The fire storm caused by the simultaneous outbreak of a large number of fires in a densely populated city was unique and rendered useless the ordinary methods of defence. Thousands of people were trapped in the shelters in what had become a furnace and were burnt or, in most cases, more mercifully asphyxiated. The rush of air produced by the intense heat carried burning timber and other inflammable material far through the air and spread similar fires in other unburnt areas. The extent of the damage and its consequences are surveyed in the next section, but the shock to the humanity gathered in the big city was as great, if not so enduring, as that caused by the most destructive earthquakes of past ages.<sup>1</sup>

Other cities received highly concentrated raids which killed thousands of people and destroyed or damaged beyond repair tens of thousands of their homes. Yet in nearly all cases the workers after a short interval resumed their labours, factories and workshops were hastily repaired or substitute buildings provided, new machines replaced those destroyed, generally a small percentage of the total number, and, when necessary—and it was not often necessary—double shifts were used to maintain the volume of production. If in Hamburg itself production never reached the pre-raid figures and in some cities a fairly long interval elapsed before that was done, yet on the whole recovery was complete in a surprisingly short period of time. In some cases war production was even helped by the destruction of non-essential industries whose workers could be transferred to those which were making what the armed forces most needed, thus accomplishing what Speer had in vain been trying to get the Gauleiters to allow.

This result did not come about without a great effort on the part of those who were responsible for air raid protection, relief and rebuilding. The population of the towns played a foremost part, but their resistance was much assisted by the skilled direction of their leaders and the activities of national organisations whose efforts could be rapidly concentrated where they were most needed. As has already been noted, the foundations of A.R.P. had been well laid in the period before the war and the comparative safety of the early war years. Then the more severe and concentrated bombing of 1942 had revealed deficiencies and the lessons of the Lübeck and Cologne raids had been taken to heart. It had also been realised that relief and skilled assistance must come from outside the towns immediately attacked and the organisations for providing them had been made more flexible and efficient. And Speer and his helpers were there to overcome any crisis in production which might be caused by a well-directed and successful raid. When the great attack came in 1943 the

<sup>1</sup> Report by the Police President and local Air Protection leader of Hamburg, 1st Dec. 1943, see App. 30, for extract.

Germans were much better prepared to meet it than they would have been twelve months previously.<sup>1</sup>

The system was still based on self-help in which the people of the town attacked, under the direction of a hierarchy of officials from the Police President to the House Warden, were responsible for the protection of their property and the rescue and care of the wounded and buried. They were given a greater provision of substantial shelters than the people of Britain. More deep shelters were provided, often occupied every night by sections of the population as in Britain, while the cellars of the houses were turned into shelters by reinforcing their structure and they sometimes extended under several buildings. No such small personal shelters as the Morrison or Anderson were supplied in Germany, but small bunkers of concrete were erected in gardens or other nearby areas where space allowed.

In some towns, notably Hamburg, great bunkers of solid reinforced concrete with a number of floors and many amenities were erected above the ground. The anti-aircraft personnel had generally first claim on these, but other people crowded into them until they were filled to overflowing. The intention was that shelter should be available for all, within easy reach of their homes. Fewer personnel were left above ground without shelters than in Britain, and one air protection leader insisted that, contrary to British practice, the saving of life was placed before the saving of property.<sup>2</sup> Nevertheless, the factories each had their own highly organised and trained protection service raised amongst the workers there, though these tended to insist that shelters should be constructed in the works themselves so that they could have cover while the raid was in progress. The so-called 'extended fire protection service' for offices and public buildings seems on occasion to have been somewhat neglected in the natural desire to remain in a place of greater safety during a heavy aerial attack.

Immediate help might come from the small towns and villages in the neighbourhood, each of which had a volunteer fire corps. As the war went on these were organised in such a manner that a number could be combined together under one commander if a heavy raid occurred in a town in their vicinity. This system worked on the whole very well, with much mutual help and service. It was assisted and directed by the strong force of special fire police maintained in the towns. But this combination was quite inadequate to cope with the mass of fire and destruction caused by a heavy and concentrated

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<sup>1</sup> This account is based to a considerable extent on that of the *U.S.S.B.S. Civilian Defense Division Final Report* (No. 40) and its studies of five separate towns. The subject also arises frequently in Speer's conferences with Hitler. There are also details of the measures taken and their results in the reports on the raids by the German Police Presidents and others.

<sup>2</sup> *U.S.S.B.S. Hamburg Field Report, Vol. I—Text*, (No. 44), pp 5-16.

attack. Further help was then necessary, and this was provided by a number of organisations established on a national basis which could be used where the need was greatest.

The most important of these were the motorised fire-fighting battalions of the *Luftwaffe* which by the end of the war amounted to fifty-three. Though the average age of their members steadily increased as the younger men were withdrawn for active service, they were largely composed of old soldiers of the First World War and tributes were paid to their courage and efficiency by many German officials interrogated after the war. Stationed in central positions in each *Luftgau*, they could rapidly reach the threatened town and undoubtedly often played a large part in reducing the immediate consequences of the attack. Once the fires were under control they were left to the local services and the mobile battalions withdrawn so as to be ready for other emergencies.

There were also the mobile battalions of the fire protection police, a para-military organisation provided by the fire-fighting services of sixty-three towns. These were stationed in small towns on good highways so as to be able to be sent quickly to a number of different cities. They were under the control of the police, and though, like those of the *Luftwaffe*, they were intended to meet the immediate crisis of a heavy attack, they were generally retained longer to help the local services since they were often the most effective force which the police president of the city had at his disposal. Commanded by well-trained officers, though less in numbers than the *Luftwaffe* battalions, they rivalled them in efficiency.<sup>1</sup>

In addition, the Army units stationed in the vicinity of a town were called upon to render assistance if necessary. Composed of troops in training they had not the same skill and experience as the mobile battalions, but, directed by army engineers, they were often very useful in creating fire breaks or demolishing dangerous structures and clearing up the roads.

All these organisations were created to fight the flames and to deal with the immediate aftermath of the raid. The problem of the care of the thousands of homeless people, who in some cases had lost all their possessions as well as relatives and friends, was handled by the Party, which, as has been seen, took over this duty under the leadership of Goebbels early in 1942. To assist the local services in this task mobile relief columns were organised, consisting of either large motor-truck convoys or special railway trains, both equipped with

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<sup>1</sup> There were complaints at times of tardy and inadequate assistance. Thus, after a heavy raid on Frankfurt on 22nd March 1944 it was reported: 'Such weight of attack had never before been seen. The available fire fighting equipment was not even remotely sufficient to master the outbreaks of fire. Forces from outside Frankfurt arrived after considerable delay and in small formations.' Police President Report.

kitchens, refrigerators and ample supplies of food and other necessities and capable of supplying as many as 30,000 meals a day. Through the Party agencies clothing, food tickets and money were quickly supplied to those who needed them. And, while the efficiency of the service naturally varied a good deal in different towns, it was on the whole performed with sympathy and understanding and often did much to sustain the morale of a city shaken by a heavy raid. More prolonged relief was given through the factory organisations as far as possible, so that the worker had to return there for the food cards and other necessary documents. In this way relief was used to prevent undue absenteeism. There were cases in which absenteeism was greater than the conditions seemed to justify, or so the authorities thought. In some cities, Speer told a Gauleiter meeting in October 1943, only twenty to thirty per cent of the labour force were back at work eight days after a raid. He looked to the Party to use the necessary pressure. If stern measures were necessary to prevent demoralisation, looting or subversive talk the S.A. supplied special battalions, but according to post-war reports these were inefficient and unpopular. Goebbels, in November 1943, thought that morale was excellent, partly because of his propaganda but partly owing to the severe measures taken against defeatists.<sup>1</sup>

There were also cases, especially in towns which had been heavily bombed, where the workers left the factories in panic when an air-raid warning sounded. It was necessary, therefore, to provide trustworthy shelters in the works themselves. For this reason also the *Luftwaffe* and Hitler were eventually persuaded to stop the air-raid warnings of the attacks by isolated Mosquito aircraft in the daytime and also at night to prevent the fatigue caused by unnecessary alarm.<sup>2</sup>

When the raid was over it was necessary to restore as quickly as possible public services of gas, water and electricity and make provision for rebuilding or repairing essential factories and for housing the homeless. For the rebuilding and repair Speer began to use the Todt Organisation, the first occasion being the creation of a special Ruhr battalion after the raids in the spring. This was a paramilitary organisation, but Speer applied to it his usual method of

<sup>1</sup> *The Goebbels Diaries*, p. 419. Speer himself in a phrase, which he said had escaped him in a moment of irritation, demanded that stern measures should be used against slackers (*The Trial of German Major War Criminals*, Pt. 17, p. 47). In some cases great brutality was used in the control and treatment of foreign workers, especially Russian prisoners of war. But it was also later realised that only by providing reasonably adequate food and living conditions could the best results be obtained from this slave labour which often worked extremely well. Milch at one time said, 'The best workers we possess are the concentration camp internees. They're our élite.' Conf. held by Goering, 22nd Feb. 1943.

<sup>2</sup> For example, the effect of the 'numerous' air-raid warnings on the workers at Schweinfurt. Report Kessler to Speer, 6th April 1944. App. 31. Both Goebbels and Speer were in favour of reducing the air-raid alarms long before this was done to a modified extent.

putting in positions of command those who knew most about what had to be done. Thus, he had skilled and trained builders, foremen and artisans directing a labour force which was often composed mainly of foreign workers. This organisation was also given some transport of its own so that it was mobile and a squad could be quickly despatched to meet a special emergency which threatened production. In addition, there was the technical emergency corps, composed of artisans of a number of special trades, originally set up in the inter-war period as a strike-breaking force, but now able to send squads of trained men where they were most needed. They could reinforce or instruct workers in the local services or those of a damaged factory and so hasten the necessary repair.

When it was considered necessary to guard against future attacks the dispersal of the industry was ordered. By a decree of the Fuehrer of 26th August 1943 this decision was left to Speer. It was a vital one, for dispersal inevitably caused a temporary decline in production, however skilfully it was managed. It also necessitated strong action from the centre of power to secure without undue delay the necessary sites, buildings and machinery.<sup>1</sup>

Much less was done to provide new housing for the workers. They were encouraged to repair their own houses if these were not too badly damaged. Barracks of cement or wood and camps were erected outside the bombed towns. Some towns were given prefabricated houses. In such cases as that of Hamburg special efforts were made to erect new housing centres in the neighbourhood.<sup>2</sup> But much was left to the initiative of the workers themselves, assisted by the local building trade and the party organisations. The materials for repair could be partly obtained from the buildings which had been ruined beyond rehabilitation. Many workers lived in neighbouring villages but many were left to dwell in the cellars and bunkers.

The government also paid compensation for injury to person and damage to property, giving pensions when necessary as well as immediate grants to relieve distress. This service also seems on the whole to have been expeditiously performed with humanity and common sense. No doubt the Party influence, in this as in other forms of relief, sometimes caused injustice or graft, but at the same time it reduced the delays and lack of understanding with which purely official machinery often works.

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<sup>1</sup> A special committee was set up to regulate it under Speer's direction. Special Summary (Reprint) by Dr. Franz Kaute to Economic Group of Textile Industry, January 1945, Speer Docs. (Herford Series).

<sup>2</sup> Both Speer and Hitler were impressed by the recovery of Hamburg, and in September 1943 Hitler agreed to confer the Knights Cross of the War Merit Cross with Swords on the Gauleiter of the District (Kaufmann) to mark his approval of the great efforts made. Speer also explained to Hitler that it was necessary to release some armament workers to assist repair. Notes on Confs. with Hitler, 11th and 12th Sept. 1943, 6th and 7th Dec. 1943, Speer Docs. (Hamburg Series).

Finally, the evacuation service was much increased and extended over the whole of the Reich.<sup>1</sup> As has been noted, the Germans were as reluctant as the British to leave their homes or part with their children and many evacuees returned during the period of light bombing. But the raids of 1943 made a great difference and great efforts were made to get the children out of the towns. In this service also the Party played an important role. Two Party organisations were used, the Nationalsocialist Peoples Welfare (N.S.V.) and the Extended Child Evacuation Scheme (K.L.V.), the latter having grown out of a pre-war effort to provide free holidays for city children. Their work in dispersal hardly met with such general acceptance as some of their other activities. In the early years of the war the children and old people were often sent long distances so that they might be in the more beautiful and attractive parts of Germany, Bavaria being known as the air-raid shelter of the Reich. It was thus difficult for parents to keep in touch with their children especially when the transport situation deteriorated. In the case of the school children the K.L.V. worked closely with a teachers' organisation and whole schools were evacuated with their staff. The older children were looked after by the Hitler Youth who were given positions as camp leaders which sometimes enabled them to challenge the authority of the teachers. In many cases they tried to detach the children from the influence of their parents and teachers and indoctrinate them with their own National-socialist ideology.

This complicated a system already difficult enough. But in 1943 it was found that areas nearer the threatened cities must be used instead of remote spots in Bavaria or elsewhere, and new arrangements were made for this purpose. And in the conflict with the Hitler Youth the teachers more than held their own. There was no compulsory evacuation of children and old people, even when conditions were at their worst, but teachers were compelled to go with their schools. Yet some parents still refused to part with their children even though in many towns no teaching was provided. No doubt this was partly due to the fact that as time went on the camps for children became more crowded and uncomfortable. Some were even reported as unsanitary.<sup>2</sup> There was, however, an immense evacuation which saved many lives and eased the burden on the towns. If there was considerable friction and difficulty in arranging it, the same phenomenon also occurred in Britain.

All these measures resulted in a more rapid resumption of work

<sup>1</sup> In addition to a long account of evacuation measures in the U.S.S.B.S. report on *Civilian Defense* (No. 40) a special study was made of *Reception Areas in Bavaria, Germany* (No. 47). There are also five special studies of A.R.P. measures in selected towns. These studies have been the main source of the short account given here.

<sup>2</sup> U.S.S.B.S. *A Brief Study of the Effects of Area Bombing on Berlin, Augsburg, Bochum, Leipzig, Hagen, Dortmund, Oberhausen, Schweinfurt and Bremen*, (No. 39), p. 12.

even in heavily bombed cities than had been thought possible. It was largely the result of effective organisation and skilful concentration of effort. There were also severe penalties for those who refused to return to work and the number of such punishments increased.<sup>1</sup> Foreign workers were specially watched and prisoners of war were sometimes subjected to barbarous treatment. But the recovery in production could not have succeeded as well as it did if German men and women had not displayed great endurance, energy and courage under most appalling conditions.

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<sup>1</sup> But the number of these seems to have increased very little with the intensity of the bombing. In Berlin the average number in 1942 was 2,000 per month. In December 1944 it was 2,267, composed of 272 German men, 692 German women, 989 foreign men, 314 foreign women. *U.S.S.B.S. A Brief Study of the Effects of Area Bombing on Berlin, etc.*, p. 31.



### 3. Appreciations and results of general area bombing

There had never before been anything like the destruction produced in Germany by the area offensive of this period. The bomber crews themselves could see the holocausts of fire in the cities and those assessing the results could obtain some idea of what had been done from the night photographs, taken as the bombs fell. The reconnaissance aircraft brought back as soon as possible large numbers of photographs of the devastated areas from which the extent of the damage, so far as it was visible from above, could be measured and estimated. Standards of measurement were established on the basis of British experience in 1940-41 and calculations made as to the loss in production caused by the absenteeism due to the destruction of or heavy damage to the dwelling houses, the injury to the factories and the dislocation produced by the stoppages in gas, electricity and water supplies. There were also the usual sources of intelligence—the German and neutral press, interrogations of prisoners of war and secret reports. But by now these were being used much more cautiously than in previous years.

It was natural that after the frustrations of the past there should be a tendency to overestimate the effects of raids that were obviously so much more successful than previous ones. The maps constructed of the stricken cities which showed the large areas of damage were very impressive, especially to those not trained to consider exactly what had been accomplished. But the experts who interpreted the photographs were for the most part cautious and the official estimates of R.E.8 and M.E.W. were based on a scientific process, however defective. Thus, on the whole, in view of all the circumstances, they exaggerated but little the total effect on German production, though making some large errors in particular aspects of it. The estimates of the numbers of dwelling units destroyed were often very accurate. They were less so as regards the factories and still less as regards the machinery in the factories. For the most part it needed a direct hit by at least a 500-lb. H.E. bomb or an uncontrollable fire to damage irreparably heavy machinery. Thus, many factories shown to have lost their roofs by fire could be restarted almost at once, and from others in worse state the machinery could be transferred to some other building surprisingly rapidly. Much of this work could be done by the factory workers themselves with some expert assistance from outside sources.

Nevertheless, the estimates of total effect were safeguarded from such errors as had been made in the past by the application of standards of measurement devised for the purpose. It was not those

who had the main responsibility for such estimates who used such phrases as the 'total destruction' of a city except on rare occasions. They gradually learned also the rapidity with which an industry could be restored to full production, though still underestimating the energy and resource by which this was brought about.

The process of assessment also took a considerable time. The Central Interpretation Unit at Medmenham studied the photographs and provided the statistics of destruction. The Operational Research Section at Bomber Command and the Intelligence and Operations Directorates of the Air Ministry could at once use these in assessing the effects of a raid from an operational point of view. But an assessment of the economic effect took time. Thus, the considered appreciations always lagged a good way behind events.

What R.E.8 did was to take the total area and damage, calculate the amount of building upon it, both housing and factories, and from these figures on the basis of British experience estimate first, the loss due to direct damage to the factories, secondly, that due to absenteeism both in the bombed and unbombed factories, and finally, that due to the interruption of gas, water and electricity and to the necessity of repairs to houses. The total loss was measured in numbers of man-hours. Then the total number of man-hours worked in the city was calculated by multiplying the number of workers by the average hours worked. The percentage of production that had been lost was then obtained by a simple calculation. The same process could be applied to all the towns attacked and compared with an estimate of the total production of Germany. The total loss of production caused by the offensive over a period could thus be estimated.<sup>1</sup>

None of the assumptions on which the estimate was based was capable of exact proof. It was assumed, for example, that British and German workmen would react similarly to similar circumstances. The estimates of damage to factories were obviously bound to be inaccurate on occasion, nor did they take into account the availability of alternative accommodation which might be, and in fact was, different to that which existed in Britain. They ignored the possibility of the loss being made up by the use of second shifts, but, in fact, this was done in very few industries. Nor was it correct to assume that the labour devoted to repair of housing would be of the same dimensions as it had been in Britain. On occasion some of these things were

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<sup>1</sup> Min. of Home Security Report, 19th Oct. 1943. App. 24. This document was chosen as an Appendix because it shows the method and is comparatively short. But later refinements were made in the process. Throughout the war studies were also being made in R.E.8 of the effect of incendiary bombs of different kinds and the different forms of H.E. bombs on the various structures, dwelling-houses and factories, which had to be destroyed. They also considered such questions as the variations in success produced by the nature of the built-up areas in different cities and the influence of 'firebreaks' on the spread of the fires.

allowed to influence the estimates, but in many cases they were ignored.

On the other hand, some points of loss were not taken into account by R.E.8 in any very specific manner. Dispersal, which affected the production of unbombed factories, had some effect in this period. Nor did the R.E.8 estimates include at first the destruction of stocks; but these were mainly consumer goods which were much more susceptible to bombing than armaments. There were also other indirect effects such as fatigue produced by the continuous alarms created by the Mosquito raids and the loss caused by sea mining.

Yet the estimate of the loss of total production was not far from that which is given by a reasonable interpretation of the post-war surveys. R.E.8 seems to have been surprised at the lowness of the figure. It suggested at any rate that the unmeasured loss was considerable. This gave an opportunity to those who were anxious to justify the offensive to claim that it had been more successful than in fact it was.

R.E.8 also attempted to determine the proportion of the loss which fell on different industries. This was a much more difficult problem and R.E.8 recognised that its estimates were tentative. But its studies tended to increase the illusion that the loss fell to an even greater extent on armaments than on consumer goods, though in fact the contrary was the case. The calculations of R.E.8 as to the destruction of machine tools was especially unfortunate.<sup>1</sup>

M.E.W. accepted the figures of R.E.8 for their long-term reports and tried to estimate the effects of the loss on the whole of the German economy together with that produced by the blockade. They were less concerned with the effect of particular raids and their Industrial Damage Reports appeared at less frequent intervals, took longer to prepare and received less attention than in previous periods.<sup>2</sup> But their six-monthly reports were of great importance and the views put forward in them were also the principal influence in the economic assessment made by the J.I.C. These surveys were comprehensive and dealt with every aspect of the German economy besides estimating the effect of bombing upon it. They often showed remarkable skill in many of their estimates of stocks of various important raw materials though sometimes exaggerating such shortages as existed. But as regards bombing they also tended to add other assumptions to those of R.E.8. They sometimes stressed the effect on production of the administrative difficulties caused by bomb destruction, though, in

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<sup>1</sup> Min. of Home Security Report, 15th Feb. 1944. The estimate was based partly on measured damage in identified factories and partly on the distribution of German labour among the different industries.

<sup>2</sup> A note by the Air Ministry on one of them says: 'These reports served a most useful purpose in the "bad old days". Today they are late and long-winded. . . .' Min. Morley to Bufton, 21st June 1944.



30. Generalfeldmarschall  
Erhard Milch.  
*German photograph.*



31. Reichsminister Albert Speer inspecting fortifications. *German photograph.*

the opinion of Speer and his subordinates, no real loss was caused by it. They did not realise the position of the machine-tool industry and their misconceptions on this head were increased by the mistakes in the calculations of R.E.8. They also for some time exaggerated the effects produced by damage to communications, though they had eventually to recognise that the railways were meeting all the demands made upon them.

But their picture of the German economy was stated with caution and restraint except in one or two special particulars. The deception in them came from three fundamental errors. They did not appreciate that total production in the Reich was being maintained during this period while that for the use of the Reich in the occupied territories was increasing. They did not realise that the greater proportion of the loss was being borne by the consumer goods industries and that much of this need not be replaced during the war, and finally they were in error in thinking that a greater proportion of the armament industries was in the cities attacked than was really the case.

The J.I.C. tried to relate the economic results to the strategic situation and thus show the place of the strategic counter-offensive in the whole attack on German power and in particular in the planned invasion in the West. One of the matters which they had to consider, indeed, had special orders to consider, was whether there was a likelihood of such a collapse in Germany that the invasion could take place before it was fully mounted. They devoted in this respect a good deal of space to the consideration of German morale on which they often made statements founded on inadequate evidence. But they always came to the conclusion that Germany's powers of resistance were still formidable and that the softening-up process was not likely to make the invasion merely a police operation.

Thus, if a misleading picture was given by these agencies of the situation in Germany and one that tended to exaggerate the effects of the area offensive, the error was mainly as regards the nature of the German economy and not as regards the effects of bombing upon it. It was true also that immense damage was being done and no one could be certain what the effect would ultimately be on the German will and ability to resist. The hope that the German people would refuse at some moment to submit any longer to the conditions created by area bombing in a hopeless war was a legitimate one, though it would have been quite wrong to base future operations upon it. And, though it was often said at this time by some in both the Air Ministry and in M.E.W. that more selective bombing would produce much greater results, the effects of such bombing as was carried out in this period were, as will be seen in the next section, no more decisive than those of area bombing; nor is it likely that at this time they could

have been made so, if all the effort of Bomber Command could have been so used.

In comparing these estimates with the results of the post-war investigations there are many difficulties to encounter. The main body of statistics and the surveys of particular towns' industries and individual factories were made by the United States teams which were naturally more interested in the results of the activities of their own Air Forces than in those of the Royal Air Force. Nor did the Germans themselves keep their statistics in such a manner as to facilitate comparison with those made in Britain during the war.<sup>1</sup> After heavy raids they found it difficult to keep them at all and they were often inadequate or inaccurate, while some were destroyed by later bombing or other operations of war. In their surveys of the effects of area bombing in particular towns the United States team sometimes made a careful estimate of the total losses suffered during this period, but more often they were combined with those suffered in the subsequent period. The reports of the Police Presidents or those made to Berlin by the Gauleiters are full of detail, but often lack the necessary information on the overall effect. Indeed, this could not be ascertained until a considerable time had elapsed and then other factors were liable to intervene.

However, in the more general estimates, there are comparable figures of total loss of production and total loss of armament production. There are also some careful surveys of the effects of particular raids which can be compared with those made in Britain at the time. There are also figures for the production of the different kinds of armaments which enable the estimates made in Britain to be checked, as for example, in the supply of aircraft or of stocks of essential raw materials such as steel or oil, though in some cases the accuracy of these figures may be disputed. As might be expected, in some cases the British estimates are quite wrong, but there are a number of cases in which they are very accurate. Factory buildings were often wrongly identified and the nature of the damage to them not appreciated. The rapidity of repair was at first under-rated, though later this error was to a large extent corrected. On the whole, the estimates of the Battles of the Ruhr and Hamburg were not very wide of the mark. That of the Battle of Berlin was, however, for special reasons, much less accurate until a very late stage in it.

M.E.W. had some difficulty in fitting their conception of a declining German economy with all the evidence which they had to con-

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<sup>1</sup> For example, the British surveys measured damage largely in square feet. This was sometimes converted into numbers of buildings or dwelling units by an arbitrary decision. The German reports naturally give numbers of buildings destroyed, though these are in some cases converted into the number of dwelling units. Naturally the relation between the two varies from town to town and area to area inside a town.

sider. They were now well aware of Speer's position and of his efforts to streamline the methods of German industrial production. On 5th June 1943 Speer made a speech to a large body of workers in the *Sportpalast* in which he claimed to have made great increases in the production of armaments. It is true that the figures which he gave were misleading since the comparison was made with 1941. Still there was much other evidence of his success in some fields so that M.E.W. could not deny the truth of his statements and the result was surprising if their previous estimates had been at all correct. They tried to solve this problem by explaining that, while increases had undoubtedly taken place in some forms of armaments, this had only been accomplished at the expense of other less essential armaments. 'The view that has hitherto been held', they confessed, 'is that the output of the German engineering and armament industries as a whole reached its peak in the early part of 1941 and that since that date it has tended to fall off somewhat . . . It should be remembered in this connection that an overall increase in all fields of war production is compatible with neither the admittedly difficult labour position nor the perennial transport and raw material supply problems.'<sup>1</sup>

As has been seen, this view was entirely misleading, for, in the first half of 1943, the production of armaments had increased to fifty per cent above that of 1942. In their survey of the second half of the year M.E.W. were rather more cautious. Dispersal and other factors, they said, made an appraisal difficult, but 'there can be little doubt that the output of armaments and engineering products has fallen as a whole in the last six months.' Thus, increases in finished armaments had been obtained by a reduction in those only indirectly contributing to the war effort, though the evidence of this would not be available until later. They emphasised the fact that Speer had taken over Funk's duties as regards production, but suggested that there would still be great rivalry and friction between the two departments. They still thought that consumer goods were in such short supply that Speer, in spite of his loudly advertised intentions, would not be able to divert production to armaments. There was some truth in this supposition, but not for the reasons which were given.<sup>2</sup>

In their next survey, made on 31st August 1944, M.E.W. took a somewhat different point of view. The peak of production, it was now said, had been reached early in 1943, the fall since that date being due, amongst other things, to a decline in numbers of workers. At the same time industry had adjusted itself to the strategic bombing

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<sup>1</sup> M.E.W. Intelligence Weekly, 3rd July 1943.

<sup>2</sup> do. 29th Feb. 1944. First priority, it was realised, had now been given to fighter aircraft, but tank production, it was thought, was falling in numbers if not in weight. This last opinion was quite mistaken.



offensive with surprising efficiency by dispersal and repair. Nevertheless, M.E.W. believed that both the quantity and quality of armaments had declined. The total quantity was less and such increases of production as Speer had claimed had only been brought about by allowing the quality of these products to fall below previous standards. The armies, M.E.W. suggested, were already short of equipment and could not replace the great losses incurred on the Russian and African fronts.<sup>1</sup>

There was some truth in these statements. Total production in the Reich itself had not increased in the second half of 1943; but more was coming from the occupied territories and a greater proportion of production was going into armaments. There was a shortage of some weapons in some of the field armies, but this was mainly due to the insistence of Hitler that so much armament production should go to new formations.<sup>2</sup> For this reason there were progressively increasing complaints from early in 1943 of shortages of some kinds of weapons and equipment. The supply of ammunition was also unsatisfactory. As has been already pointed out, this was one of the defects of Speer's planning.<sup>3</sup>

But in this period armaments were just as well produced as before in spite of dispersal and other difficulties. Indeed, bigger and better tanks and self-propelled guns were being produced and, if no satisfactory new types of aircraft had come into existence, the latest marks of the Me.109, the Me.110, the FW.190 and the Ju.88 were an improvement on their predecessors. Some consumer goods were in short supply, but there was still a sufficient quantity being produced or in stock to meet the essential needs of the population. There had been some transfer of labour inside the consumer goods industries from the less essential to those necessary to satisfy basic requirements. The clothing factories, often situated near the centre of the large cities, had suffered heavily and the supply was certainly only sufficient to meet specially urgent needs, particularly those of the large numbers in the bombed towns who had lost all their possessions. But this shortage was never allowed to become so serious as to affect the efficiency

<sup>1</sup> M.E.W. Intelligence Weekly, 31st Aug. 1944. The judgment was made largely on the evidence of one captured document where there were bitter complaints of the ammunition, due, it was said, to mass production, dispersal, the introduction of new types without adequate trial and lack of skilled workers.

<sup>2</sup> U.S.S.B.S. *The Impact of the Allied Air Effort on German Logistics*, (No. 64a), para. 43(e). As is noted later, the increase in anti-aircraft defence also affected the supply to the Army.

<sup>3</sup> Speer had some difficulty in explaining away the shortages after the German defeats in Russia but no doubt the Army made the most of this excuse for their failures. The United States team on Ordnance considered that 'until the last six months of the war the army was never critically short of weapons or shells.' No doubt that was true, if by critically is meant an inability to resist, but the army was short of some kinds of important weapons and equipment. The development of drum fire on the Russian front had called for greater quantities of ammunition than had previously been used. U.S.S.B.S. *Ordnance Industry Report*, (No. 101), p. 30. *The Goebbels Diaries*, p. 405.

of the working people. Had that not been so there would not have been the continual diversion of textile workers to the armaments industry during this period.<sup>1</sup>

But, if the general picture of the German economy was very misleading, the estimate of the direct effect of area bombing on total production was not far from the truth. For this calculation the surveys relied on the estimates made by R.E.8 by the methods already described, which became more detailed and elaborate as time went on. The R.E.8 estimates of the total loss of production due to bombing were nine per cent in the ten months March to December 1943 and seven per cent in the first quarter of 1944. These figures, no doubt, seemed somewhat discouraging. At any rate, R.E.8 suggested that factors not taken into account by them might increase the figures to fifteen per cent and twelve per cent respectively. Nearly all of the damage had been due to area bombing though, of course, the United States air forces had contributed to it by their attacks on specific industries.<sup>2</sup>

M.E.W. accepted the figures produced by R.E.8 and consequently they were also the basis of the J.I.C. reports. In their first six-monthly review M.E.W. suggested that total production in the spring of 1943 was fifteen per cent lower than a year previously, but that only seven per cent of this decline was due to the area bombing. The fall in production in the Ruhr by thirty-five per cent was considered to be the main element in the reduction. Their review of the second six months produced an estimate of a loss of ten per cent, some of the effect being due to the attack on the aircraft industry by the Eighth Air Force. But they considered these figures to be a minimum and that they might be well under the real damage, because of the growing proportion of the industrial effort that had to be devoted to repairs. Their review of the first six months of 1944 simply stated that the destruction of the Axis war production was proceeding much faster than it could be replaced.<sup>3</sup> The J.I.C. gave similar estimates. They laid emphasis on the large numbers of workers employed in repairing damage and concluded that both total production and that part of it devoted to armaments had been reduced by ten to fifteen per cent.<sup>4</sup>

The estimates of the loss of total production were, in fact, very close

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<sup>1</sup> U.S.S.B.S. *Effects of Strategic Bombing, Ordnance Industry Report*, p. 14.

<sup>2</sup> Min. of Home Security Reports, 20th July, 20th Oct. 1943, 15th Feb., 10th May 1944 (for the percentages of damaged buildings given in this last report, see App. 49 (xvi)). Some alteration in the estimate was made in a later survey, 2nd November 1944, when the methods had been further elaborated. The estimate of the damage to housing, given in App. 49 (xvi), may be compared with that produced for Speer at this time, App. 49 (xv).

<sup>3</sup> M.E.W. *Intelligence Weeklies*, 3rd July 1943, 29th Feb. and 31st Aug. 1944.

<sup>4</sup> J.I.C. Reports, 22nd July, 12th Nov. 1943, 3rd April, 13th June 1944.

to those made by the B.B.S.U. in its post-war investigations, if the figures of the iron and steel processing groups are included in the calculations, viz. 3.5 per cent in the first half of 1943, 10.5 per cent in the second half of 1943 and 5.7 per cent in the first half of 1944, the greater proportion of this last occurring in the first quarter.<sup>1</sup> The United States survey, using an entirely different method, estimated the total production loss of 1943 as nine per cent and that of 1944 as seventeen per cent, of which latter the greater part occurred in the second half-year.<sup>2</sup> The actual figures arrived at by R.E.8 were, therefore, reasonably accurate. It was only the suggestion that there was considerably larger reduction due to unmeasured causes that was misleading.

It was in the estimate of what proportion of this loss had been borne by armaments that R.E.8 and M.E.W. went seriously astray. For they considered that it was equal to or rather more than the percentage of loss of total production. In this view they were quite wrong for, as has been seen, the loss was diverted to a considerable extent to the less essential industries. According to the B.B.S.U. the loss in armament production, if the figures of the iron and steel processing groups are included, was only 3.2 per cent in the first half of 1943, 6.9 per cent in the second half of 1943 and 2.4 per cent in the first half of 1944.<sup>3</sup> The United States survey of area bombing was unable to distinguish between total and armament production, but its general survey accepts the figure of five per cent for this period.<sup>4</sup> Other tests confirm the general character of these figures. It seems to be fairly certain that the loss of armaments directly due to area bombing in this period was somewhere in the region of five per cent in 1943 and a good deal less in the first half of 1944.

The judgments of M.E.W. and R.E.8 are somewhat surprising, for M.E.W. was constantly insisting on the shortage of consumer goods. But it was considered that armament production had to be diverted to meet this deficiency, rather than that the deficiency had been caused by the diversion of production to armaments. These calculations were in any case based on doubtful assumptions. But the error was the more likely because the fifty-eight towns considered contained a smaller proportion of German industry than was imagined. Only forty-one per cent of it was contained in them during the area offensive of 1943-44. The rest was in smaller towns or in the

<sup>1</sup> *B.B.S.U. Report on the Effects of Strategic Air Attacks on German Towns*, p. 80. See App. 49 (xii). The B.B.S.U. rejects these figures and, leaving out the iron and steel processing groups, reaches the figures 2.7 per cent, 8.2 per cent and 4.4 per cent respectively. The basis of these calculations is discussed in Annex V.

<sup>2</sup> See App. 49 (xiii).

<sup>3</sup> The B.B.S.U. rejects these figures and prefers the figures 1.8 per cent, 3.8 per cent and 1.0 per cent respectively. See App. 49 (xii).

<sup>4</sup> *U.S.S.B.S. Effects of Strategic Bombing*, p. 11.

country.<sup>1</sup> When dispersal came the proportion was even smaller. Moreover, the factories, even if technically in the towns, were generally in the zones which suffered least damage.

Another error of R.E.8, no doubt, tended to confirm the view of the injury to the armament industry. For they came to the conclusion that, though only ten per cent loss in machine tools had been caused by bombing the machine-tool industry, yet that its output was being more and more absorbed by the necessity of replacing machine tools destroyed in the bombing of other factories. In its last survey of this period the surprising figure of fifty-nine per cent of the production of the whole industry was suggested as possibly absorbed in this way in the second quarter of 1944. M.E.W. had always gone wrong in its estimates of the position of this industry and they were now led further astray. It is not surprising that they had some difficulty in reconciling this estimate with the fact that Germany was exporting more machine tools in 1944 than in 1943.<sup>2</sup>

The reality was quite different. It is not possible to determine exactly what proportion of the total output of the industry was devoted to replacing machines destroyed by bombing but it was probably never more than ten per cent. At any rate there was no shortage of machine tools for any essential purpose except in a few special categories. Indeed, the productive capacity of the industry was still being diverted to the direct manufacture of armaments.<sup>3</sup>

These figures do not mean that large quantities of armaments were not destroyed by bombing. Even more tanks, for example, would have been produced but for the successful area attacks on Berlin, Kassel, Essen and Friedrichshafen. But the losses were only a small fraction of the great increase in armaments which Speer's new methods had produced in these years.<sup>4</sup>

If the economic experts erred in their estimate of the amount of armaments lost, it was natural that those directing the attack should

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<sup>1</sup> *B.B.S.U. Report on the Effect of Strategic Air Attacks on German Towns*, p. 40, para. 125. The towns which were actually attacked by Bomber Command only increased this figure to forty-three per cent. Thus nearly sixty per cent of German industry was never bombed at all except by accident by area bombing.

<sup>2</sup> Min. of Home Security Report, 15th Feb., 2nd Nov. 1944. M.E.W. Intelligence Weekly, 31st Aug. 1944.

<sup>3</sup> No exact figures can be given, but no more than five per cent of the deliveries were to replace destroyed machines. There were difficulties in obtaining certain special-purpose machine tools, a type which the industry had never viewed favourably. Speer never obtained effective control over this industry and in his interrogations dwelt on its deficiencies, but he also stated that he wished to divert some of its resources to armament manufacture. *U.S.S.B.S. Machine Tool Industry in Germany*, (No. 55), paras. 35-37.

<sup>4</sup> The raid on Friedrichshafen of 27/28th April 1944 which destroyed a gear-box factory was reported by German officials as the most damaging attack on panzer production ever delivered, but the loss was soon made good. The total loss in the period October 1943-July 1944 has been estimated as 700-800 while 14,000 tanks were made in the same period. *U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), p. 170. Interrogation of Stieler von Heydekampf, 4th Sept. 1945.

make more extravagant claims. Sir Arthur Harris had, indeed, as has already been noted, claimed in 1943 that, in addition to others damaged, nineteen towns had been 'virtually destroyed' and were a liability rather than an asset.<sup>1</sup> It is, however, more surprising that this claim was endorsed by Sir Charles Portal and General Eaker in their report to the Combined Chiefs of Staff at the *Sextant* Conference in November 1943.<sup>2</sup> They also quoted a joint report of the Air Ministry Intelligence Branch and M.E.W. that '10% of the total war potential' had been destroyed, whatever that might mean, and added that a further decline of twenty per cent might well be fatal, though this judgment could be no more than a guess. They again insisted that the effect fell most heavily on the most important armaments. In its final survey of 1943 Bomber Command took an even more optimistic view. Thirty-six per cent of the industry of twenty-nine towns had, it was thought, been lost in the ten months since the combined offensive began and this loss had fallen on the most vital industries. The effect was cumulative, it was said, and, if the offensive was reduced, much of what had been gained would be lost while a continuation of it would have a much greater effect than before. The argument was directed to preventing the strategic offensive from diversion to the attack on communications in France and Belgium. But it at least recognised that, whatever damage was being inflicted, the German industries were being repaired with remarkable celerity.<sup>3</sup>

All these calculations have concerned direct damage to German industries caused by destruction of factories and amenities and the absenteeism of workers. But there was also an indirect effect in the loss caused to production by the diversion of materials and labour to reconstruction and defence rather than to the creation of more armaments or reinforcement of the armed services. This effect is not susceptible to exact measurement but some indication of its extent can be given. Many workers were occupied entirely on reconstruction. Speer's estimate was from one to one and a half millions by the autumn of 1944.<sup>4</sup> More important was it that a number of these were skilled workers. Thus, in May 1944, Hitler agreed that a special damage repair squad should be formed, drawn from armaments workers ready to be sent to any town where the need was urgent. Some skilled men were even taken from the armed forces for the same purpose. Large numbers of the Todt Organisation were removed from work on the Atlantic Wall and other essential construction to assist

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<sup>1</sup> See above, p. 47.

<sup>2</sup> Progress Report on the Combined Bomber Offensive, 21st Nov. 1943.

<sup>3</sup> Report by Air Staff Intelligence, H.Q., Bomber Cmd., 19th Feb. 1944.

<sup>4</sup> Speer Interrogations, 13th and 20th Aug. 1945.

in repairs in the Ruhr and other heavily bombed cities.<sup>1</sup> Much reconstruction was carried out by the workers themselves during their enforced idleness and this loss has been already taken into account. But the permanent removal of so many workers, including a definite, if unknown, number of highly skilled workers must have had some effect on the total production of armaments. Some workers were also employed in supplying the civilian goods which had been lost in area bombing and some of these might, no doubt, have been directed to armaments production. In addition, there were the large numbers of men and women used in the Flak services. Not all this diversion was, of course, due to area bombing. Some of it was caused by the precision bombing, the results of which are described in the next section. But, because of the wide range of the area bombing and the greater destruction that it caused, the greater part of this indirect loss may be attributed to the general area attack in this period.

There was also the effect of bombing on morale and on this question there were, as heretofore, some misconceptions. It is true that the J.I.C. reports never went so far as to suggest that Germany was likely to collapse before the invasion took place. But they tended to extend such effects as were produced by the first serious bombing of the Ruhr and the fire storm at Hamburg over the whole area of the Reich and to regard as permanent what were only limited and temporary phenomena. In September 1943 they compared the situation in Germany to that of the position in the late summer of 1918 and suggested that even before the end of the year the German people might decide that the consequences of a continuation of the war were worse than those of defeat. They considered that the populace were refusing more and more to carry out their task of fighting the flames and were withdrawing their support of the war effort because of the bombing and Germany's military defeats.<sup>2</sup> There was some truth in

<sup>1</sup> Notes on Confs. with Hitler, 22nd and 23rd May, 20th June 1944, Speer Docs. (Hamburg Series). There is other evidence of similar transfers. The United States Survey calculated a total diversion of 4.30 to 5.45 million men from the following table:

<i>Bomb Damage:</i>	<i>Millions</i>
Casualties	0.25
Unproductive labour	1.50-2.00
Construction workers	0.75-1.20
Civilian goods production	1.00-1.20
<i>Air Defence</i>	
Ground	0.80
Air	Indeterminate

*U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), p. 41.

Following Speer, its authors do not think that much effect was produced on armaments until 1944 because until then labour could easily be replaced. In the later part of that year it ceased to be important because industry had been reduced by bombing. It is clear that no exact figure can be estimated in view of all the different factors involved. The effect on the armed forces is considered below, p. 299, that on the British estimates of loss in Annex V.

<sup>2</sup> J.I.C Reports, 9th Sept. and 12th Nov. 1943.

this statement in that absenteeism had increased somewhat, but as has been shown in Section 2 of this chapter, the mass of German workers were still ready both to fight the fires and to resume work at the earliest possible moment. Where there were lapses from this general standard, it was due to some failure in organisation; but these occasions were the exception, not the rule. Sir Charles Portal in a report to the Combined Chiefs of Staff went further and stated that the 'social disruption' threatened 'the structure of the entire home front.'<sup>1</sup>

The evidence for such statements came from exhortations in the German press and speeches of leaders, but there was proof enough in British experience to show that such evidence could easily be misleading.<sup>2</sup> These reports, at any rate, had no effect on the Chiefs of Staff who never reduced their preparations for attack in the vain hope that it might not be necessary, though plans were made to take advantage of any collapse, if it came.

Hitherto, we have discussed estimates of the general effect of area bombing on the whole of Germany during this period. But those directing the attack had to take account of its successive stages, the battles of the Ruhr, Hamburg and Berlin. These names are only convenient labels, since in each case the attack was distributed over a wider area, but they show the main objectives in each period. It is necessary, therefore, to consider what was thought to have been accomplished and what was actually achieved.

It was difficult at the time to estimate the extent of the damage to so many different towns in the battle of the Ruhr. R.E.8, however, made a number of different surveys and the production of the Ruhr had been studied by M.E.W. more than that of any other part of Germany. On the whole, while the estimates exaggerated what had been done, they are more accurate than might, perhaps, be expected in so complicated a problem.<sup>3</sup>

It is also difficult to assess exactly what was done by a study of the post-war surveys. There are no separate statistics for the area as a

<sup>1</sup> Note by Portal, 22nd Nov. 1943.

<sup>2</sup> R.E.8 circulated a report to prove this fact. It compared the figures of absenteeism in four British towns with the reports in the local press at the time of severe air raids. In the one instance where absenteeism did show a decline in morale, it was due to the lack of initiative and administrative energy of the local authority. The reports in the British press were very similar to those appearing in the German press in the spring of 1943.

<sup>3</sup> R.E.8 made three reports on the raids on Essen of 5/6th March, 12/13th March and 3/4th April, a special report on Krupp's and another of the total effect of the attacks on Essen. (Min. of Home Security Reports, 5th, 26th, 27th May, 9th and 11th June 1943.) They later issued a comprehensive review of the period 1st April to 4th July which was mainly concerned with this area. (Min. of Home Security Report, 5th Aug.) There are also surveys of the effects of particular raids on Duisburg (Min. of Home Security Report, 6th Aug. 1943), Barmen-Wuppertal (27th Aug. 1943) and Krefeld (9th Sept. 1943). These reports took time and, meanwhile, more hasty surveys might give misleading impressions.

whole, which includes the Rhineland as well as the Ruhr. There are, however, detailed post-war surveys of some of the towns attacked, while there are a large number of reports from Police Presidents and other officials made immediately after the raids. From these we can obtain a fair idea of what occurred and how far the appreciations made at the time were correct.<sup>1</sup>

Enough is known at any rate to show that in the Battle of the Ruhr Bomber Command won what Sir Arthur Harris rightly termed 'an impressive victory'.<sup>2</sup> Severe damage was done to the main centre of German heavy industry and Krupp's, the symbol of German rearmament, was heavily hit. These results were important, but in no sense crippling and small in comparison with the general rise in armament production at the time.

One of the reasons why the British estimates tended to exaggerate the importance of what had been done was that they overrated the importance of Krupp's itself. Its main works in the centre of Essen covered 1,088 acres, its production being widely distributed in eighty different buildings with its own electric power plant and a highly necessary internal transport system. But in recent years it had been more important as a centre of development than for volume production. This work was largely finished by 1943. 'For that reason', reported the United States team, 'the management considered Krupp-Essen a decoy in the heavy bombing attacks of 1943 and 1944'. However Krupp's, besides its speciality of heavy guns and armour plate, had a large locomotive works and made tank bodies, self-propelled guns, anti-aircraft guns and shells, if not in large quantities.<sup>3</sup>

There were other important factories in Essen and district. Krupp's itself had one at Borbeck for making electric steel which was only lightly damaged in this period. Nearly all the towns in the Ruhr itself suffered some damage and two, Wuppertal and Remscheid, though less often attacked, suffered more than Essen. Krefeld had nearly forty per cent of its housing destroyed in a single raid. Düsseldorf, the administrative centre of the engineering industry, was devastated and

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<sup>1</sup> The United States teams made surveys of the two Krupp plants in Essen (*U.S.S.B.S. Friedrich Krupp A.G., Borbeck Plant, Essen, Germany*, (No. 73), and *Gusstahlfabrik Friedrich Krupp, Essen, Germany*, (No. 108)) and of the area bombing of Wuppertal, Düsseldorf, Solingen and Remscheid (*U.S.S.B.S. A Detailed Study of the Effects of Area Bombing on Wuppertal, Germany, Dusseldorf, Solingen, Remscheid*, (Nos. 33-36)). There is also a brief statistical study of the effect of area bombing of Bochum, Hagen, Dortmund and Oberhausen (*U.S.S.B.S. A Brief Study of the Effects of Area Bombing on Berlin, Augsburg, Bochum, Leipzig, Hagen, Dortmund, Oberhausen, Schweinfurt and Bremen*, (No. 39)). The Operational Research Section of Bomber Command made post-war reports on Essen, Bochum and Dortmund, but statistical detail is lacking. (O.R.S.(B.C.) Reports, 9th, 22nd and 28th Aug. 1945.) The Police President reports give much detailed information of the effect of particular raids, but it was often impossible to furnish the necessary statistics when the officials were occupied with more urgent tasks.

<sup>2</sup> *Bomber Offensive*, p. 148.

<sup>3</sup> *U.S.S.B.S. Gusstahlfabrik Friedrich Krupp, Essen, Germany*, (No. 108), p. 3.



Duisburg, Bochum, Dortmund and other towns suffered heavily. Solingen is an example of how a town not hit itself suffered from the destruction of others for many of its workers lived in Wuppertal and Remscheid.<sup>1</sup> The fate of the important Rheinmetall-Borsig plant in Düsseldorf shows what dispersal might do, since its machinery, sent away to save it from destruction, was never used again during the war.<sup>2</sup> Cologne and other Rhineland towns also had heavy losses in a battle which extended as far as Bavaria.

The attacks for a time at any rate produced great anxiety amongst the German leaders. Goebbels and other high officials visited the Ruhr and in a meeting with the Gauleiters of western Germany examined the system of relief and rehabilitation.<sup>3</sup> Speer was so impressed that he urged Hitler to go there, but the latter never fulfilled his promise to do so. Speer himself took charge of the repairs and a *Ruhrstab* was set up to direct the work of reconstruction. It was in the Ruhr that the first special labour battalions were organised and men were transferred from the Atlantic Wall for that service.<sup>4</sup> The anti-aircraft batteries were continually increased, twenty batteries being sent there from other towns.<sup>5</sup> Its heavy industry obviously could not be dispersed. 'The Ruhr', Hitler agreed, 'is the one base for our industry which cannot be evacuated.' Some factories were, however, removed to safer areas.<sup>6</sup>

Echoes of this perturbation reached Britain and it was natural that first estimates should be too optimistic. One of M.E.W.'s early reports emphasised the almost 'incalculable repercussions' of the bombing of Essen.<sup>7</sup> M.E.W. also accepted the estimates of R.E.8 of the first three raids on Krupp's which were much too high, the loss of three months' production, while in fact no more than that was lost in all the raids up to 1944.<sup>8</sup> It was not realised that even when the roofs and other parts of buildings had been destroyed the heavy machinery remained intact and production would soon be resumed. The heavy damage to the locomotive works was of little importance, because owing to skilful reorganisation the supply from other factories was already sufficient. The guns and tank bodies were, however, a real loss, for there could never be too many of these.<sup>9</sup>

Such estimates as were made of the loss in other towns were, how-

<sup>1</sup> U.S.S.B.S. *A Detailed Study of the Effects of Area Bombing on Solingen Germany*, (No. 35).

<sup>2</sup> U.S.S.B.S. *Rheinmetall-Borsig, Dusseldorf, Germany*, (No. 105).

<sup>3</sup> *The Goebbels Diaries*, pp. 148-149.

<sup>4</sup> *Speer Interrogations*, 28th to 30th Aug. 1945.

<sup>5</sup> Notes on Confs. with Hitler, 13th to 15th and 30th May 1943, *Speer Docs. (Hamburg Series)*.

<sup>6</sup> Notes on Confs. with Hitler, 30th May 1943, *Speer Docs. (Hamburg Series)*.

<sup>7</sup> M.E.W. Industrial Damage Report, 30th April 1943.

<sup>8</sup> M.E.W. Intelligence Weekly, 3rd July 1943.

<sup>9</sup> U.S.S.B.S. *Gusstahlfabrik Friedrich Krupp*, (No. 108).

ever, much nearer the truth. After the first raid on Wuppertal, for example, the loss was assessed as fifty-two days' production, while the post-war survey concluded that two months' production had been lost in the two raids of this period, of which the first was the most severe.<sup>1</sup> The estimates of R.E.8 of the loss of Krefeld, where there was a great conflagration similar to that in Hamburg, was almost the same as the post-war survey of the United States team, two months' production.<sup>2</sup>

On the other hand, but little loss of production was caused by the devastation in the centre of Düsseldorf, which M.E.W. thought would produce a chaotic condition in the administration of the Ruhr industries, and its factories on the outskirts of the city suffered but little harm.<sup>3</sup> Remscheid, which lost three months' production, was the only other town which suffered as heavily as Wuppertal in this period. It never recovered its full production.<sup>4</sup>

It is obvious that it was very difficult to estimate the total loss of production in the Ruhr and Rhineland. M.E.W. considered that it had been reduced by thirty-five per cent in the spring of 1943 and that this figure had been increasing in the second quarter of the year. A survey by R.E.8 of thirteen towns, of which eleven were in the Ruhr and Rhineland, hardly supported this estimate, but it made no specific calculation of the total loss. M.E.W. also overestimated the effect on steel production and for a time on transportation. Neither was very seriously injured. M.E.W. was, however, careful to point out that as the loss had fallen on the earlier stages of production no effect in the supply of weapons would be seen for some time.<sup>5</sup>

Such estimates as we possess made by the Germans at the time and the survey teams afterwards show that M.E.W. put the loss too high. Two reports by economic sections of the German armed forces consider that the damage to the heavy industry was not serious. They were at the time more afraid of an attack on the chemical complex of nitrogen, explosives and aviation spirit than of mass attacks on the

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<sup>1</sup> Min. of Home Security Report, 27th Aug. 1943. *U.S.S.B.S. Effects of Area Bombing on Wuppertal*, (No. 33).

<sup>2</sup> Min. of Home Security Report, 9th Sept. 1943. *U.S.S.B.S. Fire Raids on German Cities*, (No. 193). Though the two reports agree very closely in the total effect, the figures on which the conclusions are based are very different and this seems to be a case where errors in estimates cancel one another out.

<sup>3</sup> *U.S.S.B.S. Effects of Area Bombing on Dusseldorf*, (No. 34), suggests a ten per cent loss for six months. R.E.8's estimate based largely on destruction of the central part was much too high. Min. of Home Security Report, 22nd Nov. 1943. The British survey estimated that there was two and a half months' loss of production up to November 1944. O.R.S.(B.C.) Report, 27th Sept. 1945.

<sup>4</sup> *U.S.S.B.S. Effects of Area Bombing on Remscheid*, (No. 36).

<sup>5</sup> M.E.W. Intelligence Weekly, 3rd July 1943, Min. of Home Security Report, 20th July 1943. They calculated that six per cent of the industrial buildings and twenty per cent of the non-industrial buildings had been heavily damaged, but put the damage to factories as causing no more than two weeks' loss of production.

cities.<sup>1</sup> Speer, in a speech in June, estimated that production of armaments had been reduced by ten per cent, but he did not say for how long. He stated, however, that his plans for increased production had been delayed for about a month.<sup>2</sup> The fact that total production in the Reich was not increased in the second half of 1943 was to some extent due to the Battle of the Ruhr, but more to other causes. Perhaps, a reasonable deduction from all the evidence would be that there was a loss of from one to one and a half months' production in the Ruhr and Rhineland as a result of the battle, spread of course over the whole ten months of 1943.

If the Battle of the Ruhr was spread over too wide an area to be correctly appreciated, the damage done to Hamburg could be measured with some exactitude. The extent of the fire storm had not been foreseen, but it was due to carefully contrived concentration. Different sections of the city were attacked in successive raids and had not the weather greatly reduced the effect of the last attack, no part of it would have been left without extensive damage. The shock to the Reich was a profound one, and Speer's reported remark that six more on this scale on other cities could have reduced the Reich to impotence has often been quoted. This judgment was, however, qualified by him later when Hamburg had recovered so rapidly and when other cities had been devastated to an almost equal extent.<sup>3</sup> Time was given, he explained, to recover from the shock and the experience gained at Hamburg used to reduce the loss caused by later raids. Hamburg itself made a heroic effort to reduce the damage during the raid, and afterwards, when all the circumstances are taken into account, made a remarkable recovery. The damage inflicted on the production of armaments was substantial, but it could be easily absorbed in the whole economy of the Reich. Though nearly a million people fled the city, the large majority of the workers soon returned and continued to work with undiminished vigour.<sup>4</sup>

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<sup>1</sup> Extract from *Luftwaffe* Intelligence Report, 25th April 1944. Study issued by the German Economics Intelligence Branch, 3rd April 1944. Neither gives detailed statistics.

<sup>2</sup> Notes for speech by Speer, 21st June 1943, Speer Docs. (Hamburg Series). The damage, he said, was 'not yet considerable'. He gave falls in production: drop forgings, fifteen per cent; aircraft crankshafts, eighteen per cent; tank bodies, two per cent; coal production, twenty-five per cent; locomotives, thirteen per cent; but he does not say for how long.

<sup>3</sup> In an interrogation he stated that he changed his view because of the speed with which Hamburg recovered, see App. 37 (i), para. 11.

<sup>4</sup> There are a number of detailed reports on Hamburg but the most authoritative is that of the *U.S.S.B.S. A Detailed Study of the Effects of Area Bombing on Hamburg*, (No. 32). Its estimates of loss are based on samples, but they are large ones and are confirmed by such statistics as those of the consumption of electricity. The Bomber Command O.R.S. post-war report is compiled from similar sources and is the best of this series. There is also a Police Report of 10th September 1943 which gives detailed information of the extent of the damage. The difficulty of estimating it exactly may be seen from the fact that it was many weeks before the number killed in the raid was even approximately known.

Still the loss was a severe one. Hamburg, the third city of the enlarged Reich, never recovered to full production, though it did so in its most important armaments industries. Its labour force was reduced permanently by ten per cent. Forty-two thousand six hundred people were reported as killed in these raids and 37,000 injured.<sup>1</sup> A large amount of labour and material had to be used for rehabilitation and reconstruction. Large stocks of food and consumer goods were destroyed as well as some of important armaments. A number of ships and some submarine construction works were destroyed or badly injured, though, owing to the reorganisation of the submarine industry then taking place, this had only a slight effect on the efficiency of the submarine fleet.

The estimates of R.E.8 were not unduly exaggerated but their compilation took a long time. Reconnaissance cover was good and rapid but their report did not appear until the middle of November and so made less impression than it might have done had it appeared earlier. The area of devastation was carefully measured and the usual calculations made. These produced an estimate of total loss of production which was too high, but in the circumstances, perhaps, not excessively so. The loss as calculated by the United States post-war survey was 1.8 months' production, say forty-five to fifty working days in the larger firms. The loss in the smaller ones was greater though difficult to assess exactly. The Operational Research Section team thought that they lost six months' production. The United States estimate did not include long-term effects after May 1944 because they could not be distinguished from those produced by later raids.<sup>2</sup> The estimate of R.E.8 was about eighty-three days' production loss, but this included items not considered in the post-war survey such as repairs to houses and loss of domestic goods and chattels. R.E.8 itself recognised that the figures did not necessarily give an accurate result as the circumstances were different from previous raids.<sup>3</sup>

The United States survey was able to show statistically that the greater proportion of the loss was borne by the least important industries. Textiles and food processing suffered a good deal more than machinery, electric products and aircraft, due partly to the fact that less damage had been done to them and partly because of priority in repairs and transfer to them of workers from the other industries.<sup>4</sup>

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<sup>1</sup> In addition there were two thousand missing. The total number of deaths was probably nearer fifty thousand than forty thousand.

<sup>2</sup> *U.S.S.B.S. Effects of Area Bombing on Hamburg*, (No. 32), p. 43. O.R.S.(B.C.) Report.

<sup>3</sup> Min. of Home Security Report, 22nd Nov. 1943. The dead were put at 27,000, showing how the average was exceeded by such conditions as were created at Hamburg by the fire storm.

<sup>4</sup> *U.S.S.B.S. Effects of Area Bombing on Hamburg*, (No. 32), p. 47.

A comparison of damaged and undamaged plants seemed to show that half the loss had been caused by direct damage and half by absenteeism which affected all the industries in the city.

Nevertheless, the Police report gave long lists of factories destroyed in the different quarters of the city. Though many of the important newer ones in the outskirts escaped, the loss included many chemical works and some engineering and aircraft firms. One hundred and eighty-three large factories were completely destroyed out of the 524 in the city and 4,118 smaller ones out of 9,068. Five hundred and eighty industrial concerns and armament works, 299 of which were important enough to be listed by name, were either destroyed or damaged.<sup>1</sup> The local transport systems, both the underground railway and the tramway, were completely disrupted and did not recover for a long period.<sup>2</sup> R.E.8 could not estimate exactly the proportion of the loss that fell on the armaments industries. It noted that only thirty-two of the seventy factories given the highest importance by M.E.W. were damaged, but its report suggested that the armament industries had suffered greater loss than the others. However, it did not itself profess great confidence in these figures, admitting that the location of many factories was unknown.<sup>3</sup>

On the other hand, R.E.8's estimate of the number of dwelling units destroyed, 214,350 out of 414,500, was less than the actual loss as reported at the time; 253,400 out of 450,800.<sup>4</sup> It exaggerated the effort that would be necessary to rehouse the occupants. Nevertheless, the effort was a considerable one and absorbed large quantities of new materials and labour in addition to the contribution made by the inhabitants themselves; in total, perhaps, the effort was greater than that of any other city in Germany.<sup>5</sup>

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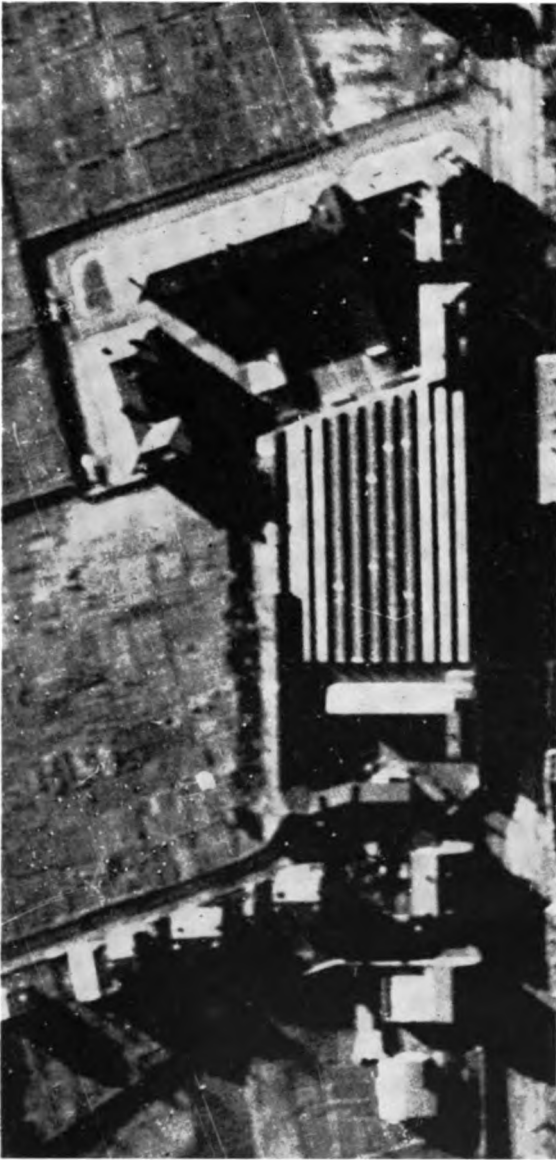
<sup>1</sup> Hamburg Police H.Q. Report, 10th Sept. 1943. In addition, 457 public buildings were destroyed and 396 seriously damaged during the war, eighty-four per cent of them in these raids. The United States survey (No. 32, p. 11) found that these destroyed forty-eight and a half per cent of the plants, shops, stores, office buildings, warehouses, garages, coal and oil dumps, cold storage plants, theatres, beer taverns and amusement facilities.

<sup>2</sup> O.R.S.(B.C.) Report, 29th Oct. 1945.

<sup>3</sup> Min. of Home Security Report, 22nd Nov. 1943. As has been pointed out above, the basis on which this kind of assessment was made was in any case not able to produce accurate results.

<sup>4</sup> Min. of Home Security Report, 22nd Nov. 1943. Hamburg Police H.Q. Report, 10th Sept. 1943. The United States Survey found that thirty-three per cent of the houses were destroyed and about seven and a half per cent heavily damaged. This is considerably less than the percentage given by Speer on 1st May 1944 which, however, contained some earlier and later losses. *U.S.S.B.S. Effects of Area Bombing on Hamburg*, (No. 32), and App. 49 (xv). The R.E.8 estimate was possibly made of a smaller area than that of the Police Report. But all the reports of the damage must have had a considerable margin of error for it was impossible to keep all the records up to date and accurate in the conditions existing. The Police Report, for example, had only obtained the estimate of 35,000 dead six weeks after the raids had taken place. The actual total then known was 26,409.

<sup>5</sup> One of the greatest difficulties in repair here and elsewhere was to find glaziers and glass to replace the broken windows.



32. The needle-bearing works at La Ricamerie before attack; 33. La Ricamerie after the attack on the night of 10th March 1944.



34. Final briefing of a Bomber Command Squadron.



35. A Bomber Command crew being interrogated after an attack.

The port of Hamburg and its contents also received considerable damage which is reckoned separately both in the R.E.8 estimates and in the United States survey. Eighteen seagoing ships, totalling 108,262 tons, and 294 smaller craft, totalling 64,536 tons, were either sunk or burnt out as well as numbers of lighters and barges. The installations of the harbour were also severely injured, many piers, cranes and warehouses being destroyed. But the port of Hamburg was not working at full stretch and, as was recognised in Britain, remained capable of dealing with all the trade which it had to handle.<sup>1</sup> Hamburg's second port, Harburg, which carried twenty-five per cent of the seagoing traffic, was not affected by these raids.

In sum total the loss inflicted on the city and port was a great one and felt to be such at the time. But even the city of Hamburg itself was not crippled, but recovered to a great extent in a comparatively short period. For a month production was reduced by half, but the loss grew less as time went on, though the recovery was not complete before new and even more serious losses were inflicted on it in the final stages of the war.

The Battle of Berlin, though a record of sustained heroism, was not as successful as the other two. The loss inflicted was proportionately less than that suffered by the Ruhr and Rhineland; there was no such permanent effect as occurred in Hamburg. Nevertheless, great injury was done to a very important section of the German armament industry and some of the raids were so devastating that they caused acute anxiety in the minds of those directing the resistance of the Reich. Towards the end of it Milch confessed his fears to a meeting of representatives of the aircraft industry. 'The British', he said, 'have calculated exactly how many attacks they need to make an end of Berlin. The total may be twenty-five. They have already made fifteen attacks, leaving ten to come. Furthermore, they have announced that when they have finished with Berlin it will be the turn of the Central German industrial area . . . I would like to suggest that you look at Berlin: it will then be obvious that what has happened in the last few months cannot be endured indefinitely.' Nevertheless, he still considered that the Eighth Air Force attack on the aircraft industry was an even greater menace, because, if it was successful, all means of resistance would be gone and the armament production of Germany lie at the mercy of the enemy.<sup>2</sup>

The target was, of course, something different from all the others. Berlin was the third largest city in the world, at that time, 883 square

<sup>1</sup> Hamburg Police H.Q. Report, 10th Sept. 1943. *U.S.S.B.S. Effects of Area Bombing on Hamburg*, p. 12. O.R.S.(B.C.) Report. Some of this loss was caused by the two daylight raids by the Eighth Air Force which was specially directed at the port. The effect on submarine construction is discussed on p. 287 of this chapter.

<sup>2</sup> Conference with Milch, 23rd Feb. 1944.



miles in extent, with large open spaces, and a population in 1939 of over four millions. This had been considerably reduced by the autumn of 1943 by the evacuation caused by previous raids and another half million people left the city during the winter, including most of the children that had remained.<sup>1</sup>

In addition to its importance as the capital city, it was a great industrial complex. One-third of the electrical engineering industry was centred there, mainly in Siemensstadt where the great Siemens works constituted 'A city within a city'. One-tenth of the aero-engines, machine tools and precision instruments of Germany were manufactured there. The Alkett factory produced over one-quarter of the German tanks, though not the new Panthers and Tigers,<sup>2</sup> as well as nearly half of the German field artillery. These factories drew their supplies from the excellent water communications system linking the Spree with other canals and rivers and the sea. It was also a centre of rail communication between East and West and was thus thought to be specially important to the Russian front.

The public utilities of the city, water, gas and electricity, were most efficient, the installations of each being widely distributed yet linked together. There was both an electricity and a gas grid. They were a difficult target to cripple seriously. There was an underground railway system which, however, had a weak link since it sometimes came above ground as an overhead one. The railway lines through the city with their three large railway stations were also vulnerable in this respect.

Milch was right in thinking that a plan had been made. But in a sense the battle had been fought blindly. In winter Berlin is generally obscured by cloud and seldom more so than in the winter of 1943-44. Daylight photographs of Berlin showing the ground damage were only twice obtained from the middle of November to the middle of February. Thus, the damage caused by the great raids during that period could not be assessed with any accuracy. The estimates made by R.E.8 were preliminary only, and based on insufficient cover. The first was not circulated until 29th January and comprised only the raids from the middle of November to the middle of December. Subsequent preliminary reports on later raids were not completed until the battle was virtually over.<sup>3</sup>

<sup>1</sup> 4,090,953 in March 1943; 3,300,204 in September 1943; 2,920,095 in March 1944. U.S.S.B.S. *A Brief Study of the Effects of Area Bombing on Berlin, Augsburg, Bochum, Leipzig, Hagen, Dortmund, Oberhausen, Schweinfurt and Bremen*, (No. 39,) p. 12a.

<sup>2</sup> U.S.S.B.S. *Tank Industry Report*, (No. 78), p. 11. *The Goebbels Diaries*, p. 437.

<sup>3</sup> Min. of Home Security Reports, 29th Jan., 23rd March, 26th June 1944. There was also one of 14th August 1944 which calculated that by that date thirty-one per cent of the city had been devastated. The actual housing figure was twenty per cent. According to the first three reports the number of days of production lost was sixty-three. But these reports did not pretend to the same exactitude as those produced less quickly.

Without the usual statistics, it was difficult to estimate the success achieved and, on occasion, wild claims were made. Thus, in their Monthly Report for January, M.E.W. stated 'that except for the south-eastern districts organised industrial activity in Berlin virtually ceased at the end of November and had not been resumed by the end of January.'<sup>1</sup> Their half-yearly report, however, made little mention of Berlin. A considerable number of plants, it said, of high priority had been seriously damaged.<sup>2</sup> Its next long survey, however, hazarded the judgment 'that the industrial production of the Berlin area was reduced by as much as 30% over the winter of 1943/44', though it admitted that the exact significance of attacks on Central Germany could not be known until after the war.<sup>3</sup> The J.I.C. reports were mainly indefinite and tended to dwell on the evidence of the unrest of the workers and their unwillingness to work rather than on the loss to production.<sup>4</sup> The injury to Siemensstadt and the Alkett factory had become well known, but any general estimates could be no more than guesses. It is not surprising, therefore, that the public statements as to the results, while sometimes correctly describing a particular effect, were also sometimes widely extravagant on the general results of the raids. Goebbels, indeed, as he surveyed his battered *Gau*, was surprised alternately at their accuracy and inaccuracy. When they were absurdly optimistic he gave orders that nothing should be published to correct that impression. The sooner the British thought that they had destroyed Berlin, the sooner they would leave it alone.<sup>5</sup>

In these circumstances Bomber Command had to make its own claims. In December it circulated to all stations a report that 'the administrative machine of the Nazis, their military and industrial organisation, and above all, their morale have by these attacks suffered a deadly wound from which they cannot recover.' And in February, after the photographic report had been studied, they asserted that 'with the single exception of Hamburg, Berlin is now the most devastated city in Germany . . . The whole series of attacks since mid-November which have come to be known as the Battle of Berlin have destroyed nearly one quarter of the German capital.' This exaggerated the damage which had yet been done to Berlin and did less than justice to the other achievements of Bomber Command.<sup>6</sup>

The difficulty was to find the industrial areas or workers' quarters

<sup>1</sup> Industrial Damage Report, 13th March 1944.

<sup>2</sup> M.E.W. Intelligence Weekly, 29th Feb. 1944.

<sup>3</sup> do. 31st Aug. 1944.

<sup>4</sup> 'The offensive against Berlin drove one-third of the population and the larger part of the Government machinery from the Capital, and produced a weakening in discipline such as had been evident in other heavily-raided areas'. J.I.C. Report, 4th March 1944.

<sup>5</sup> *The Goebbels Diaries*, pp. 424, 438, 439.

<sup>6</sup> Bomber Cmd. O.R.B. Immediate Assessments of Results, 29th Dec. 1943 and 28th Feb. 1944.

in so large an area as that of Berlin. There was thus a failure to concentrate on particular portions of the city until they were damaged as those of Hamburg had been damaged. The attack was distributed over a wide area and, if in some raids the administrative centre of the city and the Siemensstadt and the Wedding workers' quarters received heavy concentrations of bombs and suffered much damage, the attack was often less successful and time given for the stricken areas to recover. Still, some of the injury to transport facilities affected the whole city for a short time, and when the working-class district of Wedding was heavily bombed numerous factories elsewhere suffered from it.<sup>1</sup>

Berlin, in fact, received very heavy damage in this battle, though less in proportion than a number of other cities. There is no specific estimate of the total loss but the reports of the organisation of the *Gau* supplemented by those of factory wardens and utility and transport installations show how widespread they were. The effect on the utilities was but small and industry suffered hardly at all from this cause, though the people were deprived of gas in some districts for a time. Damage to transport did cause loss for a short period, some factories being left short of raw materials. This was a foretaste of what was to happen a year hence, but at this time such deficiencies could be made up out of stocks.<sup>2</sup> The Chancellery, the Finance Ministry and several other central departments were also severely damaged.

Many factories were destroyed or heavily damaged, including the important ones already mentioned. The heavy damage to the Siemens factories and the Alkett works was a very real loss and felt as such at the time. In addition, the dispersal of the electrical and instrument industry from Berlin to Silesia, which was caused by the heavy raids of November, reduced production considerably and consequently affected a number of other industries. Frydag considered these raids to be the most important area bombing of the whole war so far as aircraft production was concerned.<sup>3</sup>

Much other damage was done. In the first six big raids forty-six factories were destroyed and 259 damaged more or less. The lists are not complete but they include many important industries, chemicals, electrical engineering plants, and other engineering and armaments factories. The loss of life was surprisingly small. In twelve out of the

<sup>1</sup> U.S.S.B.S. *A Brief Study of the Effects of Area Bombing on Berlin*, ect., (No. 39). This survey is not one of the most informative reports. Circumstances made it impossible to obtain complete and accurate information of the damage done by area bombing to Berlin. We have, however, also a number of German reports of the casualties and destruction of factories and housing in several of the most important raids. The O.R.S.(B.C.) post-war report on Berlin is so general and imprecise as to be of little value.

<sup>2</sup> U.S.S.B.S. *A Brief Study of the Effects of Area Bombing on Berlin*, ect., (No. 39), pp, 23 and 25.

<sup>3</sup> Frydag Interrogation, 5th July 1945. Frydag was head of the Main Committee of Aircraft Production.

fifteen big raids there were only 5,166 killed as well as a number seriously injured and missing.<sup>1</sup> Something under one-fifth of the housing was made uninhabitable. Large numbers were rendered homeless.

But the fact remains that Berlin's armament production steadily increased during this period and, indeed, continued to do so until late in 1944. The production loss there seems to have been transferred more quickly and efficiently to the less important industries than in any other city owing to the fact that Goebbels and Speer made special efforts to bring this about. Goebbels, who believed in total war, enforced more strictly than was done in some other cities the decrees shutting down unnecessary establishments, retail shops, wholesale stores, hotels and industries such as book-binding. The clothing and printing industries, banks, insurance companies and civil departments were vigorously combed out and the manpower that could not be sent into the armed forces distributed in the armament industries. At the same time Speer's system of rationalisation was applied with exceptional vigour. Standardisation of indispensable consumer goods was also carried as far as possible. Thus, much skilled labour was released for other purposes. In fact, some firms had a reserve of labour which could be used to maintain production when bombing had deprived some workers of their homes and caused absenteeism. Thus, the attacks never reached the industrial nerve centre and production could increase, though, of course, less than would have been the case if the attacks had not done so much damage, provided that the same vigorous measures had been taken, which is by no means certain.<sup>2</sup>

It must be remembered also that much damage was inflicted during this period on other towns in various parts of Germany, some such as could only be reached when long nights made deep penetration possible. That on Leipzig, for example, of 3rd December, though only classified in the town records as a medium to heavy attack, killed 1,182 people and destroyed or seriously damaged many factories including the Junkers aero-engine works and an oxygen plant of the I.G. Farben Co.<sup>3</sup> Perhaps the most successful raid of all this period was that on Kassel on 22nd October which reproduced conditions which had been created at Hamburg. For a concentration on the centre of the city produced a fire storm and paralysed the defences which do not seem to have been conducted with the same efficiency

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<sup>1</sup> German Raid Reports. Goebbels attributed these low figures to evacuation and other emergency measures and the good sense of the Berlin population. *The Goebbels Diaries*, p. 432.

<sup>2</sup> *U.S.S.B.S. Effects of Area Bombing of Berlin, etc.*, pp. 34-35. This is the view of the team which made the study reflecting that of Dr. Weniger, Reich-Commissioner for the Planning Office of the Four Year Plan, who had been in a good position to watch the statistics of production during this period.

<sup>3</sup> German Raid Reports.

as those of Hamburg. 5,248 people were killed out of a population of 228,000. 91,000 people were made homeless. Sixty-one per cent of the residential buildings of the city were destroyed, the rail communications disrupted and the railway station burnt out, a large number of military installations and public buildings gutted and heavy damage inflicted on at least nine of the principal factories.<sup>1</sup> Düsseldorf, Frankfurt, Hanover, Munich and Stuttgart also received much damage and Bomber Command joined the Eighth Air Force in attacks on the Northern ports and submarine construction yards. Such diversions were necessary, as has been seen, for tactical reasons, and they prevented any area of the Reich from feeling safe, relaxing its preparations for defence or concentrating them at a threatened spot. There was also the harassing effect of the Mosquito raids which was severely felt in some cities, and, in addition, there was also the slow but not inconsiderable pressure of the sea mining. But the main objective of the last phase of this period was the armament production of Berlin and, though it was reduced, the loss was comparatively small compared to the increase produced by Speer's efforts in almost all the important industries.

It is thus apparent that the area bombing was very far from inflicting any crippling or decisive loss on the enemy and had not prevented the great increase in armaments carried out in this period. Whatever reservations be made about the reliability of some of the statistics and computations there is no doubt about the main fact. How great an effort would have been necessary to increase the effect to such an extent that it caused a collapse cannot be known, but it was clearly one quite outside the capacity of the two air forces. For this reason the demands for more selective bombing grew in number and insistence as time went on. The survey in the following section of the results of selective bombing will help to show what justification there was in this period for these attempts to divert Bomber Command from general area bombing.

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<sup>1</sup> *U.S.S.B.S. Fire Raids on German Cities*, (No. 193), pp. 17 ff. German Raid Reports. The percentage of housing destroyed as given by the U.S.S.B.S. survey hardly corresponds to the number of homeless. The Immediate German Raid Report states that seventy to eighty per cent of all buildings were destroyed. Speer's later percentage is fifty-five. See App. 49 (xv). The Germans used the following categories in assessing damage after air attacks:

Total	70-100 per cent destroyed
Heavy	50- 70 per cent    ,,
Medium	10- 50 per cent    ,,
Light up to	10 per cent        ,,

Obviously immediate classification of such damage or one made long after the event from imperfect records must have considerable margins of error. The records of loss to industrial buildings are even more suspect because local authorities were not allowed to keep such records though their building authorities often did so. (*Fire Raids on German Cities*, p. 8.)

#### 4. Appreciations and results of selective and precision bombing

Throughout this period, in addition to the area bombing, there had been attacks on particular industries or factories as had been envisaged in the plan for the Combined Bomber Offensive. This part of the offensive had been mainly carried out by the Eighth and later also by the Fifteenth Air Force of the United States and, as has been seen, they concentrated on the aircraft industry including its component, ball-bearings. It has also been shown that Sir Arthur Harris considered that the co-operation by Bomber Command which had been expected on this objective by selective bombing would divert his force from its primary task, the destruction of German cities. Nevertheless, either by his own desire or by the pressure or direct command of the Chief of the Air Staff, Bomber Command was used at times in this manner. By selective area bombing it joined in the attack on the aircraft industry and ball-bearings towards the end of this period. There were also notable examples of precision bombing of small sites or installations, in the attacks on the dams, on Peenemünde and on factories in the occupied territories. The operational problems which they involved have already been considered, but there is also their economic aspect on which Sir Arthur Harris had his own views and which was a matter of controversy inside the Air Staff. It must be remembered that the Air Staff was responsible for the intelligence concerning the aircraft industry, though receiving much information and advice about it from M.E.W.

As has been seen in Chapter IX, there had for some time been important elements within the Air Staff which believed that decisive results might be obtained from a selective application of area bombing, as also from the development of precision techniques. When in the autumn of 1943, confidence in the success of a general area offensive began to decline, those views gathered force and, despite the continued belief of the Directorate of Intelligence in the policy of general area attack, were invested with greater authority. The controversy reached its height in the discussions as to the attack on Schweinfurt, the main centre of the ball- and roller-bearing industry, and some detailed examination of the economic assessment of that industry and the actual results of the attack on it is, therefore, necessary. It reveals in a striking manner the possibility of fundamental errors in the economic appraisal of a particular industry.

There can be no doubt that the ball- and roller-bearing industry was studied by the British and United States economic experts with a persistence and concentration which was only exceeded by that

given to the oil industry.<sup>1</sup> It was first considered by the Target Committee in October 1941 and was recommended by M.E.W. with increasing insistence throughout 1942 as the most rewarding bottleneck industry to attack. It also assumed great importance in United States planning, which had as its first objective the crippling of German aircraft production. By the autumn of 1942 the location, the percentage of production and special character of the factories engaged in the industry were known, and, as post-war records show, in nearly all cases the estimates were remarkably accurate. M.E.W. had discovered that fifty-two per cent of German supplies were produced in one town, Schweinfurt, and though their estimates of the production of other factories were not quite so near the truth, the errors were not such as to affect the validity of their conclusions. They were also engaged in a costly effort to limit Swedish exports to Germany by pre-emption of their products. Thus, it was suggested that, if Schweinfurt was destroyed or its production largely reduced, not only the aircraft industry, but all the other armament industries using ball-bearings, would be seriously affected.

This conclusion was sent to Sir Arthur Harris by the Air Staff on 21st November 1942 together with a memorandum by M.E.W. giving the facts and reasoning on which it was based, and it was hoped that he would make a raid on the heaviest scale against Schweinfurt similar to those made on Cologne, Essen and Bremen. His reply was naturally mainly concerned with the operational aspect of the problem, but in a notable paragraph he also challenged the economic appraisal of M.E.W. In particular, he alluded to the fact that greater stocks might be in existence than M.E.W. supposed and that Sweden might be coerced into giving more assistance if German armaments were seriously threatened. He maintained this sceptical attitude throughout the controversy as the quotations from his letters in Chapter IX abundantly show. In spite of the fact that he was hardly qualified to make these judgments in opposition to the experts, he was much more correct in his assumptions than they were.<sup>2</sup>

The ball-bearing industry in Germany had been partially controlled by the Swedish international combine Svenska Kugellager Fabrik (S.K.F.), which had set up two large factories at Schweinfurt, the Vereinigte Kugellager Fabrik (V.K.F.). Its main rival was a German firm, Kugelfischer A.G. (F.A.G.), which also possessed a large factory at Schweinfurt. These two firms produced about half the ball-bearings made in Germany. They had subsidiaries at Berlin and

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<sup>1</sup> The term ball-bearing industry was generally used to describe the target system and has so been used in this book. In general, balls as rolling parts are used where high speeds are required and rollers where ability to carry heavy loads is more important. There are many different types of each kind.

<sup>2</sup> Letter Bottomley to Harris, 21st Nov. 1942. M.E.W. Memo., 20th Nov., and letter Harris to Air Min., 23rd Nov. 1942, App. 19 (i) and (ii).

Cannstatt/Stuttgart which, with a new independent factory at Steyr in Austria, produced important quantities. Thirty-five smaller plants scattered over Germany, some very specialised, produced the rest. German production supplied about three-quarters of Germany's needs. The original Swedish factory (S.K.F.) supplied them with almost half of the remaining quarter and this contribution was specially important, since it was used to obtain bearings in short supply or not made at all in Germany. The rest was produced in two factories, one at Paris and one at Turin, with some other firms of smaller importance in France and Italy. No attempt will be made to describe the many different kinds of bearings used in the different industries. It suffices to say that there were many varieties and that some factories produced nearly the whole range while others specialised in particular kinds.<sup>1</sup>

Thus, the ball-bearing industry was, as M.E.W. had discovered, the bottleneck industry likely to give the best possible return to a selective attack and Schweinfurt itself, a comparatively small town of 60,000 inhabitants was, if it could be found and hit, an ideal target for such a purpose. If, in addition, Sweden could be prevented from increasing her exports to Germany, as the latter would certainly demand, and other plants could be successfully attacked, a critical situation might become almost catastrophic. But obviously, whether this would be so or not, depended on a number of unknown factors and especially on the amount of stocks in hand and the rapidity with which machines could be repaired or replaced and set to work again at Schweinfurt or elsewhere.

The information on the factories possessed by M.E.W. in 1942 was abundant and largely correct. It took some time to locate the new factory at Steyr and appreciate its importance, but otherwise its estimates of the contribution of each factory to the total was remarkably

<sup>1</sup> U.S.S.B.S. *The German Anti-Friction Bearings Industry*, (No. 53), p. 18. The proportions were as follows:

Places	Plants	No. of bearings	Per cent	Value in 1,000 RM.	Per cent
Schweinfurt	3	3,771	45.0	12,250	52.2
Cannstatt/Stuttgart	1	1,533	18.3	1,921	8.2
Berlin	2	1,094	13.0	2,049	8.7
Steyr, Austria	1	854	10.2	2,734	11.7
Other plants in Germany	35	1,127	13.5	4,499	19.2
	42	8,379	100.0	23,453	100.0

This description of the industry and the results of the attacks upon it are largely based on this study, one of the best of those produced by the U.S.S.B.S.



accurate.<sup>1</sup> M.E.W. made, however, a number of errors in its assumptions by which its conclusions were largely vitiated. The most fundamental was that the amount of the stocks of ball-bearings was grossly underestimated, not those in the hands of the makers, but those in the possession of the industries which used them as components. It is not surprising that the mistake was made for, until the crisis in October 1943 produced by the second attack on Schweinfurt, the Germans themselves had no idea that such stocks existed. There were, in fact, from six to twelve months' supply of nearly all bearings. This was the case even when allowance was made for the planned expansion of the armaments industry.<sup>2</sup>

Secondly, M.E.W. thought that it would take nine months to construct new machines while, in fact, they could be built in four. Thirdly, the damage done to machines by bombing was always much less than M.E.W. and R.E.8 imagined. Fourthly, they did not realise to what a large extent the Germans could substitute plain bearings for those in use. Fifthly, even if Sweden's exports of ball-bearings were limited to a certain value, the nature of the exports was not prescribed and could be adjusted to the special needs of Germany. Finally, there was the fact, which Sir Arthur Harris had clearly seen, that, if the whole armament industry of Germany was threatened by a shortage of ball-bearings, all its energy and resources would be directed to preventing such a catastrophe.<sup>3</sup>

For these reasons the result of the attack was very different from that which had been anticipated by the experts. The attack caused great loss and anxiety and a special effort had to be made to prevent it being of grave consequence. But it was not, and almost certainly could not have been made, a decisive attack as many of those advocating it had claimed would be the case.

The first attack on Schweinfurt by the Eighth Air Force in August was a comparative failure and was so considered in Britain. Its results were, in fact, underestimated, for, though it was true that the V.K.F. factories had received little injury, the ball department of the Kugelfischer plant had been seriously damaged, reducing its capacity for nearly three months to less than fifty per cent.<sup>4</sup> The second

<sup>1</sup> Much skill and ingenuity was shown by British and United States experts in discovering which factories made the ball-bearings used in aircraft and tanks.

<sup>2</sup> The question had been considered by M.E.W. but the conclusion reached was that it would be contrary to the usual practice. See App. 19 (i), Annexe A, para 2. But German manufacturers were lavish in such matters to a degree unknown in Britain and the United States. Large stocks of raw materials of all kinds were also found to be in their possession.

<sup>3</sup> In addition there was the improved organisation of the industry when it came under strict control, but that some such process would ensue must have been assumed by M.E.W.

<sup>4</sup> Min. of Home Security Report, undated. *U.S.S.B.S. Anti-Friction Bearings Industry*, (No. 53), p. 28. The production of balls was partly transferred to a new plant in the nearby town of Kirchheim.

American attack of 14th October was the most important of all the raids on Schweinfurt and did the most damage. The ball department of V.K.F. was very heavily hit and this produced the balls used by the other factory and the subsidiary at Stuttgart. The Kugelfischer factory was also again damaged, but the other V.K.F. factory remained practically intact. The damage was fairly accurately estimated in Britain as the loss of one and a half months' production, but it was pointed out that Schweinfurt was still an important target. The statement in the report of General Arnold, made to soothe opinion in the United States, so gravely disturbed at the terrible losses of the Eighth Air Force, must have been made after these facts were known at Washington.<sup>1</sup>

Nevertheless, the effect of this successful raid on the German leaders was all the greater as they realised that, as had been long feared, a plan had been made to destroy the ball-bearing industry. Unprecedented steps were at once taken to meet the emergency. Under the Speer reorganisation the *Sonderring Walzlager* had already been set up to co-ordinate the industry. It was staffed by high officials of S.K.F. and F.A.G. and had already done good work in reducing the number of different types of bearings and distributing their production more economically amongst the different factories. New machinery was already on order as part of the expansion programme. But the *Sonderring* had no compulsory powers and was simply a joint planning committee. Now its functions were extended and it was given more authority. Speer also appointed one of the most efficient and energetic of his staff, Philip Kessler, as special commissioner for ball-bearings. In accordance with Speer's principles he did not set up an elaborate new organisation, but worked through the *Sonderring*. With overriding authority he, the first of the industrial 'Czars' appointed by Speer, obtained new machinery at a rapid rate and carried out a dispersal programme for which some plans had already been drawn up.<sup>2</sup>

Through the *Sonderring* a census of stocks in the hands of the industrial firms was immediately set on foot with severe penalties for false returns. The result compiled by 9th November surprised everyone. It was possible not only for many firms to continue full production without new supplies but also to distribute surplus stocks to others, who for some reason or other were short of stock. No less than eight

<sup>1</sup> For General Arnold's statement see above, p. 63. Min. of Home Security Report, 18th Nov. 1943. The appreciation of M.E.W. also shows that, as is so often the case, the distribution of the damage amongst the different factories was not correctly apportioned. M.E.W. Report, 16th Nov. 1943.

<sup>2</sup> The process is described in considerable detail in *U.S.S.B.S. Anti-Friction Bearings Industry*, (No. 53), pp. 105-114. A plan for dispersal had been drawn up as early as 1942. When on the morning after the raid of 14th October Goering called a meeting to consider the situation, great alarm was caused by the news that dispersal had hardly begun. The existence of the plan hastened the process.

million bearings were reported and of these four and a half millions were redistributed. A special section of the *Sonderring* then controlled all new orders and directed the production of the different firms in the best manner to meet all needs. Moreover, it was found that plain bearings could be substituted for ball-bearings in many forms of components and the demand could consequently be considerably reduced.

Even then there was difficulty about some types of bearings. Recourse was, therefore, had to the mother factory at Gothenburg and, though there was disappointment that the total value of the exports had been restricted by the agreement made with Britain, S.K.F. agreed at once to supply exactly those types of bearings most useful to Germany in the emergency. After all, S.K.F. had large capital investments in Germany and Sweden drew important supplies from her.

Thus, though production was further reduced by attacks on the Paris factories by the Eighth Air Force and by sabotage, and by the Fifteenth Air Force on Turin, there was no effect on the production of armaments. Meanwhile, the dispersal of the Schweinfurt factories was begun, the army authorities co-operating in finding suitable sites and buildings and the machine-tool industry making a special effort to equip them with machines in addition to those received from Schweinfurt.<sup>1</sup>

Thus, though M.E.W. was anxiously looking for signs of the effect of a shortage of bearings in the armament industry, none appeared. It seemed all the more necessary, therefore, to compel Bomber Command to make an attack on Schweinfurt where, it was correctly ascertained, repairs had been hastily carried out, though the extent of the dispersal had not been realised.

In February, the attack at last took place and again produced heavy damage at Schweinfurt, though not so great as the American attack in October, because thirty-four per cent of the plants' resources had already been removed elsewhere. Other attacks were made on the Erkner factory in Berlin and Stuttgart had been devastated by a heavy area raid. The Fifteenth Air Force began attacks on Steyr and made a very successful one before the dispersal already planned had been carried out. At the end of February production had almost completely ceased at Schweinfurt, Erkner, Cannstatt and Steyr. By April 1944 total production had been reduced by fifty per cent. This situation necessitated further efforts by Kessler and his staff, but these were forthcoming and justified the slogan which he had given to the workers, 'Not one fighter or tank less through the lack of ball-

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<sup>1</sup> Report Kessler to Speer, 6th April 1944, App. 31. *U.S.S.B.S. Machine Tool Industry in Germany*, (No. 55), p. 20.

bearings.<sup>1</sup> This slogan was substantially justified, for the stocks in the hands of the industrialists were sufficient to meet emergencies. Further attacks took place, but the industry was now considerably dispersed and, as is seen in the tables of production, the smaller plants were able to make up most of the losses due to the destruction of the larger factories and the delays caused by dispersal. Moreover, though great damage was done to the buildings, only ten per cent of the machines, now protected by blast walls, were seriously injured.

Some, but not all, of these facts became known in Britain in the course of the spring. There was much dismay at the manner in which Sweden was carrying out her agreement and considerable discussion of drastic measures to prevent her doing so. These were, however, eventually abandoned in favour of a new agreement concluded on 12th June 1944 which reduced the quantities of bearings to be exported and prevented specialisation in the types most needed by Germany.<sup>2</sup> Pressure continued to be exerted on the Air Forces to continue the attack on the ball-bearing industry and a number were made. But there were no means of discovering the places to which the industries had been dispersed and production of ball-bearings continued to increase until other factors made its supplies redundant. No appreciable effect was produced on the armament industries by any shortage of ball-bearings throughout the whole period.

The effect of the bombing was on the whole realistically estimated in Britain. Though they exaggerated its effect on the 1943 production, M.E.W. correctly stated in a report issued in July 1944 that production had been reduced by over fifty per cent. But at the same time they admitted that no evidence had yet been found to show that armaments production had been affected by this fact. Sir Arthur Harris was thus able to point out in a pungent letter that here was a good example of the error of diverting his force to a 'panacea' target. If, in fact, he suggested, this item had been as vital to the German war effort as M.E.W. had repeatedly asserted, a reduction of 54.5 per cent could not have been otherwise than fatal to the German war effort. Yet all that M.E.W. could now say was that if the attacks were renewed in addition to reducing Swedish exports further some effect would eventually be produced. He hoped, therefore, that in future

<sup>1</sup> The Steyr plant lost four and a half months' production of its 1944 output, but some of the loss was caused by the dispersal of the plant. Fifty per cent of the large stocks there were destroyed in the raid of 2nd April 1944. The production of the Cannstatt/Stuttgart plant had been largely dispersed before it was heavily damaged by the area attacks of Bomber Command.

<sup>2</sup> The correspondence between departments shows the shock caused by the Swedish action and the question was considered by the Chiefs of Staff on several occasions. For the lengthy negotiations with the Swedish Government and S.K.F., see W. N. Medlicott: *The Economic Blockade*, Vol. II, (1959), pp. 479-492. Even after the new agreement was made S.K.F. did its best to meet urgent German needs for a time, but in October all export was stopped. *U.S.S.B.S. Anti-Friction Bearings Industry*, (No. 53), p. 54.

'panacea' targets would be put forward with more discretion if they were advocated by M.E.W. The reinforcement in Sir Arthur Harris' mind of this conviction, already strongly held, was, indeed, an unfortunate result of the attack on the ball-bearings industry, for, as will be seen, it was one of the considerations which led him to take a similar attitude towards the attack on the oil industry where the advice of the experts was much more soundly based.<sup>1</sup>

The long and laboured reply to his letter sent by M.E.W. after an interval is not convincing. Their report, they said, was an understatement and they tried to show that desperate shortages had already been produced in all kinds of the enemy's weapons and equipment, especially in aircraft, tanks and motor transport. In fact, the supply of armaments of all kinds had been steadily increasing and had certainly not been affected in any important manner by any shortage of ball-bearings. They were on stronger grounds when they asserted that they had never officially put forward the view than an attack on ball-bearings would by itself defeat the enemy, though earlier communications and advocates of the target both in M.E.W. and the Air Ministry had come very near doing so.<sup>2</sup>

The question remains whether results more commensurate with the expectations of M.E.W. would have ensued if the attack had been pressed home after the raid on Schweinfurt on 14th October. Certainly an attack on Schweinfurt alone would not have produced decisive results. If, in addition, successful raids could have been made on the other plants as was done in the spring, undoubtedly much greater difficulties would have been produced in some forms of armament production. Speer thought that the effect would have been very serious, but other experts did not agree with him. Obviously much would have depended on the speed with which not only Schweinfurt but the other factories could have been seriously damaged. The United States team refused to pronounce on this hypothetical question, but the evidence goes to show that no very different effect could have been produced. More damage would have been done at Schweinfurt if an equally effective raid had been made before so much dispersal took place. But the stocks were sufficient to tide over such an emergency and an even greater effort could have been made if it had been necessary to accelerate dispersal and reconstruction.<sup>3</sup>

<sup>1</sup> Letter Harris to Air Min., 8th July 1944, App. 19 (iii).

<sup>2</sup> Letter Vickers (M.E.W.) to Inglis, 26th July 1944, App. 19 (iv).

<sup>3</sup> This view is supported by that of the United States official history: 'basic stocks were too large, the pipelines in the aircraft industry too well filled, and the possibility of economy too great for even the most successful bombing of the bearing plants to affect final aircraft production appreciably.' *The Army Air Forces in World War II*, Vol. III, p. 45. After the October attack both Speer and Saur thought the danger to be immediate for Speer reported to Hitler '— im Beisein von Saur — dass weitere Angriffe auf die Kugellager-

But, even though all this is true, it is also true that Schweinfurt was as good a target as existed in Germany, perhaps the most rewarding at that period, and an immediate attack on it would have caused greater damage to armament production than an equivalent load dropped on other cities almost equally difficult to attack.

The attack on the ball-bearings industry was part of the attack on the aircraft industry which was the major objective of the Eighth Air Force during this period. But Bomber Command was also involved in it to some extent and its importance in the strategic offensive is so great that some account must be given here of its results.

It is one of the ironies of the strategic offensive that, despite the final success of the attack on the aircraft industry, when nearly ninety per cent of the fighter airframe plants were destroyed or heavily damaged, the production of fighters increased three-fold during this period and continued to increase until September 1944. Large numbers of aircraft were lost to the enemy by the attack, but not sufficient to reduce the front line of the *Luftwaffe* in the manner that had been expected. Yet such air superiority was attained as made the invasion possible and the strategic bombing offensive much more destructive than it had previously been. The strategic and operational aspects of this subject have been discussed in the two previous chapters. The effect of the attack on the industry itself and the appreciations made of it remain to be considered here.

In a previous chapter,<sup>1</sup> the character and distribution of the aircraft factories have been described. None of the airframe factories and only one of the aero-engine factories was in the Ruhr. They were in central and northern Germany and Austria and so could not be attacked by Bomber Command while the nights were short. They were also for the most part situated on the outer fringe of the cities and so were little damaged by the area attacks, though their workers sometimes lived in the devastated areas of the towns. They drew their components from a large number of different factories so widely distributed over Germany that except in one or two cases, such as ball-bearings, these were not susceptible to precision or selective area bombing. How formidable was the task of destroying such an

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*industrie die Rüstung zum Erliegen bringen müssen.* ('—in the presence of Saur—further attacks on the ball-bearing industry would bring armament production to a standstill.'). At this date they were not aware of the large stocks in existence. In their interrogations both at times expressed the view that further successful attacks would have had great effect on production. Speer, for example, stated on one occasion that the armaments industry could have been brought to a standstill in four months. Saur seems to have had finally a different view. Speer's assertions can hardly stand in face of the facts revealed by the post-war investigations of the problem. Nor did Petersen, the head of the Aircraft Inspection at Rechlin, agree with them. Speer Interrogation, 18th July 1945, see App. 37 (ii), para. 18. Saur Interrogation, 7th June 1945, Petersen Interrogation. *U.S.S.B.S. Anti-Friction Bearings Industry*, (No. 53), p. 119.

<sup>1</sup> See Vol. I, pp. 292-295.

industry can be shown by the fact that its output has been estimated as forty per cent of the total of the whole munitions industry.<sup>1</sup>

In 1943-44 the *Luftwaffe* was passing through a period of disillusion. As the strategic attack developed the demand for a more effective defence grew continually more urgent, but opinion as to the best method was divided. Both Hitler and Goering believed that the best deterrent was to bomb Britain. The threat had often been made, but neither the machines nor the trained crews were there to carry it out efficiently. Radar guidance had been little developed and the attacks were comparatively ineffective. Much design and productive capacity was devoted to meeting the demand for bigger and better strategic bombers, but a large part of this was wasted in futile efforts which had no satisfactory result. The *Luftwaffe* administration had been staffed by young officers promoted by Goering and the manufacturers were hampered by incessant demands for modifications. Messerschmitt complained continually that the manufacturers were not sufficiently called into consultation and Speer agreed with him and laid his complaints before Hitler. The task was, perhaps, an impossible one in any case. The United States did develop the B.29 in the course of the war, but the British bombers designed in 1936 were not in quantity production until 1941-42, though it is true they were delayed for a considerable time by Lord Beaverbrook's concentration on fighters and medium bombers. At any rate, no satisfactory new German heavy bomber was produced and the conferences of Goering with the *Luftwaffe* administration and the manufacturers were a long series of recriminations and ill-planned programmes, most of which were frequently changed, never materialised, and caused great waste. Thus, the great production capacity of the aircraft industry was not utilised as it might have been. Only in the development of jet engines was Germany ahead of Britain and the United States.<sup>2</sup>

Meanwhile, Milch, like most of the operations officers of the *Luftwaffe*, believed that only a great increase in fighters would save the Reich from destruction. He did a great deal to increase production of the standard types, the Me.109, Me.110, the more efficient FW.190 and the Ju.88 which could be used both as a night fighter and a medium bomber. On Speer's advice, Milch set up special committees to control each particular model under the general direction of the main committee on airframes. But he was not for a long period allowed to concentrate on fighters as he wished to do.<sup>3</sup>

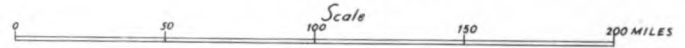
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<sup>1</sup> This is the estimate of the U.S.S.B.S. If the weapons and the anti-aircraft defences are added the percentage rises to fifty per cent. *U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), p. 148.

<sup>2</sup> For example, a four-engine bomber had been designed with its engines in couples which had every kind of defect. For a long time the *Luftwaffe* insisted that all bombers, whatever their size, should be able to dive.

<sup>3</sup> See his speech of 25th August 1943, App. 29. Wagenfuhr states that, in terms of

# Principal Plants of German Aircraft Production Prior to 1939

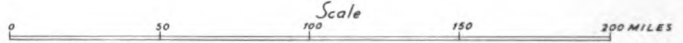


Town..... Leipzig  
 Plants..... A.T.G. ERLA

(A.T.G. - Allgemeine Transportanlagen Gesellschaft.)



# Principal German Aero Engine Factories Prior to 1939



Hamburg  
KLOCKNER

Stettin • Arnimswalde  
POMMERSCHE

Bremen

Reinickendorf  
ARGUS

Basdorf  
B.M.W.

Brunswick  
NIEDERSÄCHISCHE  
*later known as*  
BUSSING

Spandau  
B.M.W.

BERLIN

Marienfelde  
DAIMLER BENZ

Waltersdorf  
HIRTH

Genshagen  
DAIMLER BENZ

Magdeburg  
JUNKERS

Dessau  
JUNKERS

Köthen  
JUNKERS

Leipzig  
MITTELDEUTSCHE

Kassel

Altenbeuna  
HENSCHEL

G E R M A N Y

Nuremberg

Stuttgart  
HIRTH

Munich  
B.M.W.

Town ..... Munich  
Factory ..... B.M.W.

(B.M.W. - Bayerische Motoren Werke)

Nevertheless, he made preparations by the accumulation of raw materials and components and the construction of jigs and machine tools for a great expansion of fighters in due course.

The first attack of the Eighth Air Force on the industry which began in the summer of 1943 and ended with the raids on Schweinfurt and Regensburg on 14th October had considerable success. It was levelled at the airframe plants, because their buildings were most vulnerable, and it was thought that the effect would be more immediate. The information on which it was based was extensive and accurate so far as the location of the factories was concerned. Target selection was made by the so-called 'Jockey' Committee specially set up for the purpose by the Combined Chiefs of Staff, a joint committee of United States and British specialists. A number of factories were destroyed or seriously damaged. By the middle of August fighter production had been reduced for a period by twenty-five per cent. There were not enough aircraft to go round and the defence of the Reich had to be given priority over the Eastern front. Germany itself had become, as Milch insisted, the real front line.

But the defence of the *Luftwaffe* for all the criticism levelled at it was sufficient to stop the offensive of the Eighth Air Force in October and the respite thus gained enabled fighter production to mount sharply in January and February 1944. Then came the second attack supported by the long-range fighters which was brilliantly successful. While the fighters of the Eighth Air Force drove the *Luftwaffe* from the skies, its bombers, now a larger force, were able to pour a mass of bombs on the airframe plants. Though some dispersal had already taken place, the targets were still comparatively few in number and well known. Immense damage was inflicted on them and it seemed as if their output must be permanently reduced.

Yet in a very short time fighter production was greater than ever and continued to rise for nearly six more months. When Milch handed over production to Speer, the new *Jagerstab* organisation which the latter set up with Saur in control, produced spectacular results. Mass-production experts under the control of Saur and Frydag, with greater co-operation from the aircraft industry than Milch had been able to obtain, soon caused the production to rise steeply. Some of the increase was due to the preparations Milch had made in the previous year, but, for the first time, the productive capacity of the industry was fully utilised. At the same time dispersal was carried out without too great loss and thus the number of targets had been greatly multiplied and were much harder to find.

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stripped weight, production of fighters did not equal that of bombers until October/November of 1943, but that depends on a classification of types not accepted by the United States survey. *Rise and Fall of German War Economy*. See the figures, App. 49 (xxiii) and (xxiii).

Production of fighter aircraft was, in fact, more than doubled within five months.<sup>1</sup>

It has thus been possible for Saur and other experts to assert that the attack on the industry, so far from reducing it, was the principal factor in causing it to expand.<sup>2</sup> Some of those studying the industry have accepted this view. It is, however, a doubtful hypothesis; for Goering's position was already undermined and Milch was by no means averse from Speer obtaining control. But it was at any rate demonstrated that not even such a powerful and skilled attack as had been concentrated on the fighter aircraft industry was sufficient to cripple it. No doubt, more would have been done to injure it, had not the diversion to the preparation for *Overlord* begun in April. But even then it seems unlikely that any decisive effect would have been produced.

Informed German opinion, as ascertained after the war, was almost unanimous that much greater results would have been obtained if the aero-engine plants had been from the first made the principal target systems instead of the airframe industry. The concern caused at the time, when an attack was later made on it, is shown by the fact that it was given high priority for the use of underground space. But this conclusion is also far from certain. When, from April onwards, a heavier attack was directed on it the numbers of engines produced began, it is true, to fall rapidly. But there were other causes for this decline. The concentration on fighters reduced the demand for engines. Moreover, the bombs of the Eighth Air Force did not produce as much effect on the engine factories as on those of the airframe plants.<sup>3</sup>

Finally, though the number of fighter aircraft produced was so largely increased, the effect was not visible to anything like the same extent in the front line, whose strength remained almost stationary. This problem may be left to a later chapter, but it should be again stressed here that the achievement of 'Big Week' and the subsequent attack on the aircraft industry was to reduce not the production of

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<sup>1</sup> The figures are given in App. 49 (xxiii). The peak month of acceptances was in September 1944, 3,031 S/E fighters and 344 T/E fighters. The totals for the year 1944 were 25,860 and 5,025 respectively. The production peak was no doubt at a rather earlier date. There are no complete figures of production month by month and the acceptance figures always depend to a certain extent on the weather and other extraneous causes. Milch had not expected to be replaced by Saur but to continue to manage the industry inside the Speer organisation. *U.S.S.B.S. Aircraft Division Industry Report*, (No. 4), p. 35.

<sup>2</sup> Saur Interrogation, 7th June 1945.

<sup>3</sup> The United States surveys think that it would have been better to have attacked the aero-engine industry at an earlier date. *U.S.S.B.S. Aircraft Industry*, (No. 4), pp. 10, 97-99; *U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), p. 158. The British surveys do not at any rate think that it should have been made the main target system. *B.B.S.U. The Effects of Bombing the German Aircraft Industry*, pp. 21-22, *The Strategic Air War*, p. 108. Only five per cent of the machine tools in the aero-engine industry had been destroyed by bombing by September 1944.

aircraft but the fighting capacity of the *Luftwaffe*. The attack on the aircraft industry was, in fact, another example of the failure of selective bombing.

There arises, therefore, the further question as to whether the result would have been a different one had Bomber Command devoted more of its operations to attacking the industry by selective area bombing as had to a great extent been advocated by the Air Staff. The attack had been watched as anxiously by the British intelligence services as by those of the United States and, indeed, the appreciation of the results was a joint operation. R.E.8 devoted as much of its resources to the evaluation of the destruction of the aircraft factories as to that caused by the area bombing of Bomber Command.<sup>1</sup> On the whole, the effect was accurately measured. The results of the attacks were if anything underestimated. But in a number of respects the appreciations were misleading. The productive capacity of the German aircraft industry was now as much underestimated as it had previously been overestimated. Yet the number of German aircraft in action both by day and by night seemed to be increasing rather than decreasing. This was explained by assuming that more had been transferred from the Eastern front than was in fact the case, but its consequences were so serious that there was a renewed demand for Bomber Command to take a greater share of the attack.<sup>2</sup>

Thus, in addition to the attack on ball-bearings, the Air Staff wished Sir Arthur Harris to devote more of his effort to the area bombing of the towns connected with the aircraft industry, a list of which had been included in the plan for the Combined Bomber Offensive. Sir Arthur Harris had little more faith in the likelihood of an attack on this target system proving decisive than he had concerning ball-bearings. But in this case the larger number of targets gave him the tactical freedom which he thought necessary to the success of his own offensive. Tactical considerations had the first place, and for this reason he avoided any commitment to deliver night attacks on the same target as the Eighth Air Force had bombed by day. Nevertheless, the contribution of Bomber Command was a considerable one and increased sensibly in 1944, when, in addition to the attack on Schweinfurt in February, Bomber Command also attacked with success airframe plants and aero-engine factories in France.

It is, however, obvious that more could have been done by

<sup>1</sup> The appreciations of R.E.8 came, as has been noted, rather late in the day for operational purposes. These were based on the more immediate ones made by the Operational Research Departments and the Central Interpretation Unit at Medmenham where, as has been seen, there was close co-operation between the United States and British teams.

<sup>2</sup> The two errors neutralised one another in the middle of 1943 so that the figures for the second half of 1943 are not inaccurate, but they became so in 1944. See App. 49 (xxv).

Bomber Command to destroy the aircraft industry had it been directed over the whole period by the recommendations of the Jockey Committee in the same way that the Eighth Air Force was. It may be doubted, however, whether this would have made any great difference to the final results. It might be argued that the attacks of the Eighth Air Force in the autumn had so reduced production that there would have been a dangerous shortage of fighter aircraft if Bomber Command had continued the attack. But the results of the February attack show that in such a situation the industry could be reorganised so quickly as to prevent any disastrous consequences arising. Moreover, general area attacks sometimes produced more effect in 1943 than selective area attacks specifically directed against the aircraft industry. Hamburg is a case in point and the attacks of Bomber Command on Kassel in October 1943 reduced the production of the Fieseler aircraft factory even more than the precision attacks upon it by the Eighth Air Force in July of that year.<sup>1</sup> Air-frame construction was, in fact, a less vulnerable target system than the ball-bearings industry and could recover and disperse production in a remarkably short space of time.

There is also a division of opinion as to whether allied bombing affected the quality of the aircraft produced. Dispersal naturally complicated the inspection of construction and it has been asserted that in consequence some processes were not as accurately finished as before. As regards the standard machines, it is probable that this deterioration did not go so far as to affect their performance to any great extent. But bombing did certainly delay the production of the new jet planes and this had important results in the final period of the war. Nearly all of this effect was, however, produced after March 1944 and will need further consideration when the later stages of the strategic offensive are described.

Nor do these conclusions suggest that the Eighth Air Force could have found a better target system in this period. The attack forced the *Luftwaffe* to air battles which were a turning point in the air war. Perhaps, only an attack on the oil industry could have produced a similar response, and it may be doubted whether in this period as much important damage could have been inflicted on the oil industry as was incurred by the aircraft industry. In the next period this situation was to alter and a decisive attack on a particular industry became for the first time possible.

By 1943 there was hope in Germany that the failure to develop a strategic bombing offensive against Britain would be compensated for by the production of the 'wonder weapons', the V1, the pilotless aircraft, and the V2, the rocket bomb. Since the defence against

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<sup>1</sup> O.R.S.(B.C.) Report, 21st Oct. 1945.

these weapons has been described in considerable detail elsewhere,<sup>1</sup> all that is required here is to give some estimate of the contribution of Bomber Command in the period under consideration to the attempts made to prevent or delay the attack or reduce its efficiency if it were made.<sup>2</sup> It is necessary to bear in mind that the main causes of the delay in the attack were the refusal of Hitler and Speer to give priority to the production of the V2 in the early years of the war, the rivalries of departments, services and commands for the control of the development and operation of both weapons when it seemed that they might be successfully produced, and the inherent difficulties of developing two new weapons to such a stage that mass production could be undertaken and effective use be made of them.

Both the V1 and the V2 were developed at the research and experimental station at Peenemünde on the Baltic coast. It had long been suspect and surveyed by reconnaissance aircraft, but British intelligence did not become sufficiently aware of the threat of the new weapons to begin active preparations to measure and meet it until the spring of 1943. Even then attention was almost entirely concentrated on the V2 and little or nothing was known of the V1. It was now naturally decided to attack Peenemünde as soon as a suitable moonlight night was available.<sup>3</sup> The attack of 17th August 1943 was most carefully prepared and rehearsed and carried out with great determination and skill under the control of a master bomber, and, indeed, was an example of precision bombing as much as of selective area attack.

By the time this attack was made development of both weapons had proceeded so far that mass production of the prototypes had already been decided, but there were still many deficiencies in both to be corrected. This attack did considerable damage, but was hardly so successful as was thought to be the case in London. As regards the V2 several buildings were destroyed or badly injured and in the residential settlement and a labour camp over seven hundred people

<sup>1</sup> Basil Collier: *History of the Second World War. The Defence of the United Kingdom* (1957).

<sup>2</sup> Two reports were made by the U.S.S.B.S. *V-Weapons (Crossbow) Campaign* (No. 60) deals rather sketchily with the results and there is a more considered account of the subject in Chapter IX of the *Aircraft Division Industry Report* (No. 4). The book of Major-General Dornberger, (*V2*, 1954), the head of V2 development, is a graphic account but has no statistical detail. There is an A.D.I.(K) report, 30th November 1945, on the V1 organisation. The account in *The Army Air Forces in World War II*, Vol. III, uses a file containing interrogations of Major-General Dornberger and others, but this is not in the archives of the Air Historical Branch as is suggested in the notes to Chapter 4 of that work.

<sup>3</sup> M.E.W. pointed out in a May report that an attack on Peenemünde, 'particularly if conducted in a manner calculated to cause maximum casualties among its personnel', would only delay production if development of the rocket had not been completed. Such an attack would also warn the enemy and might 'fatally handicap the procurement of further intelligence'. An attempt to estimate where the components and fuels were being produced was merely guesswork. M.E.W. Memo., 19th May 1943.

lost their lives, including two important experts and some draughtsmen and technicians. But the essential part of the plant was not destroyed and research and development could proceed after a short delay. The testing grounds for the V<sub>1</sub> in Peenemünde West were not part of the target and only suffered very slight damage from bombs falling wide of the mark. In Britain, however, it was not considered necessary to accept the offer of the Eighth Air Force to renew the attack by daylight.<sup>1</sup> No further attacks were made on Peenemünde for nine months, when as regards the V<sub>1</sub> and V<sub>2</sub> there was nothing left to attack.

It is difficult to assess the effect of the attack of 17th August. General Dornberger estimated the delay caused in development at from four to six weeks and some such figure has been accepted in most subsequent accounts. But this estimate seems to have been no more than a personal view and is not supported by any detailed reasons or calculations. Though the V<sub>2</sub> was supposed to be ready for mass production serious defects were discovered and it took a long period to correct them. The fact, therefore, that the attack caused the transfer of production to an underground site in the Harz mountains and the testing grounds to another site in Poland must have caused some delay in accomplishing this difficult task. The killing of Professor Thiel, the expert on propulsion, and Chief Engineer Walther, may also have been of considerable importance in this respect. On the production of the V<sub>1</sub> the effect of this attack was only slight, though some delay was caused by the disturbance produced by the raid and the need to provide alternative firing sites for testing the aircraft, which were as yet far from what was required.<sup>2</sup>

In addition to the attack on Peenemünde itself, there was some attempt to destroy production of the weapons by other attacks. Those planned on the production centre of the V<sub>1</sub> at Fallersleben and on components and liquid fuels at other places seem to have had little effect in delaying the offensive, though V<sub>1</sub> production was also driven underground. But the view of the United States survey is that sufficient alternative production of components always existed to enable the production of the V-weapons to go on without cessation. Both weapons, perhaps, suffered as much delay by the loss of components in factories which had been damaged without special intention by area bombing.<sup>3</sup>

There were also a large number of attacks on the launching sites and depots in the north of France when they were discovered. As

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<sup>1</sup> C.O.S. Mtg., 19th Aug. 1943.

<sup>2</sup> These judgments are based on the account in V<sub>2</sub> so far as that weapon is concerned and on the U.S.S.B.S. reports on V-weapons (No. 60) and the A.D.I.(K) report, so far as the V<sub>1</sub> is concerned.

<sup>3</sup> The attack on Kassel, for example, on 22nd October 1943, which damaged the Fieseler works where V<sub>1</sub>'s were being made.

regards the V<sub>2</sub>, this effort had no effect for this weapon did not come into production sufficiently early for these sites to be used. But the destruction of a great many of the 'ski sites', which were the first design for the launching of the V<sub>1</sub>, undoubtedly caused some delay and caused the attack to be less rapid and efficient once it had begun. However, 'modified' simpler sites were very quickly substituted and were largely ready when sufficient production had been made to enable the bombardment to begin. The bombing of the V<sub>1</sub> sites in this period was in any case mainly the work of the tactical air force and the bombers of the Eighth Air Force and no great contribution to it was made by Bomber Command. Once the attack had begun in June Bomber Command had to devote a considerable proportion of its sorties to the effort to stop it by bombing the sites, with little success and to the detriment of other aspects of the strategic offensive. In the later stages of the V<sub>1</sub> offensive the strategic bombing of communications and industrial towns in the Ruhr reduced the output of sheet metal of which the weapons were constructed and added to the difficulty of transporting the finished weapons to such an extent that a loss of twenty per cent of the total number planned has been estimated to have been caused by it. But the United States survey came to the conclusion that strategic bombing had little direct effect during this period on the production of the V<sub>2</sub> weapon.<sup>1</sup>

For all the reasons mentioned above there has been a tendency to dismiss the contribution of Bomber Command as of little importance in delaying the attacks. It is true that as regards both weapons other causes and in particular the inherent difficulties of development were more important than the strategic attack. But the effect of the attacks on Peenemünde and other sites may well have caused a delay of two months in the V<sub>2</sub> offensive and, if so, this was no small contribution to averting what might have been a serious diversion. The number of V<sub>1</sub>'s was certainly reduced by the indirect effect of the strategic bombing on communications and to some extent by that on the supply depots and sites.

General Eisenhower has stated that, if the weapons had been used six months earlier, 'our invasion of Europe would have proved exceedingly difficult, perhaps impossible.' This passage refers to both weapons and it would seem certain that no such delay was caused by strategic bombing.<sup>2</sup> A period of two months' delay in the production of the V<sub>2</sub> was important if by no means decisive. All the different kinds of bombing also certainly reduced the effectiveness

<sup>1</sup> *U.S.S.B.S. Aircraft Industry*, (No. 4), pp. 122-123.

<sup>2</sup> General Eisenhower: *Crusade in Europe*, (1948), p. 284. Sir Winston Churchill did not agree with this judgment because of the inaccuracy of the weapons (*The Second World War*, Vol. V, pp. 208-209), but it is clearly difficult to estimate what the effect would have been on the assembled forces.



of the V1 attack and probably delayed its beginning to some extent. But it is impossible to determine with any exactness the contribution of Bomber Command to these results. Too many other factors are concerned and judgments must be largely subjective.<sup>1</sup> Finally, it should be noted here that other weapons were being developed at Peenemünde and the attacks on it certainly helped to prevent them being used during the war.

Though German fighter production was the main object of the strategic offensive in this period in the mind of the Eighth Air Force and the Air Ministry, the destruction of submarines, it will be remembered, was placed first in the Casablanca directive and in a sense retained pride of place in that of *Pointblank*. In the first half of 1943 a considerable percentage of the attack was devoted to the bombing of Biscay bases and the U-boat construction yards on the North Sea and the Baltic. The Eighth Air Force began its offensive on Germany itself by attacks on these targets and Bomber Command made a number of area raids on the towns in which they were situated. In the second half of the year much less attention was paid to them, since the failure of the U-boats in the Battle of the Atlantic had reduced the pressure continually exerted by the British and United States Naval Staffs for assistance in coping with it. Nevertheless, a number of raids were made on the Biscay bases and the Eighth Air Force was glad to have the northern ports as a target when in the autumn it could no longer penetrate deeply into Germany.

The estimate of the effect of these attacks is complicated by the fact that in the course of 1943 the whole system of U-boat production in Germany was radically altered.<sup>2</sup> Hitherto, the hulls of the U-boats had been built in the ports and the necessary engines and components brought to them from other factories. But in the face of defeat Doenitz demanded better submarines just as Goering demanded better aircraft. New types, the XXI and XXIII, were devised, but it was also decided to construct them in a new way. The hulls were to be built from large sections, pre-fabricated in a number of different firms, transported by waterways and assembled in centres on the

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<sup>1</sup> Air Chief Marshal Sir Philip Joubert de la Ferté considers that the bombing of Peenemünde delayed the attack of the V2 by six months, but he gives no reason for refusing to accept Dornberger's estimate except that he cannot believe it. *Rocket*, (1957), p. 76. The United States survey, previously quoted, considers that the attack on Peenemünde 'proved to be of relatively small importance,' but it also gives the probable delay in the development of the V2 as about two months.

<sup>2</sup> The results of the attack on the submarine industry are considered in *U.S.S.B.S. German Submarine Industry* (No. 92) and B.B.S.U. report *The Effects of Strategic Bombing on the Production of German U-Boats*. A number of studies of the firms concerned has also been made by U.S.S.B.S. The effect of the attacks on the bases and on production has also been surveyed in a comprehensive and detailed manner by Captain Peyton-Ward, R.N., in the fourth volume of his narrative, *The R.A.F. in the Maritime War*. The Speer papers have many references to this subject which add a few details of importance.

coast. It is possible that Doenitz had such a plan in mind when, as has been seen, he gladly handed over to Speer the control of naval armaments. At any rate it could only have been carried out by Speer's organisation. Meanwhile, no new conventional U-boats were laid down, but the process of completing the large number already partially built was continued. It is necessary to consider, therefore, how many of these were denied to the enemy by the strategic offensive during this period, while its effect on the new types is dealt with in Chapter XIV, since it mainly occurred late in 1944.

The estimates in London of what had been accomplished were but little exaggerated. The first attack by the Eighth Air Force on the Vulkan works at Bremen on 18th March 1943 was, indeed, hailed as a great success and marked by a letter of congratulation from Mr. Churchill himself. It did in fact do no more than delay the construction of one U-boat for fifteen weeks.<sup>1</sup> But generally the estimates given in the J.I.C. reports to the Chiefs of Staff were only a little above the actual losses. These, it has been calculated, amounted to about thirty U-boats in the course of 1943. The main damage was done by the attacks on Hamburg of 24th July to 3rd August which, it has been estimated, caused a loss of twenty-six to twenty-seven U-boats over the next nine months, due more to the devastation of the town itself than the special attacks on the port by the Eighth Air Force and Bomber Command. Thus, the area attack, which was not specially directed at the submarine industry, did it more damage than the selective and precision attacks. The effect in this period was entirely on the older type of U-boats, but these types fitted with the schnorkel did some damage before the war ended.<sup>2</sup>

It must be remembered also that, in addition to the attacks on the ports, the supply of components was affected by the attacks on the inland cities. In some cases there were also selective or precision attacks by the air forces aimed especially at some component of the U-boats which it was known was manufactured in a particular place. But, in fact, more damage to such components was done by the area attacks made without any such special objective. This point becomes of some importance when the question of how far the production of the new types was delayed by the strategic offensive is discussed in Chapter XIV.

The offensive against construction was, therefore, as the Air

<sup>1</sup> *B.B.S.U. German U-Boats*, p. 13. R.E.8 estimated the loss as equivalent to four U-boats. Min. of Home Security Report, 3rd June 1943.

<sup>2</sup> The above estimate is that of the B.B.S.U. The United States team refuses to make any such calculation because of the uncertainty whether, in view of the change in the construction plan, the U-boats would in any case have been constructed. On the whole, however, the character of production in other plants which were not bombed makes it probable that they would have been built but for the attack. For the details see App. 49 (xlviii).

Ministry and Bomber Command had always insisted would be the case, more effective than the attack on the Biscay bases. There was, however, one successful attack on these which caused considerable alarm. For one of the bunkers at St. Nazaire, already injured by an attack in 1942, was seriously damaged by a raid of the Eighth Air Force on 29th June 1943. Hitler agreed after much urging by Speer that the concrete should be increased in thickness and that this should be done even at the expense of the Atlantic Wall of which he was so proud.<sup>1</sup> This is another example of the diversion of constructive effort to passive defence which, in this period at any rate, had a sensible effect on the production of armaments even if it cannot be exactly measured.

Lastly, mining continued throughout the period and a considerable number of ships were destroyed, mainly trawlers and small craft.<sup>2</sup> Some effect was produced on the supply of Swedish iron ore and eventually mining and the fact that Germany was losing the war caused all Swedish ships to be withdrawn in the summer of 1944. The mining also impeded U-boat testing and the training of their crews with results that gradually increased until, in the final period, they became really important.<sup>3</sup>

In this period also, as has been seen, Bomber Command began to master the technique of precision attack by night and the first experiment, the raid on the dams, will remain for all time as a model of supreme courage and skill. This incident was later also cited as an example of a 'panacea' target where the results likely to be produced by a successful attack had been grossly exaggerated. But, so far as M.E.W. was concerned, the estimate was in close correspondence with the facts, and, if the results were disappointing, this was because it had not been possible to destroy the Sorpe as well as the

<sup>1</sup> Notes on Confs. with Hitler, 3rd, 4th, 5th Jan., 6th, 7th Feb., 4th, 5th Aug., 30th Sept.-1st Oct. 1943, Speer Docs. (Hamburg Series). Organisation Todt Report, 12th July 1943, Speer Docs. (Flensburg Series). 2,000-lb. bombs were used by the Eighth Air Force.

<sup>2</sup> The following table shows the amount of effort and the results. The only big prizes were the *Gneisenau*, a troopship for the Russian front (18,160 tons) and the liner *Strasbourg* (17,001 tons).

1943	A/c sorties	Mines laid	Vessels sunk	Tonnage	Vessels damaged	Tonnage	A/c losses
Jan.-May	2,723	6,559	74	77,705	10	18,725	105
June-Dec.	2,611	7,244	69	25,751	13	36,649	53
Totals	5,334	13,803	143	103,456	23	55,374	158

Roskill: *The War at Sea*, Vol. II, p. 394, and Vol. III, Part I, p. 96, where more details are shown.

<sup>3</sup> See Vol. III, p. 277.

Möhne and Eder dams. Had that been done, much greater damage would have been produced, though it is probable that no crippling or very prolonged effect would have been obtained and in fact no such effect was ever prophesied by M.E.W.

The Air Staff were, it is true, at first led to form an erroneous estimate by a report prepared in conjunction with the scientific advisers of the Ministry of Production. This stated that in addition to the loss caused by the destruction of electricity works, flooding of towns, and the disruption of railway communications, a successful attack on the Möhne dam would cause a most serious deterioration in the activities of 'the foundries, coal mines, coke ovens, blast furnaces and chemical plants which require enormous quantities of water for their operation'. If the Sorpe dam could also be destroyed, in spite of the fact that its construction made it more difficult to breach, a 'paralysing' effect might be produced on the industries of the Ruhr.<sup>1</sup>

Before accepting this estimate, however, Sir Charles Portal insisted that it should be checked by M.E.W. It so happened that at this time Mr. Lawrence was away ill, and, though M.E.W. had been consulted by the Intelligence Department of the Air Staff, it had not been possible for a comprehensive survey to be made. Such advice as had been given had already, however, shown the uncertainty of the effect of a successful attack on the Möhne dam.<sup>2</sup> When Mr. Lawrence returned he was able to be more explicit. It is not possible to state, his report ran, that 'a critical shortage of water supplies in the Ruhr would be a certain and inevitable result of the destruction of the Möhne dam'. He added, however, that if the Sorpe dam could also be destroyed, its destruction 'would very greatly enhance the prospects of the development of a water supply shortage.' . . . 'The destruction of both dams', he wrote, 'would be worth much more than twice the destruction of one.'<sup>3</sup> Both the original report and that of Mr. Lawrence pointed out clearly that the destruction of the Eder dam would not produce effects of major economic importance. The scientific advisers of the Ministry of Production, when this estimate was communicated to them, agreed with it, and stated that their own views had not been entirely accurately stated in the original report.<sup>4</sup> Both reports claimed that the effect of a successful attack on the morale of the population of the Ruhr would be profound.

Thus, it is clear that at the beginning of April the problematical

<sup>1</sup> Air Staff Memo., 28th March 1943.

<sup>2</sup> Letter Portal to Brooke, 27th March 1943. Min. M.E.W. to Verity (A.I.3.c), 21st March 1943.

<sup>3</sup> Memo. by Lawrence, 2nd April 1943.

<sup>4</sup> Min. Bottomley to Portal, 5th April 1943.

economic effect of breaching the Möhne dam was fully known to the Air Staff and also that the breaching of the Eder dam would not add substantially to the economic damage. The Germans themselves were puzzled at the choice of targets. 'If the Sorpe valley dam had been destroyed instead of the Eder dam', Speer said, 'Ruhr production would have suffered the heaviest possible blow. The loss of the Eder dam on the other hand had no detrimental effect on production. From this point of view I never could understand this attack.' But it is clear also that the Air Ministry was doubtful what the effect of the special bomb would be on the Sorpe dam, though it was to be dropped on the dam and not against it as in the attack on the other dams. The only explanation of the fact that the Eder dam was given priority over the Sorpe seems to be that those planning the attack were convinced that the destruction of the latter was so difficult that it was better to try first to obtain the more probable but much smaller result from the destruction of the former.<sup>1</sup> But little estimate was made of the results to be obtained from the destruction of the other smaller dams which were only included as 'last resort targets.'<sup>2</sup>

The reports of what actually occurred as a result of the breaching of the Möhne and Eder dams confirm the accuracy of the estimates made by M.E.W. Nine hundred and ninety-nine people were reported drowned and 221 others were missing. Over half of these were 'workers from the East' who were in a labour camp. A number of dwelling houses were destroyed or severely damaged. Half a dozen electricity works were also destroyed or seriously injured, but they were too small in size to cause delay in production. Railway trans-

<sup>1</sup> Speer Interrogation, 28th Aug. 1945. As early as the middle of March 1943 the importance of the Sorpe dam had been realised, but it had also been considered that it was virtually impossible to destroy it. The report submitted to the Chiefs of Staff stated: 'There is a third important dam, the Sorpe, which although important we have ruled out as being unsuitable for attack, for tactical and technical reasons. Of the two other dams the Möhne is much the more important, is tactically the more suitable for attack, and its destruction would have far reaching effects on the enemy's war economy.' C.O.S. Memo, 19th March 1943.

<sup>2</sup> O.R.S.(B.C.) Nt. Raid Report, 30th Aug. 1943. The first report on the dams gave their construction and contents:

	<i>Constructed</i>	<i>Water volume Million Mc</i>	<i>Type</i>	<i>Height of Wall m.</i>
Möhne	1909-1913	134	Masonry wall	40·3
Sorpe	1927-1933	72	Earth with concrete core	58
Lister	1909-1911	22	Masonry wall	35
Ennepe	1902-1905	15	Masonry wall	45
Henne	—	11	—	

Total capacity 254 Million Mc.

The Eder dam built in a tributary of the Weser, had a volume of over 202 million Mc and also a masonry wall. Air Staff Memo., 28th March 1943.

portation was disrupted and one of the main lines in the Ruhr rendered useless for some time. Many bridges were destroyed, a few cattle and pigs were drowned and a considerable area of agricultural land flooded.<sup>1</sup>

The greatest effect on production was caused by the temporary shortage of water due to the destruction of the Möhne dam. Several coking plants in Dortmund, for example, had a nine per cent production loss for two months<sup>2</sup> and there were, no doubt, other results which have not been brought to light. But the total effect was small, though at first there was a good deal of anxiety as to the future. The purity of the drinking water in the wells was also affected for some time. The main result of the destruction of the Eder dam was to flood agricultural land in the valley. The flood did reach Kassel but the effect on production there was negligible.<sup>3</sup> In its post-raid estimate, M.E.W. was of the opinion that the Eder dam could not be repaired before the winter set in and caused further flooding; in fact, the repairs were completed by the end of September. But though some sensational accounts of the damage done were published immediately after the raid, the reports of M.E.W. gave a pretty fair estimate of the results with the reservation that the total effect could not yet be perceived.<sup>4</sup>

This result was due to the energy and efficient action of the authorities and without such an effort the effect would, of course, have been greater. A considerable number of workers were drafted into the Ruhr to replace those drowned and to repair the communications and damaged utilities. The repair of the dams themselves needed a very large number and it was for this reason that Speer transferred workers from the Atlantic Wall to the Ruhr with, he claims, a most serious effect on the former.<sup>5</sup> Another effect of the raid was that Speer now took control of all the water undertakings of the Reich. The permanent effect on morale was not important. There was, of course, a shock at the time. But within a few weeks

<sup>1</sup> The details are given in two reports from the *Regierungspräsident*, Arnsberg, Westphalia, to the Minister for Home Affairs (Funk) and the Minister of Labour (Sauckel), 22nd and 24th June 1943.

<sup>2</sup> *U.S.S.B.S. The Coking Industry Report on Germany*, (No. 66), p. 24. O.R.S.(B.C.) Report, 28th Aug. 1945.

<sup>3</sup> O.R.S.(B.C.) Report, 21st Oct. 1945.

<sup>4</sup> M.E.W. Industrial Damage Report, 10th July 1943. M.E.W. Intelligence Weekly, 3rd July 1943.

<sup>5</sup> *The Trial of German Major War Criminals*, Pt. 17, pp. 40 and 52. Speer states that 50,000 workers were sent from the Atlantic Wall Todt Organisation to repair the dams, but the majority of these must have been used for the other much-needed repair work in the Ruhr. The German report above estimates that 2,000 would be needed to repair the Möhne dam and doubtless more were required for the Eder. Speer stated that the repairs to the Möhne dam were completed before the autumn rains began and he reported to Hitler that the Eder dam had been completed by 30th September. Speer Interrogation, 30th May 1945, App. 37 (i), para. 10. Note on Confs. with Hitler, 30th Sept.-1st Oct. 1943. Speer Docs. (Hamburg Series).

the *Regierungspräsident* of Arnberg was referring to the opportunity given by the catastrophe for a better plan of communications and amenities in the Möhne valley.

But though the raid on the dams did no great damage to German armament production it led ultimately, as has been seen in Chapter X, to one of the most important developments of the war, the mastery of the technique of precision bombing by night. Even in this period remarkable results were achieved and their promise for the future was immense. Hitherto on a few occasions Bomber Command had achieved on moonlight nights such concentration on a single factory or group of factories that the process might fairly be called precision bombing. The successful raid on the Renault factory at Billancourt, as long ago as March 1942, for example, is, perhaps, entitled to that description. But, for the most part, precision bombing had been considered a daylight technique and been performed by the aircraft of 2 Group. As early as March 1943 ten Mosquitoes of that Group had made a very successful raid on the molybdenum factory at Knaben in Norway which had reduced its production for a long period. Though the skill and resourcefulness of the German metallurgists had prevented any loss being caused to the supply of special hard steels, much anxiety was caused to the economic staff of the *Wehrmacht* by this attack.<sup>1</sup> There were other successful raids on factories in Holland and Belgium, but 2 Group had hardly had the same success in France where its main object had been to provoke the German fighters to action.

But in 1944 the specialists of 5 Group began to use their much increased skill with great effect on factories in France. Here precision was imperative in order to cause the smallest possible loss of French lives and in nearly all cases it was achieved. Two of the most notable examples are the raids on the aero-engine works at Limoges on 8/9th February and the rubber factory at Clermont-Ferrand on 16/17th March. United States survey teams made specially careful and detailed investigations of these factories after France had been occupied and there can be no doubt that in both these factories the virtual cessation of production was mainly due to the damage caused by the 12,000-lb. (H.C.) bombs.<sup>2</sup> That at Limoges was done by only five of these bombs, each of which hit the factory and destroyed not only steel and concrete buildings but many of the machine tools within them. At Clermont-Ferrand only five of the ten bombs carried were as accurately aimed, but there were sufficient to produce a similar result. In each case only very little damage was done by 1,000-lb. bombs also carried, while the main effect of the incendiaries

<sup>1</sup> German Economics Intelligence Branch study, 3rd April 1944.

<sup>2</sup> U.S.S.B.S. *Gnome et Rhone Aero Engine Factory at Limoges France* (No. 145) and *Michelin Tire Factory Clermont-Ferrand, France* (No. 146).

was to destroy the roofs of some buildings but to leave the contents almost uninjured.

There were, it is true, other successful raids in which only 1,000-lb. bombs and incendiaries were used, notably that on the needle ball-bearing factory at La Recamerie near St. Etienne. But the effect in these cases was much less certain and depended on how far the fires produced got out of hand. The difference can be seen by the much smaller effect produced by different raids on another aero-engine factory at Le Mans where neither the same accuracy nor the heavy bombs were used in both day and night raids.<sup>1</sup> But Bomber Command, in the period between 1st March and 6th April, attacked and heavily damaged seven other aircraft factories and repair depots and two explosive factories. The raids were continued at intervals in April and May against similar targets with considerable success, the ball-bearing plant at Annecy being almost completely destroyed. At the same time raids were begun on Germany where the improved precision technique could be combined with area bombing as in that on Friedrichshafen on 27/28th April where a number of important factories were destroyed.<sup>2</sup>

The total effect of the damage in France was not very important. There were in most cases other plants which could supply what was necessary and in any event these factories were soon to be overrun by the allied armies. But the amount of destruction caused in relation to the force used was something quite new. Only a small part of the damage was produced by the new 12,000-lb. H.C. bombs; but even so there was proof that these could destroy machine tools and structures which might otherwise be uninjured. Moreover, it was also clear that a really concentrated attack of 1,000-lb., 4,000-lb. bombs and incendiaries was much more destructive than the previous methods used. A few 4,000-lb. bombs accurately placed might cause all the difference to a heavy structure. This fact was to be of great importance when the attack on the oil plants began in the summer and autumn of 1944. For the Fortresses and Liberators could not carry heavy loads, and though the Lancasters had to be specially modified to carry the 12,000-lb. bombs, all of them and many Mosquitoes could carry the 4,000-lb. Though all these facts were not known at the time, the photographs revealed the destructive effect of the

<sup>1</sup> U.S.S.B.S. *Gnome et Rhone Aero Engine Factory Le Mans France* (No. 147). In the two raids specially directed at the factory by the Eighth Air Force only seven of the 1,754 bombs fell on the target, 0.4 per cent of the total dropped. Others fell on it from area raids by Bomber Command so that the relative value of 100, 500- and 1,000-lb. bombs could be compared and especially their effect on machine tools. In some cases the 100-lb. did more damage than the 500-lb. In each case production could continue.

<sup>2</sup> There was great destruction in factories where tank motors and driving gear were being manufactured and where the construction of the new Dornier 335 had just begun. The Zeppelin works, one of the centres of rocket assembly, was also damaged. German Raid Reports.



12,000-lb. bombs, and it was at last resolved to produce them in larger numbers both in the United States and in Britain.<sup>1</sup> It may be said that these bombs would have been of little use until the skill to drop them with such effect had been acquired; but the fact remains that, when the skill had been attained, there were not sufficient bombs available to take full advantage of it. Meanwhile Mr. Wallis had been planning even more destructive bombs, 12,000-lb. and 22,000-lb. M.C., the *Tallboy* and the *Grand Slam*. Their construction had also been delayed for various causes, some due to the nature of the problem and others to the lack of foresight of those in authority. But these also in the final stage of the war were to play a notable role in the disintegration of the German economy.

Finally, it should be noticed that in general the night bombing of the Royal Air Force probably caused a smaller number of casualties in French towns than the day bombing of the Eighth Air Force. This was partly due to the fact that by day more workers were in the factories, but it was also due to the long time the aircraft of Bomber Command stayed over the target before dropping their bombs, thus giving ample time for shelter to be taken. This fact had long been apparent to the French authorities and in April 1943 M. Massigli, then acting as Foreign Minister to the French National Committee, informed the Foreign Office that the Bretons were saying 'Vive l'Angleterre et vive la R.A.F., but A bas l'American Air Force.' If the Eighth Air Force did cause more French casualties than Bomber Command—a supposition which, perhaps, owed something to propaganda from Vichy—the reasons were due to the difference between the two operational techniques. If the Bomber Command attacks were, in fact, more economical in French lives, that economy had to some extent to be paid for by higher casualties in a force which stayed for so long a time exposed to the hazards of the night fighter.<sup>2</sup>

Thus, if selective and precision bombing in this period had accomplished no more than area bombing, the reason was that it had not yet been directed against a target system which it was capable of so damaging as to paralyse the resistance of the German armed forces and the production of their armaments and equipment. But the command of the air in daylight which had been won by the United States Air Force and the greater accuracy which Bomber Command could now produce were to make possible new develop-

<sup>1</sup> In their studies of the attacks on the Limoges and Clermont-Ferrand factories R.E.8 were able to describe very accurately the positions of the 12,000-lb. bombs. Min. of Home Security Reports, 1st and 15th April 1944.

<sup>2</sup> Letter Massigli to Eden, 16th April 1943. It is difficult to establish any exact figures on this subject because the French records are spasmodic and the German reports often grossly exaggerate the effects. Similar complaints about the United States Air Force came from the Netherlands and on one occasion about an R.A.F. daylight raid.

ments. Before these could be fully applied the strategic offensive was reduced to much smaller proportions by the necessity of preparing the way for the invasion of the Continent and of protecting the allied armies once they had effected a lodgement there. When the offensive was resumed in full force other factors largely increased the advantages already won in this period.

There were also two important general effects which must be briefly surveyed. In the first place the strategic bombing offensive in this period reduced the strength of the German air force fighting against Russia. There the *Luftwaffe* was employed as a tactical force acting in co-operation with the armies. By diverting production to fighters, the offensive caused less bombers, both medium and dive bombers, and less reconnaissance and transport aircraft to be available in the East.<sup>1</sup> At the same time it diverted the increased fighter production to the defence of the Reich against attack from the West. As has been previously pointed out, the exact effect is not easy to estimate, but it is clear that, while the total fighter force in the Reich and on the Western front came near to being doubled, that on the Eastern front did not increase at all. Moreover, the best aircraft and the best pilots were concentrated against the West.<sup>2</sup>

Nor was this the only effect on the supply of weapons to the East. The number of anti-aircraft guns in the Reich and the West was increased by nearly a third, and with them the searchlights and predictors necessary for their effective use.<sup>3</sup> Demands came from

<sup>1</sup> See the speech by Field-Marshal Milch on 25th August 1943, 'A large number of S/E and T/E fighter Gruppen has been brought back to Germany.' App. 29.

<sup>2</sup> The effect between February 1943 and June 1944 may be seen in the following table:

*Fighter aircraft in the Defence of the Reich and Luftflotte 3*

	Single-engined	Night	Twin-engined	Total
Feb. 1943	535	430	—	965
May 1943	507	433	—	930
Feb. 1944	924	483	208	1,615
May 1944	883	586	221	1,690

*Fighter aircraft on the Eastern front*

Feb. 1943	414	27	44	485
May 1943	532	26	68	626
Feb. 1944	389	69	17	475
May 1944	400	86	19	505

*Fighter aircraft totals on all fronts*

Feb. 1943	1,290	479	134	1,903
May 1943	1,504	489	177	2,170
Feb. 1944	1,739	580	247	2,566
June 1944	1,461	699	261	2,421

These are the 'strengths' not 'serviceable' machines, the numbers of which fluctuate for a number of causes. *Luftwaffe* Orders of Battle.

<sup>3</sup> The British estimate of the numbers of anti-aircraft guns and searchlights on the different fronts was as follows:

Jan. 1943	Anti-aircraft guns	Searchlights
Germany and Western Front	14,949	3,726
Other fronts	8,030	660

(Cont. p. 296)

all sides for protection against the attack which threatened every part of Germany, and Speer agreed that special measures must be taken to protect the most vulnerable and important armament industries.<sup>1</sup> The personnel serving the guns increased by 200,000 in 1943 and by nearly 250,000 in 1944.<sup>2</sup> Though more women and older men were now employed in this service, the number of Germans available for other work was thus substantially reduced. Moreover, anti-aircraft guns were dual-purpose weapons, the heavier ones being especially valuable in the field, and the large number in the Reich reduced that which used could be employed on other fronts both as anti-aircraft guns and as field artillery. More serious than this, perhaps, was the large amount of skilled labour employed in producing the prediction instruments and the elaborate communications necessary for the efficient use of the guns. At any rate, it has been asserted that because of this drain on the supply of such instruments, the field armies were already so short of signals equipment that their operations were seriously hampered at times.<sup>3</sup> In this manner the strategic bombing offensive was part of the second front established by the Western Powers which certainly did a great deal during 1943 and the spring of 1944 to diminish the resistance met by the Russians on the Eastern front, though it is impossible to make any exact estimate of its effect.

It must also be remembered, as Sir Arthur Harris has insisted, that because the enemy were forced to the defensive many civilian lives were saved in Britain which would undoubtedly have been lost if the Germans could have mounted a strategic attack with adequate force. At the same time, the fact that Britain was left comparatively unmolested in 1943-44 ensured that there was no reduction in her own production of armaments as there had been, if only to a small extent, in previous years.

Finally it is necessary to consider how far the strategic bombing had succeeded in 'softening up' Germany so as to make an invasion of the Continent possible. For this was the main object laid down in

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Jan. 1944

Germany and Western Front

20,625

6,880

Other fronts

9,569

960

Harris Despatch.

<sup>1</sup> Notes on Conf. with Hitler, 14th and 15th Oct. 1943. For example, at Kessler's urgent request more guns were sent to Schweinfurt in December 1943, *do.*, 6th and 7th Dec. 1943. Speer Docs. (Hamburg Series).

<sup>2</sup> One estimate of the numbers is: 1942, 439,500; 1943, 642,700; 1944, 889,000. *B.B.S.U. The Strategic Air War*, p. 97.

<sup>3</sup> *U.S.S.B.S. The Impact of the Allied Air Effort on German Logistics*, (No. 64a), pp. 12-13. In 1943 and 1944 the value of anti-aircraft artillery was twenty-five to thirty per cent of the value of all weapons produced. The lighter guns were also for use against tactical bombers, but in 1943 the value of heavy anti-aircraft guns was sixteen per cent of total weapons and in 1944 fourteen per cent. *U.S.S.B.S. Effects of Strategic Bombing*, (No. 3), p. 187. See also App. 9 (ii), para. 37, for Speer's estimate.

the *Pointblank* directive and all the efforts of the strategic air forces were designed to obtain it, except those diverted to defence.

In the first place it has often been stated that the *Pointblank* offensive compelled Germany to adopt a defensive rather than an offensive strategy in the air. That this happened is clear enough. The question is how far was the change due to the strategic bombing offensive. It has to be remembered that it was the Battle of Britain which ensured the failure of the attempt to subdue Britain by strategic bombing in daylight and the necessity of concentrating on the Russian front which was the primary cause of the cessation of the attempt to do the same by night in 1940 and 1941. Nevertheless, the allied bombing attack on Germany of 1941-44, which transferred the air battle to the Reich itself and the Western front, was one of the main causes of the failure of the *Luftwaffe* to develop an effective strategic bombing force during these years.

We have seen how those directing the *Luftwaffe* were forced to concentrate on fighter defence and continually insisted on the necessity of using the aircraft industry mainly for that purpose. It is true that Hitler and Goering for long refused to accept this view and that the failure to create an adequate strategic bombing force was also due to the follies of the staff of the *Luftwaffe*, the defects of the German aircraft industry and the pressure of the war in the East. But, even so, if they had not been preoccupied with the defence of the Reich itself, Milch and the *Luftwaffe* generals, who had after all organised a heavy attack on Britain in 1940-41, could surely have created a force able to make an effective offensive at night on the towns and ports of southern England before the great armada sailed. For, though the command of the air in daylight had been established by the Anglo-American air forces, they could not have prevented heavy attacks under cover of darkness, if the means to deliver them had existed. For this purpose it would not have been necessary to build new and heavier bombers but only to produce a larger number of the existing types and to train the crews to carry out an attack effectively. Such an attack might not have been decisive, but it would certainly have caused serious losses and no one can say what the psychological effect would have been.

Moreover, such a force could have made an attack on the beaches after the armada had sailed. This could only have been delivered at the cost of heavy casualties. But in such an emergency the *Luftwaffe* would surely have shown the necessary courage and resolution, if its crews had received the necessary training and facilities. Its history shows that its pilots had such qualities, whatever the defects of their leaders. In fact, the strategic air offensive had caused such a reduction in the numbers and efficiency of the *Luftwaffe* that there was no resistance in the air of any importance throughout the whole of the

embarkation and the subsequent battle on land. The *Luftwaffe* were already a defeated force and one without either the fighters, the bombers or the trained crews necessary to protect the European fortress. The immense advantage thus obtained has hardly yet been sufficiently recognised by the military commanders who were necessarily preoccupied with the achievements of their own forces.

That no such force existed in 1944 must be in large part attributed to the strategic offensive of the previous year and that is no doubt the greatest contribution made by strategic bombing to the success of the invasion. It was hardly this aspect which was in the minds of those who issued the *Pointblank* directive. But it was inherent in the strategic principles of both the Royal Air Force and the United States Army Air Force and both can share the credit for this victory. Part of it had in a sense been secured before daylight air superiority had been won by the United States fighters, since long before that time the *Luftwaffe* in the West had been concerned almost entirely with defence and put little energy or thought into the sporadic attacks which it made on England in 1943, mostly on useless objectives.

The same is true of the air war at sea during this period. If the U-boats had been mastered, there was still opportunity to attack British shipping in home waters, especially in the North Sea, and the commander of the squadrons designed for that purpose pleaded for the means to take advantage of them. But his pleas were unheeded, his squadrons starved of aircraft and crews and eventually reduced to a skeleton. Again this lack of a trained force cannot be attributed solely to strategic bombing, but it was certainly in great part due to it. The threat from the air and, indeed, the casualties caused by air attack also affected the use of the German battle fleet. Hitler himself, for other reasons, was convinced that it was useless and, though Doenitz persuaded him to keep it in being, its potential threat was continually reduced by the attention which it received from the allied air forces. Coastal Command shares the credit for this with the strategic air forces.

Moreover, the effort that had to be devoted to aerial defence helped to reduce the manpower available for the Navy as for other services. When Doenitz demanded more men for the new U-boat fleet and the increasing number of light ships which he hoped to use against Britain, Hitler replied, 'I haven't got this personnel. The anti-aircraft and night fighter forces must be increased in order to protect the German cities. It is also necessary to strengthen the Eastern Front. The Army needs divisions for the protection of Europe'. This quotation shows how such decisions were produced by a combination of pressures and cannot be attributed to any of them alone.<sup>1</sup>

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<sup>1</sup> *Fuehrer Conferences on Naval Affairs 1943*, 15th June 1943, published in *Brassey's Naval*

Similar effects were produced on the land forces. As has been seen, men were diverted from them to defence against attack from the air and the repair of the damage caused by it. No doubt, most of the men physically fit for more active service were gradually combed out of the *Luftwaffe* ground forces and the A.R.P. organisations. But still a considerable number, and these the most skilled and reliable, had to be retained in them to command and control so large a body of men. 'There is no doubt', Speer said, 'that in the absence of air raids it would have been possible to withdraw several hundred thousand more soldiers from the armaments industry at the end of 1943', while the employment of soldiers on bomb-damage clearance lengthened the period of training and reduced their efficiency.

More important, perhaps, was the effect on the armament of the land forces. This is also a debatable subject because so many factors have to be taken into account and notably the huge losses of armaments in the East and the policy of the higher command. Such defects as occurred were partly due to Hitler's insistence on giving priority to new divisions rather than to those with battle experience. Still, as has been pointed out, some shortages were directly due to the strategic air offensive. The diversion of so much electrical equipment to the anti-aircraft and searchlight batteries resulted in a shortage of signal equipment for the Army.<sup>1</sup> The increase in anti-aircraft guns reduced the amount of the artillery available for the land forces, both in the East and in the West, though the *Luftwaffe* also complained that the Army took too great a share of these weapons. At any rate there were not enough to go round.<sup>2</sup>

All this must have had some effect on the efficiency of the German armies though it is impossible to measure its extent. Much more important was their loss of mobility caused by the attack on communications. At a number of crucial operations in the course of their stubborn defence such reinforcements as were available were delayed by the destruction of the railways and river bridges. The attacks of the tactical air forces were a necessary factor in this result, but these attacks would not have been so successful if the railways had not already been so crippled.

There was also the effect on the ground defence of northern France known as the Atlantic Wall. This has sometimes been dismissed as

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*Annual 1948*, ed. by Rear-Admiral H. G. Thursfield, p. 336. This quotation has been used (e.g. in the *Thunderbolt* survey of the bombing offensive made by the Air Staff in 1947) to show the definite result from Bomber Command's activities. But in this case and elsewhere the last two sentences were omitted and thus a wrong impression given.

<sup>1</sup> Speer Interrogations, Aug. 1945. The losses caused to the electrical industry by the destruction of plants in Berlin and the consequent dispersal was a contributory cause.

<sup>2</sup> Notes on Confs. with Hitler, 22nd-23rd and 25th May 1944, Speer Docs. (Hamburg Series). Hitler told Saur that the failure to provide sufficient of these weapons was a 'national disaster'.

unimportant, but had the defences on all the Channel coast area been as well developed as those in the Pas de Calais a more difficult problem would have been set for the invaders. Rommel, as we know, was greatly dissatisfied with them when he took over this command, and their defects were partly due to the diversion of workers to the Reich which began in the spring of 1943. Materials such as steel were also in short supply, partly as a result of their absorption by the defence of the factories in the Reich. There can be no doubt that Hitler himself attached great importance to the Atlantic Wall to which he often referred in his discussions with Speer. He was most reluctant to take workers away from it. It was only the compelling necessity to provide extra workers for the rehabilitation of the Ruhr and other devastated areas of Germany that forced him to give his consent. Moreover, if the concrete of the Atlantic Wall was not very seriously injured by the final bombardment of both the strategic air forces and the allied fleet, the destruction of the radio stations and communications did much to nullify the intelligence service of German headquarters while there was an important psychological effect on the forward German formations.<sup>1</sup>

To sum up, it is incontrovertible that the contribution of the strategic air forces to the weakening of German defence in the *Overlord* campaign was of vital importance even if it was very far from producing that collapse of armed resistance which some had thought possible. The most important of them was the absence of an adequate and efficient German air force when the invasion took place. The second most important effect was that produced on the land battles by the long attack on communications. Thirdly, there was the absorption of men and weapons which might have been used to strengthen the German army and navy. Fourthly, there was the effect on the Atlantic Wall and defence installations by reducing the workers and material available for it and by the bombardment immediately before the invasion. And fifthly, there is the share of the strategic air forces in delaying the V-weapon offensive and reducing its intensity and efficiency after it had begun.

Finally, as previous chapters have shown, this task could not have been performed had it not been for the dogged persistence in the strategic offensive in previous years during which the necessary experience and technical skill were acquired. In the last period of the war the strategic air forces were to make further important contributions to the successes of the land forces by which at last the resistance of Germany was overcome.

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<sup>1</sup> There is tragic irony in the fact that, as late as 3rd June 1944, Hitler ordered that the great achievement of the Atlantic Wall should be publicly advertised. Three weeks later he thought that this step might be indefinitely postponed! Notes on Confs. with Hitler, 3rd-5th June 1944 and 19th-22nd June 1944. Speer Docs. (Hamburg Series).

# Principal Staff and Command Appointments January 1943–March 1944

## SECRETARY OF STATE FOR AIR

Sir Archibald Sinclair

## CHIEF OF THE AIR STAFF

Marshal of the Royal Air Force Sir Charles Portal

## VICE-CHIEFS OF THE AIR STAFF

Air Vice-Marshal C. E. H. Medhurst

Air Chief Marshal Sir Douglas Evill                      From 21st March 1943

## DEPUTY CHIEF OF THE AIR STAFF

Air Marshal Sir Norman Bottomley                      From July 1943

## ASSISTANT CHIEFS OF THE AIR STAFF (OPERATIONS)

Air Vice-Marshal N. H. Bottomley

Air Vice-Marshal W. A. Coryton                      From 16th August 1943

## ASSISTANT CHIEFS OF THE AIR STAFF (POLICY)

Air Vice-Marshal J. C. Slessor

Air Vice-Marshal C. E. H. Medhurst                      From 21st March 1943

## ASSISTANT CHIEF OF THE AIR STAFF (INTELLIGENCE)

Air Vice-Marshal F. F. Inglis

## DIRECTORS OF PLANS

Air Commodore W. Elliot

Air Commodore W. L. Dawson                      From 26th January 1944

## DIRECTORS OF BOMBER OPERATIONS

Group Captain J. W. Baker

Air Commodore S. O. Bufton                      From 10th March 1943

## BOMBER COMMAND

### AIR OFFICER COMMANDING-IN-CHIEF

Air Chief Marshal Sir Arthur Harris

### DEPUTY AIR OFFICER COMMANDING-IN-CHIEF

Air Marshal Sir Robert Saundby                      From 15th February 1943





## Abbreviations

<b>A.C.A.S.</b>	<b>Assistant Chief of the Air Staff</b>
<b>A.C.A.S.(I)</b>	<b>Assistant Chief of the Air Staff (Intelligence)</b>
<b>A.C.A.S.(O) or (Ops)</b>	<b>Assistant Chief of the Air Staff (Operations)</b>
<b>A.C.A.S.(P)</b>	<b>Assistant Chief of the Air Staff (Policy)</b>
<b>A.C.A.S.(T.R.)</b>	<b>Assistant Chief of the Air Staff (Technical Requirements)</b>
<b>A.D.I.(K)</b>	<b>Assistant Directorate of Intelligence (Department K)</b>
<b>A.H.B.</b>	<b>Air Historical Branch</b>
<b>A.I.</b>	<b>Air Intelligence or Air Interception (airborne radar apparatus for intercepting aircraft)</b>
<b>A.M.S.O.</b>	<b>Air Member for Supply and Organisation</b>
<b>A.M.W.R.</b>	<b>Air Ministry War Room</b>
<b>A.O.C.-in-C.</b>	<b>Air Officer Commanding-in-Chief</b>
<b>A.R.P.</b>	<b>Air Raid Precautions</b>
<b>A.S.V.</b>	<b>Air to Surface Vessel (radar device)</b>
<b>A.W.P.D.</b>	<b>Air Warfare Plans Division (U.S.A.)</b>
<b>B.B.S.U.</b>	<b>British Bombing Survey Unit</b>
<b>B.C.</b>	<b>Bomber Command</b>
<b>B. Ops.</b>	<b>Bomber Operations, Air Ministry</b>
<b>C.A.S.</b>	<b>Chief of the Air Staff</b>
<b>C.B.O.</b>	<b>Combined Bomber Offensive</b>
<b>C.C.S.</b>	<b>Combined Chiefs of Staff</b>
<b>C.G.</b>	<b>Commanding General</b>
<b>C.-in-C.</b>	<b>Commander-in-Chief</b>
<b>Cmd.</b>	<b>Command</b>
<b>C.O.S.</b>	<b>Chiefs of Staff</b>
<b>D.B. Ops.</b>	<b>Director (or Directorate) of Bomber Operations, Air Ministry</b>
<b>D.C.A.S.</b>	<b>Deputy Chief of the Air Staff</b>
<b>D.D.</b>	<b>Deputy Director</b>
<b>Dir.</b>	<b>Directive</b>
<b>E.I.</b>	<b>Enemy Intelligence</b>
<b>E.T.O.U.S.A.</b>	<b>European Theater of Operations, United States Army</b>
<b>F.C.</b>	<b>Fighter Command</b>
<b>F.W.</b>	<b>Focke-Wulf</b>
<b>F.R.C.</b>	<b>Federal Record Center (U.S.A.)</b>
<b>G.A.F.</b>	<b>German Air Force</b>

H.C.	High Capacity
H.C.U.	Heavy Conversion Unit
H.E.	High Explosive
J.I.C.	Joint Intelligence Committee
J.S.M.	Joint Staff Mission
Ju.	Junker
M.C.	Medium Charge
Me.	Messerschmitt
M.E.W.	Ministry of Economic Warfare
<i>O.K.W.</i>	<i>Oberkommando der Wehrmacht</i> (The Supreme Command of the Armed Forces)
O.R.B.	Operations Record Book
O.R.S.	Operational Research Section
O.R.S.(B.C.)	Operational Research Section (Bomber Command)
O.T.U.	Operational Training Unit
P.F.F.	Pathfinder Force
P.S.	Private Secretary
Q.M.G.	Quarter-Master General
R.A.A.F.	Royal Australian Air Force
R.C.A.F.	Royal Canadian Air Force
R.E.8	Research and Experiments Department 8, Ministry of Home Security
R.S.I.	Research Studies Institute, U.S.A.
S. of S.	Secretary of State
S.E. or S/E	Single-engined
Sqdn	Squadron
S.O.E.	Special Operations Executive
S.S.	Schutzstaffel
T.E.	Twin-engined
T.I.	Target Indicator
U.S.A.A.F.	United States Army Air Forces
U.S.St.A.F.E. or U.S.S.A.F.E.	United States Strategic Air Forces in Europe
U.S.S.B.S.	United States Strategic Bombing Survey
V.C.A.S.	Vice-Chief of the Air Staff
W/T	Wireless Telegraphy

## Code Names

<i>Cigar</i>	The jamming of German V.H.F. radio telephonic communications with airborne fighters
<i>Circus operations</i>	Fighter escorted daylight bombing attacks against short-range targets with the aim of bringing the enemy air force to battle
<i>Corona</i>	Counterfeit orders to German fighters
<i>Crossbow</i>	The attack on V-weapon launching sites
<i>Eureka</i>	Ground radio transmitter for guiding bombers to their target
<i>Gee</i>	Radar aid to navigation and target identification
<i>G-H</i>	Blind bombing radar device
<i>Grand Slam</i>	22,000-lb. penetrating (earthquake) bomb
<i>H2S</i>	Radar aid to navigation and target identification
<i>Musical Paramatta</i>	Method of ground marking a target by coloured target indicators dropped blindly on <i>Oboe</i>
<i>Musical Wanganui</i>	Method of sky marking a target by coloured markers dropped blindly on <i>Oboe</i>
<i>Newhaven</i>	Method of ground marking a target by flares or target indicators dropped blindly on <i>H2S</i> followed, if possible, by visual identification
<i>Oboe</i>	Blind bombing radar device
<i>Overlord</i>	The allied invasion of France in 1944
<i>Pointblank</i>	The directive for the Combined Bomber Offensive, June 1943, subsequently used to refer to the Combined Bomber Offensive in its strategic aspects
<i>Sea Lion</i>	German plan for the invasion of England
<i>Serrate</i>	Radar device enabling fighters to home on the radar transmission of enemy aircraft
<i>Sextant</i>	The Cairo Conference, November-December 1943
<i>Fallboy</i>	12,000-lb. penetrating (earthquake) bomb
<i>Tinsell</i>	The jamming of radio telephonic communication with airborne fighters
<i>Torch</i>	Allied invasion of French North Africa in 1942
<i>Trident</i>	The third Washington Conference, May 1943
<i>Window</i>	Tinfoil strips designed to confuse German radar



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