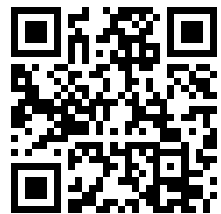
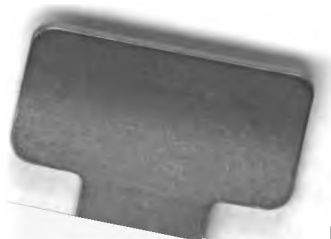

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**HISTORY OF
THE SECOND WORLD WAR
UNITED KINGDOM MILITARY SERIES**

Edited by SIR JAMES BUTLER

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Marshal of the Royal Air Force Sir Arthur Tedder, G.C.B.

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

**Volume III: Victory
Part 5**

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 V

The culmination of the offensive:
the results of air superiority
March 1944—May 1945

INTRODUCTION

IN no month between April 1944 and May 1945 was the daily average of bombers available with crews for operations in Bomber Command squadrons less than one thousand. It increased from 1,023 in April 1944 to 1,513 in December and to 1,609 in April 1945. Corresponding with this quantitative expansion there was also a great qualitative improvement. The daily average of operational Lancasters available in the squadrons was 614 in April 1944, 927 in December and 1,087 in April 1945. Stirlings were increasingly, and, in September 1944, completely, withdrawn from bombing operations and by the end of August 1944 the whole of 4 Group had been re-equipped with Mark III Halifaxes which were greatly superior to the earlier versions of that aircraft. In October 1944 the daily average available bomber strength of the front line was composed of 877 Lancasters, 471 Halifaxes and 120 Mosquitoes.¹

Bomber Command, however, was only one of the three allied forces concerned in the strategic air offensive. The United States Eighth Air Force, in terms of aircraft, though not of bombload, had an even greater strength than Bomber Command. In April 1944 it had a daily average of 1,049 bombers available with crews for operations. In December this average had increased to 1,826 and in April 1945 it was 2,018. In addition, there was the United States Fifteenth Air Force which continued to operate from Italian bases. The available strength of the three forces together amounted in July 1944 to no less than 5,246 bombers. More than five thousand of these were four-engined Lancasters, Halifaxes, Fortresses and Liberators. Fewer than forty were Stirlings and the rest were Mosquitoes.²

Thus, even by the measure of the aircraft which were actually available for operations, as opposed to those which were merely on the strength of the squadrons, the front line of the combined bomber forces considerably exceeded the target of 4,000 which had been set for Bomber Command alone in September 1941 when the United States was still a neutral country. Moreover, the destructive power, even of Bomber Command alone, was much greater than had been envisaged in September 1941 for the 4,000-strong force. That force, it had then been estimated, would be able to lift 75,000 tons of bombs from base per month. But only a quarter of these bombs were

¹ Figures computed from Bomber Cmd. O.R.Bs.

² Eighth Air Force Statistical Summary and *B.B.S.U. The Strategic Air War Against Germany, 1939-45*, p. 41.

expected to fall within five miles of their targets. In March 1945 Bomber Command actually discharged over 67,000 tons of bombs of which about ninety-eight per cent probably fell within three miles of the aiming points.¹ In this, the peak month, Bomber Command and the Eighth Air Force dropped a total of more than 130,000 tons of bombs, which was considerably more than twice the total they dropped in the whole of 1942 and not much more than thirty thousand tons less than Bomber Command had dropped in the whole of 1943.

The huge striking power of the Anglo-American strategic air forces in this final period of the war represented, as far as the aircraft were concerned, the culmination of a vast production, repair and servicing effort in Britain, the United States and in Italy too. As far as the crews were concerned, it similarly represented the culmination of a yet more complex recruiting and training programme in Britain, the United States, Canada, Australia, New Zealand and parts of the British Empire. In both respects, the result was a triumph of co-operative allied effort and organisation over the technical, logistical and operational problems which had obstructed such an achievement. But the strategic problems of how this great force should be applied were, as is shown in the first of the three following chapters, less successfully overcome.

The two main issues of the strategic air offensive concerned, firstly, the extent to which and the circumstances in which it might be diverted from its primary purpose of striking at the heart of Germany and, secondly, whether the heart of Germany would be most effectively damaged by a selective or a general application of bombing. The first issue was a question of the priority of *Pointblank* in the grand strategy of the war. The second was a question of the bombing policy by which *Pointblank* might most effectively be executed. These were not new issues but in 1944 and 1945 they arose in a more acute form than ever before.

This was because the diversion of strategic air power posed by the military requirements of *Overlord* was more drastic than any previous diversion and, between April and September 1944, even involved a transfer of the direction of the forces from Sir Charles Portal to General Eisenhower. It was also due to the greatly increased striking power available and the enormously greater operational flexibility and versatility of that striking power. This meant, as far as bombing policy was concerned, that many more possibilities were open and that the choice of what ought to be attempted was less and less controlled by the operational limitation on what could be achieved. In particular, the issue for Bomber Command of selective and general

¹ See App. 44, and *Harris Despatch*. The ninety-eight per cent was calculated on the basis of photographic evidence.

attack no longer involved, as it substantially had done in 1943, merely the question of which towns should be subjected to night area bombing. From the middle of 1944 onwards, it also involved the question of whether area attacks on towns or precision attacks upon specific targets should be made, for by that time Bomber Command had the operational capacity to undertake both tasks not only in darkness but in daylight as well.

The competing claims of these alternatives bedevilled the course of the final offensive, but before that the issue of the diversion in connection with *Overlord* had to be settled. *Pointblank* had, of course, been designed as a strategic air preparation for *Overlord*. It was intended to produce air superiority, a disruption of German military and industrial production and a decline in German morale, all of which were regarded as indispensable prerequisites to the successful military invasion of the Continent. But these were also the normal objects of the strategic air offensive and for that reason, though it was always related to *Overlord*, *Pointblank* had not been much affected by the relationship.

In the early months of 1944, however, this situation began to change drastically. It then became apparent that those who were planning *Overlord* were expecting a massive air campaign of direct air preparation and subsequently of direct air support for the armies. These demands were on such a scale and embraced such a number and variety of targets that they could not be met by the tactical air forces alone. In fact, they called for the virtual cessation of *Pointblank* so that they could be fulfilled by the strategic air forces. Thus, *Overlord* came into conflict with *Pointblank*, and for a time almost extinguished it.

But *Pointblank* was never quite extinguished. Indeed, at the height of the *Overlord* diversion, when Bomber Command was primarily concerned with the disruption of the French railway system, the beginning of a strategic attack on German oil production occurred. The initiative was taken by the United States Strategic Air Forces, but it was soon followed by Bomber Command as well. Meanwhile, the lessons of the preparatory attacks on French railways had suggested that German communications might be a profitable object both of the strategic air offensive and of the tactical campaign in support of the armies. Sir Arthur Harris, however, was still quite unconvinced by the arguments adduced in support of these two selective policies. He retained an overriding confidence, though it was no longer fully shared by Sir Charles Portal and the Air Staff, in the efficacy of general area assault upon the largest German cities.

Thus, when, in October 1944, the strategic air offensive was resumed with unprecedented violence, there were three competing policies before it, namely, the oil campaign in which Sir Charles

Portal saw the prospect of decisive results, the communications offensive in which Sir Arthur Tedder saw the possibility of a common denominator between the requirements of the military situation and the aims of the strategic air offensive and, lastly, the general area offensive in which Sir Arthur Harris so firmly believed.

Absolute concentration of effort could not be achieved if only because of weather considerations and on account of the fact that there were always some air defences to be reckoned with. Moreover, oil and communications were eventually seen to be not competing but complementary target systems. The issue between them and the general area offensive, however, was more important and it proved to be irreconcilable. It led to a substantial division of bombing effort which was greatly in excess of that made inevitable by tactical considerations and the necessity of meeting so many military requirements and other diversionary claims. It is necessary to survey in some detail the disputes engendered by this situation, in which the aims of the principal protagonists, Sir Charles Portal, Sir Arthur Harris and Sir Arthur Tedder, were to a considerable extent frustrated.

Nor was this tragic deadlock the only respect in which the final offensive was controversial. The conduct of the area offensive reinforced the doubts which some people had long since felt about the strategic air offensive on moral grounds. In particular, the attacks made in February 1945 by Bomber Command and the United States Eighth Air Force on Dresden resulted in condemnations which have persisted and even increased over the years which have elapsed since the event. This particular operation, which was undertaken for complicated reasons not wholly connected with the general area campaign, even led to some severe words, though not on moral grounds, from the Prime Minister, though it was he himself who contributed much of the incentive to carry it out.

Despite these fundamental cleavages of strategic opinion, and in spite of all the moral and also, on many occasions, mistaken, criticisms of the offensive, the actual operations, which are examined in the second of the following chapters, were an undoubted triumph. It was not simply that an unprecedentedly large number of bombers were available. It was due also to a complete change in the operational conditions of the offensive. The factors in this change were highly complicated, and, as is shown in section 1 of Chapter XIII, they were also interconnected. Among the most important were the achievement of command of the air first in daylight and eventually in darkness as well, the development of new bombing techniques together with the provision of new and more powerful bombs, and the shortening of penetrations into enemy-defended territory which followed from the advance of General Eisenhower's armies. The effect of these and other developments upon the capacity of Bomber

Command was fully reflected in the great variety of operations which were carried out. Among the more notable achievements were the wholesale devastation of many oil plants, the destruction of the German battleship *Tirpitz*, the breaching of the Bielefeld viaduct, the draining of the Dortmund-Ems Canal and, in addition, the vast devastation of many great cities in Germany.

These operations provide part of the verdict upon the strategic dispute between Sir Charles Portal and Sir Arthur Harris, for the dispute was, to some extent, based upon varying estimates of what Bomber Command could and could not do. The operational triumphs of the final offensive showed that the force had, indeed, attained a greater and, in particular, a more precise operational capacity than Sir Arthur Harris often tended to suppose. But the strategic argument between the latter and Sir Charles Portal also, and to a greater extent, turned upon their different interpretations of the economic intelligence available and their different estimates of the effects which would be produced by the alternative bombing policies.

Any estimate of these different points of view must depend on an assessment of the intelligence available to those that held them and the actual results of the final offensive. This appraisal is made in the third chapter of this part. Since the method by which the intelligence was analysed and conveyed to those directing the attack was radically changed in this period, some account of this process is given in the first section. While the machinery set up in London was in many ways more efficient and more rapid than its predecessors, it had a rival intelligence system in that set up at the headquarters of the allied armies on the Continent. Both systems were based on close co-operation between British and United States experts and the controversies which arose were not due to national preoccupations or prejudices but to the differences between the various elements in the combined offensive of the land and air forces on Germany. Such controversies naturally led to varying appreciations of what had been done and what ought to be done. The respective merits of these appreciations are discussed in the survey of results in the last three sections of this chapter.

The problem of ascertaining what these results were becomes especially difficult in this period for two reasons. In the first place they were produced by a combination of pressures exercised by both the air and land forces, and it is sometimes impossible to distinguish the contribution of each to the whole. Secondly, the problem is complicated by the chaotic condition into which Germany was reduced during the final stages of the offensive. This tended amongst other things to affect the position of Speer in the control of armaments production and to bring about the introduction of new devices in the vain effort to ward off the onslaught from the air. This effect is briefly

described in the second part of the first section of this chapter. But more important is it that from the same cause the statistics of production and communications became less complete and reliable and finally ceased to exist in many sections of the German economy.

For the two main target systems, however, oil and communications, there is abundant evidence for most of the period which enables the problems concerning them to be reduced within well-defined limits. It is more difficult to evaluate the contribution of area bombing to the final result. Yet here also, if the evidence has to be assembled from many diverse inquiries into particular cities, industries and factories, it does, when viewed as a whole, lead to fairly clear conclusions. The same is true of the direct attacks on the production of the weapons of the German land, sea and air forces which are also considered in the final section.

Most difficult of all is to ascertain the contribution of all these different forms of strategic air attack to the advance of the allied armies into Germany. It is necessary to consider this question since it affects all the others. But this problem is also being studied by those engaged in writing the history of the land campaign in the West and their conclusions may differ in some respects from those obtained from the evidence now available.

CHAPTER XII

THE CULMINATION OF
THE OFFENSIVE:
THE STRATEGY OF VICTORY

1. *Pointblank* and *Overlord*: The ingredients of victory and the bases of dissension, March–June 1944
2. The origins of the final offensive: oil, communications and morale, June–September 1944
3. The problem of concentration, October–November 1944
4. The reward of dissension, November 1944–January 1945
5. Anti-climax and climax, January–May 1945

‘And the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populous centres on a vast scale may become the principal operations of war, to which the older forms of military and naval operations may become secondary and subordinate.’

GENERAL SMUTS, 17th August 1917

‘Even in the final crisis, the most effective method of influencing the German High Command may still be to direct all our efforts to complete the destruction of the German Army in the field and to exclude every possibility of a final stand.’

SIR CHARLES PORTAL, 1st August 1944

I. *Pointblank* and *Overlord*: the ingredients of victory and the bases of dissension

March – June 1944

BY the beginning of 1944 the approach of *Overlord* had come to dominate every other consideration of strategy and especially that of the combined bomber offensive, or *Pointblank*, as it had been known since the middle of 1943. This was not due to any great new decisions in the allied camp, but simply to the passage of time, which had permitted a meeting of minds, the execution of preparations and the appointment of commanders, and which had also shown that one of these preparations, the *Pointblank* offensive, was not, of itself, likely to produce a German collapse in the immediate future. Thus, *Overlord* came to occupy the position which the choice of its name had suggested was intended for it. The plan was transformed from the aspect of a distant and, at times, even doubtful, project to that of an imminent operation, and this transformation was signalled in December 1943 by the appointment as Supreme Allied Commander of General Eisenhower. *Overlord* had become the substance of the promise to Russia that a 'second front' would be opened in Europe, and it also represented the expression of the belief, which had always been fundamental to allied grand strategy, that the war would only end with the engagement and defeat of the German army in the field.

This belief had long been disagreeable to many air-minded officers, notable among whom was Sir Arthur Harris. To them, it seemed to represent an outmoded, uneconomic and, in view of German military strength, unsound strategy which took inadequate account of, and left insufficient resources for, the development of a war-winning independent and strategic air offensive. Their view had demanded an overriding priority for the construction, manning, supply and reinforcement of heavy bomber squadrons and had suggested that the only military forces required were lightly armed flying columns more akin to policemen than to soldiers who could, in due course, be used to occupy enemy territory to exploit and impose the terms of victory after it had been won from the air.¹

Despite its attractions, this view was never adopted by the supreme authorities, especially after what the Prime Minister had described as the 'other possibilities' which were opened by the involvement first of

¹ See, for example, memo. by Trenchard for Churchill, 19th May 1941, App. 10 (i), cited above, Vol. I, p. 170, Min. Harris to Churchill, 17th June 1942, cited above, Vol. I, pp. 340-341, and Min. Slessor to Portal, 11th Dec. 1942, cited above, Vol. I, p. 376.

Russia and then of the United States. Nor was it a view upheld either in London by the Chief of the Air Staff, Sir Charles Portal, or in Washington by the Commanding General of the United States Army Air Forces, General Arnold. In neither Britain nor America were the heavy bombers ever given anything like unlimited priority and their operations were by no means always confined to the strategic role. On the contrary, the authoritative view was always that the war would end with hard fighting on land and that, to quote the words of Sir Charles Portal in 1942, 'the German fighting Services will retain their discipline to the last.'¹

The possibility of this view proving to be correct was not, of course, rendered less probable by the allied production and allocation strategy which was its corollary. Since times as remote as Dunkirk and Pearl Harbour, Britain and America had been raising, training and equipping with all the paraphernalia of surface combat, large armies on the continental scale. Enormous resources of industry, manpower and shipping space were thus consumed and, to some extent, denied to the build-up of the strategic bomber forces.

By the beginning of 1944, the great allied military forces were ready or nearly ready for the conflict. Some were already in action. The Russian armies had won many great victories and were still advancing. In the strategic air offensive, Bomber Command had fought the Battles of the Ruhr and of Hamburg and was concluding the Battle of Berlin. The Eighth Air Force had intervened in daylight in imposing and increasing strength, but Germany had neither capitulated nor shown evident signs of collapse. The launching of *Overlord*, therefore, became inevitable, and it seemed obvious that if the decision in the war was to be determined by the alliance, rather than by the Russians alone, it would depend upon the outcome of *Overlord*. This strategy, decided upon long before, made *Overlord* into the supreme operation whose requirements, whether on land, at sea or in the air, dominated all other considerations. It was this which made the viewpoint of General Eisenhower the most influential in the military councils of the alliance, but it was not this which resolved the issues between *Pointblank* and *Overlord*. These operations had not been designed as competing versions of strategy whose future could be determined simply by the dominance of one or the other. *Pointblank* had been conceived, not to compete with *Overlord*, but to make it possible. Its aim, as had been shown in the Casablanca directive, was not to defeat Germany, but to create the opportunity for the military invasion to do so. *Pointblank* was not merely an independent prelude to *Overlord*. It was really part of the great undertaking itself.

The possibility had, of course, always existed that the combined

¹ Min. Portal to Slessor, 13th Dec. 1942, cited above, Vol. I, p. 377.

bomber forces might carry out their tasks so effectively and achieve their objects so thoroughly that Germany would be rendered not only incapable of resisting a military invasion effectively but incapable of resisting it at all. Such a prospect had been much in Sir Arthur Harris' mind, it had occurred to General Spaatz and it had been taken into account by the Combined Chiefs of Staff in a plan known as *Rankin*, which provided for the rapid occupation of the Continent in the event of a German collapse under the impact of *Pointblank* and the Russian victories. Nevertheless, the realisation of these possibilities had been rendered somewhat slight by the massive preparations for a fighting invasion, owing, as has already been suggested, to the effect which these had upon the allied strategy of production and allocation. Moreover, the execution of those preparations, in the shape of the plan for *Overlord*, had rendered the materialisation of the *Rankin* situation unnecessary, while the condition of Germany at the beginning of 1944 finally banished any immediate hopes of its occurrence. *Overlord*, Sir Arthur Harris said in a memorandum of January 1944, 'must now presumably be regarded as an inescapable commitment'.¹

Whether the aim of the strategic air offensive was taken to be the collapse of Germany which might be exploited by the *Rankin* occupation plan, or, somewhat less ambitiously, only her wearing down which might be exploited by the *Overlord* fighting plan had not, however, been an issue which exerted a significant influence upon the bombing policy of *Pointblank* until the launching of *Overlord* became imminent. The debates which *Pointblank* had inspired in 1942 and 1943, and particularly those which had immediately preceded the Casablanca Conference, had pointed to distinctions, which, as far as the selection of targets at those times was concerned, made little difference. The great disputes of 1943 about the merits of general area bombing, selective area bombing and precision selective bombing did not primarily turn upon ultimate objects but upon assessments of strategic effectiveness and, above all, of operational capacities. The approach either of *Overlord* or of *Rankin* had little immediate bearing upon these problems because it was difficult to discern the difference made to bombing policy by the pursuit of either aim.

Even the increasing emphasis accorded to the attack on the *Luftwaffe*, which, after the middle of 1943, became a preoccupation, arose as much from the immediate needs of *Pointblank* itself as from the ultimate requirements of *Overlord*. Nevertheless, the approach of *Overlord* undoubtedly was a factor in bringing about an awareness of the need for air superiority and, therefore, in giving rise to the plan of attack on the *Luftwaffe*. This was particularly so in the case of the British contribution, because the need for a reduction of German

¹ Memo. by Harris, 13th Jan. 1944.

fighter strength, as also the means of attaining it, was somewhat less evident to those directing the Bomber Command night offensive than to those responsible for the Eighth Air Force day attacks. All the same, the fact remains that the need for air superiority actually arose as much, and more immediately, from the crippling losses of American day bombers and also, before the year was out, of British night bombers, as from the consideration of the security of military and naval forces in the ultimate invasion.

The encouragement of more precise bombing and the decline of Air Staff confidence in area bombing also may have owed something to the approach of *Overlord*. The Casablanca directive, among its several vague clauses, had contained the instruction to Sir Arthur Harris and General Eaker that when the Continent was invaded by the allied armies 'you will afford them all possible support in the manner most effective'. Among the many possible manners which might be regarded as the most effective it was possible to include the performance of specialised tasks, perhaps of a tactical nature, which might require a high degree of precision bombing. This was, however, by no means the only, nor was it the operative, reason for which efforts were made to develop precision bombing techniques in Bomber Command. Indeed, the Dams raid of May 1943, which was so important in this process, was intimately and directly related to the Battle of the Ruhr. The connection of the Dams raid with the land battle in Normandy more than a year later was more obscure and arose only from the strategic association of *Pointblank* and *Overlord*.

Thus, while *Pointblank* was always a factor in the prospects of *Overlord*, even to the possible extent of making the latter operation unnecessary, *Overlord* was not a significant factor in the conduct of *Pointblank* until the launching of the invasion became imminent. For that reason and until that time, it had been possible to regard *Pointblank* as an independent and strategic air offensive related to, but not ruled by, *Overlord*. The problem of the most effective manner in which the heavy bombers could afford 'all possible support' to the allied armies when they ultimately did invade the Continent, therefore, could be, and actually was, left for future solution. But when, in the early months of 1944, it became evident that the surface invasion was not only inevitable, but also imminent, and that it was certain to involve a stiff and, perhaps, a prolonged struggle between large opposing armies this problem had to be faced and solved.

The issue was brought to a head in a somewhat haphazard manner by what were regarded by those planning the operation as the indispensable air requirements of *Overlord*. It involved Bomber Command and the United States Strategic Air Forces, because these requirements greatly exceeded what could be fulfilled by the tactical air

forces specifically allocated to the service of the invasion in its preparation, execution and development. It raised a major clash between *Pointblank* and *Overlord* because the bombing policy postulated was primarily, if only temporarily, more of a tactical rather than a strategic nature and the targets indicated were mostly in France and not in Germany. It also produced a crisis in the higher command of the air forces because agreement could not be reached by the Commanders of the tactical and strategic elements.

The sense in which these various problems were eventually adjusted was of fundamental and lasting importance to the strategic air forces, which at this time were approaching the summit of their strength in numbers and of their effectiveness in striking power. This was not simply a question of another diversion like those which had occurred in the Battle of France, the Battle of the Atlantic and on other occasions, though that was involved at various stages and to a varying extent. It was not only a question of aims and methods such as that which had arisen between the British and American Air Staffs and latterly between the Air Staff and Bomber Command, though that also was involved. The arrangements made to ensure the success of *Overlord* and to maintain the subsequent land battle and the system of command by which they were executed transcended the earlier controversies of bombing strategy as well as embracing many of them. They marked a transition for the heavy bombers from an offensive which, though it had been preparatory, had also been primarily independent and strategic, to one in which their role was as an element in what the barbarous jargon of the time described as 'triphibious' war. Henceforth, the distinctions between 'independent' and 'auxiliary' and between 'strategic' and 'tactical' bombing became more and more confused. The wars in the air, on land and at sea became related to an extent which had been so only in theory at earlier stages and, in the process, the effectiveness of each arm gained immeasurable but undoubted strength.

It must not, however, be supposed that this transition was easily achieved or, indeed, that it was ever completely accomplished. A combination of functional traditions and operational inflexibilities made that impossible and the solutions reached in the spring of 1944 were neither perfect nor final. As it was, they only emerged from a vigorous, and at least partially unresolved, debate between the principal protagonists, about the most effective means by which the heavy bombers could afford support to the allied armies when they went ashore, and, as proved to be more important and more controversial, how they should be employed in the last few months before the landings were attempted. This debate, as has been mentioned, arose from the tactical air requirements of *Overlord*.

The formulation of these requirements had a somewhat curious

history to which reference must now be made. At the Casablanca Conference in January 1943 Lieutenant-General Morgan had been appointed Chief of Staff to the Supreme Allied Commander and charged with the somewhat unenviable task of planning the greatest amphibious operation in the history of war without the knowledge of who would be the Supreme Commander.¹ Already in April 1943, General Morgan had reached the stage at which his plans could scarcely prosper without the co-operation of a responsible air officer. Since it was Sir Charles Portal's view that the most important aspect of the air contribution to *Overlord* would be the attainment of air superiority over the beachheads, it was decided, with the concurrence of the Americans, that this officer should be a fighter commander and Air Marshal Sir Trafford Leigh-Mallory, who had distinguished himself as a Group Commander in the Battle of Britain, and was now Commander-in-Chief, Fighter Command, gradually began to assume the role. It was, however, not until August 1943 that any official sanction was given to this arrangement. At the Quebec Conference in that month Sir Trafford Leigh-Mallory was appointed Commander-in-Chief of the Allied Expeditionary Air Force, which was to afford the necessary tactical air support to *Overlord*.²

This, however, was not the end of General Morgan's difficulties and it was only the beginning of those engulfing Sir Trafford Leigh-Mallory. The Allied Expeditionary Air Force, as its name implied, was intended to be made up by British and American elements. The American contribution was to be the Ninth Air Force consisting of light or tactical bombers and fighters. The British contribution was to be the Second Tactical Air Force, including 2 Group, which had recently been removed from Bomber Command, and Fighter Command, or at least elements of it. The organisation of such a force and the provision of a directive for Sir Trafford Leigh-Mallory may have been expected to be a relatively simple proposition. In fact, it proved to be one of the most complicated and confusing command problems of the war.

It was not until November 1943 that even a measure of agreement was reached between London and Washington as to the meaning of the term 'administrative control' in its application to Sir Trafford Leigh-Mallory's position *vis-à-vis* the United States Ninth Air Force, and by the time that a compromise was reached on this point, other and more baffling problems had arisen.³ In the middle of November

¹ The appointment of General Eisenhower as Supreme Commander was not decided until the Cairo Conference in December 1943.

² C.A.S. File.

³ The American view, represented by Generals Arnold, Devers and Eaker, was that 'administrative control', which Sir Charles Portal had proposed should be exercised by Air Marshal Leigh-Mallory over the Ninth Air Force, embraced the award of decorations and decisions about promotion and pay.

1943, however, the Allied Expeditionary Air Force came into being, though the transfer of the Ninth Air Force to it did not occur until a month later.¹ The position of Fighter Command, for whose glorious name was substituted the title of Air Defence of Great Britain by one of the less imaginative decisions of the war, remained, however, somewhat obscure. It seemed that, as far as the Allied Expeditionary Air Force was concerned, Sir Trafford Leigh-Mallory was responsible to the Supreme Commander, who was yet to be appointed, but that, in the case of the Air Defence of Great Britain, he was responsible to the British Chiefs of Staff. No decisions were taken as to how the operations of the new Allied Expeditionary Air Force and the Strategic Air Forces might be co-ordinated, and in his directive to Sir Trafford Leigh-Mallory on 16th November 1943, General Morgan announced that 'directives for the control of the Strategic Air Forces will follow at a later date.'²

Thus, at the time of General Eisenhower's appointment as Supreme Commander, the position of Sir Trafford Leigh-Mallory was still somewhat anomalous. The control which he exercised over the Allied Expeditionary Air Force as its Commander-in-Chief had been slowly and even reluctantly conceded. He had no control and, as events were now to show, little influence over the strategic air forces. Yet it was more than evident that the air plan in support of *Overlord*, for which he was responsible, could not be carried out without the participation of Bomber Command and the United States Strategic Air Forces. Everyone knew that the exercise of air power might well prove to be the decisive factor in *Overlord*, but the prospect of co-ordinating its various elements in a strategic concentration did not seem to be promising. Certainly, Sir Trafford Leigh-Mallory was not yet in a position to resolve the conflict between *Pointblank* and *Overlord*. Neither General Spaatz nor Sir Arthur Harris paid much heed to his suggestions. Now that the air contribution to *Overlord* was seen to be something vastly more comprehensive than mere fighter action over the beachheads, the selection of a fighter commander to direct it began to seem somewhat inappropriate.

Sir Trafford Leigh-Mallory still had the intention of becoming what Mr. Churchill described as 'a real Commander-in-Chief of the air', but this, the Prime Minister said, was 'not what was meant at all'. The real commander-in-chief of the air ought, Mr. Churchill suggested on 6th January 1944, to be Air Chief Marshal Sir Arthur Tedder, who had just been appointed Deputy Supreme Allied Com-

¹ The Allied Expeditionary Air Force came into being on 15th November 1943. The Ninth Air Force was transferred to it on 15th December 1943. General Eaker had wished to postpone this transfer until March 1944.

² The file includes Notes by Portal on Formation of Allied Expeditionary Air Force, 17th Nov. 1943 and 25th Nov. 1943.

mander. As such, Mr. Churchill believed, he should not be 'an Officer without portfolio'. He ought to be the 'complete master of all the air operations'. General Spaatz could take his orders from General Eisenhower, there would be no difficulty 'in arranging between Tedder and Harris' and the position of Sir Trafford Leigh-Mallory could at last be stabilised.¹

These suggestions which had, no doubt, been much influenced by General Eisenhower, had the appearance of corresponding with the American aim of achieving unified and Supreme Command. They indicated that in the preparation and conduct of *Overlord*, the Supreme Commander would be able to call equally upon Sir Trafford Leigh-Mallory, Sir Arthur Harris and General Spaatz to carry out such air operations, whether tactical or strategic, as he might deem to be necessary. Their adoption would, in effect, have elevated Sir Arthur Tedder to the position and the function of a supreme air commander. The conflict between *Pointblank* and *Overlord* could have been resolved by the decision of Sir Arthur Tedder. Orders and not ambassadors could have been sent to the strategic air forces; but Mr. Churchill had evidently not examined all these possible consequences.

His proposals were, indeed, greeted with considerable dismay both by Sir Archibald Sinclair and by the Chiefs of Staff. The Secretary of State for Air saw no need to create a supreme air commander. He told the Prime Minister that the integration of the contribution to *Overlord* by the tactical and strategic air forces could be effected by Sir Trafford Leigh-Mallory. The American wish to place General Spaatz and Sir Arthur Harris under the command of General Eisenhower ought, he suggested, to be resisted. 'Not even Tedder', he added, 'has experience of conducting the Bomber offensive.'²

The Chiefs of Staff showed even greater resistance. 'We have been aware for some time,' they told the Prime Minister, 'of a desire in certain American quarters to depart from the agreement reached at QUADRANT and subsequently confirmed on our behalf by C.A.S. with Generals Arnold and Eaker regarding the Air set-up for OVERLORD.' General Eisenhower's position in the Mediterranean had, they said, been fundamentally different from that which he ought now to occupy in western Europe. In the Mediterranean all forces had been under his command, but in the United Kingdom there

¹ Churchill to Sinclair and C.O.S. from *Sextant*, 6th Jan. 1944. The Prime Minister, who was attending the Cairo Conference, had been approached by General Eisenhower and his Chief of Staff, General Bedell-Smith, on the matter.

² Sinclair to Churchill, 7th Jan. 1944. The last suggestion merely confused the issue. No one had suggested that General Spaatz or Sir Arthur Harris should be removed from their commands. The problem was not to find commanders with experience of strategic bombing but to find a channel by which the heavy bomber effort could be related to the needs of *Overlord*. In any case, Sir Trafford Leigh-Mallory had less experience of bombing than Sir Arthur Tedder. Incidentally, General Spaatz had always been a fighter commander until he took over the Eighth Air Force.

were forces such as Bomber Command, Air Defence of Great Britain, Coastal Command, Home Forces, and the Home Fleet which had special functions. They might render support to *Overlord* but they 'could not possibly be placed under' General Eisenhower's 'sole command'. In the Mediterranean, the Chiefs of Staff continued, all air forces had come under the control of Sir Arthur Tedder. In the United Kingdom, they claimed, that position belonged to the Chief of the Air Staff, and, they indicated, the function of a real Commander-in-Chief of the air could be discharged by a combination between Sir Charles Portal and Sir Trafford Leigh-Mallory. This combination they did not, however, attempt to define. The Chiefs of Staff agreed that Sir Arthur Tedder ought not to be an 'officer without portfolio', but the adoption of their suggestions would, of course, have made him just that.¹

Thus, the British Chiefs of Staff sought to preserve in the command structure at least something of the independence of Bomber Command, the Home Fleet and other elements of metropolitan military and air power. In so far as the Home Fleet and Coastal Command were concerned, their ideas may have stemmed from the continuing and obvious need to maintain the struggle in the Battle of the Atlantic. As far as Fighter Command, or Air Defence of Great Britain as it was now called, and, to some extent, Bomber Command were concerned, they were obviously influenced by the threat to Britain of the German V-weapon developments. The British preference for separate and independent commands had always been a bone of contention between the two great allies, but, at least as far as the air command was concerned, these ideas were ill-adjusted to the vast operations now contemplated and they survived only with increasing difficulty.

By the end of February 1944 it was clear beyond all doubt that General Eisenhower 'demurred at anything short of complete operational control of the whole of Bomber Command and U.S.S.A.F.E.', but while the Prime Minister admitted that *Overlord* must be 'the chief care of all concerned' he was now taking the view that 'there can be no question of handing over the British Bomber, Fighter or Coastal Commands as a whole to the Supreme Commander and his Deputy'.² A few days later General Eisenhower and Sir Charles Portal reached agreement upon what ought to be done. The strategic

¹ C.O.S. to Churchill, 8th Jan. 1944. The anxiety of the Chiefs of Staff was shown by their request to the Prime Minister that he should not commit himself to any arrangement until he had discussed it with them. The Prime Minister's reply from Cairo contained the statement that Leigh-Mallory did not compare with Tedder in 'experience or capacity'. Churchill to C.O.S., 9th Jan. 1944.

² Undated Note on informal meeting between Churchill, Eisenhower, Bedell-Smith, Portal and Ismay on 29th Feb. 1944. Min. Churchill to Portal and Ismay for C.O.S., 29th Feb. 1944 (circulated on 1st March 1944).

air plan in preparation for *Overlord* was to be framed by Sir Arthur Tedder in consultation with Sir Arthur Harris and General Spaatz. The co-ordination of the resulting bomber operations was to be effected by Sir Arthur Tedder. The *Overlord* tactical air plan, including the contribution of the heavy bombers, was to be drawn up by Sir Trafford Leigh-Mallory under the supervision of Sir Arthur Tedder. When these plans had been approved by Sir Charles Portal and General Eisenhower, the Combined Chiefs of Staff were to be asked to assign to General Eisenhower such use of the strategic air forces as might be necessary in the light of those plans.¹

Though *Pointblank* was to continue in parallel, this arrangement made it quite clear that it would not continue in competition with *Overlord*. The air requirements of the invasion would be the first call upon the operations of the strategic as well as the tactical bombers, and the arbiter of what those requirements were was to be the Deputy Supreme Commander, Sir Arthur Tedder. Thus, under this arrangement, there was to be a real Commander-in-Chief of the air and Sir Arthur Tedder, instead of being an 'officer without portfolio', was to be a supreme air commander of the type which had been suggested in Mr. Churchill's message of 6th January. Behind the proposal lay the wish and the authority of the Supreme Commander, General Eisenhower.

The difficulties which remained were of a technical and even a hair-splitting nature. The Prime Minister found the arrangements 'very satisfactory'² and it had not proved difficult to secure General Eisenhower's approval of the principle that his use of the heavy bombers must remain subject to the intervention of the Combined Chiefs of Staff if the grand strategy of the war made that desirable and to that of the British Chiefs of Staff if the security of the United Kingdom made it necessary.³

On 13th March 1944, therefore, the British Chiefs of Staff telegraphed to Washington suggesting that the Combined Chiefs of Staff should agree to 'Supervision' of the United States Strategic Air Forces in Europe and of Bomber Command being delegated to General Eisenhower as soon as Sir Arthur Tedder's plans had been completed and approved.⁴ The American Chiefs of Staff, however,

¹ Min. Portal to Churchill, 10th March 1944. Sir Charles Portal had foreseen as early as 1942 that an arrangement of this sort would be necessary. Memo. by Portal, 21st July 1942.

² Min. Churchill to Portal, 11th March 1944. Mr. Churchill had evidently been much opposed to any suggestion of Air Marshal Leigh-Mallory exercising control over strategic bombers. Memo. Eisenhower to Tedder, 29th Feb. 1944. He therefore seems to have accepted the Portal-Eisenhower agreement with relief.

³ General Eisenhower was, of course, in any case responsible to the Combined Chiefs of Staff for the whole *Overlord* operation.

⁴ C.O.S. to British Military Mission, Washington, 13th March 1944.

disliked the term 'supervision' and wished to substitute for it 'command'.¹ The doubts which the Americans had felt about the word 'supervision' were evidently justified, for in explaining their objections to the word 'command' the British Chiefs of Staff had said that it was inappropriate because the heavy bombers not actually engaged in *Overlord* operations would continue to function under the direction of the Chief of the Air Staff, Sir Charles Portal.² Thus, even at this late stage, the British were still seeking to divide the supreme command, and it is hardly surprising that General Marshall was reported to be getting 'very hot under the collar on this subject'.³ However, on 22nd March a compromise was reached. The British abandoned their attempt to divide the command and the Americans agreed that the word 'Direction' should be used to define General Eisenhower's authority over the strategic air forces.⁴ This new constitution came into effect on 14th April 1944.⁵

This was an historic event by which a supreme air command was at last created. Though it was intended only as a temporary expedient, its effects on the strategic air attack were enduring. The 'independent' offensive had ended. The so-called 'triphibious' assault was about to begin.

The position of power in the direction of the strategic and tactical air forces which was thus officially conferred upon Sir Arthur Tedder was, however, no more than an outward and formal expression of a condition which, informally, had existed for the past six weeks. When Sir Arthur Tedder returned to England from the Mediterranean to assume his position as Deputy Supreme Commander, Allied Expeditionary Force, he was, not surprisingly, dismayed by the lack of progress being made with the air plan for *Overlord*. Sir Trafford Leigh-Mallory had produced an ambitious plan for the disruption of German rail communications in France which could only be carried out with the co-operation of the strategic air forces. An informal committee presided over by Sir Trafford Leigh-Mallory and including representatives of General Spaatz and Sir Arthur Harris, was, however, making no progress either towards its adoption, its amendment or its rejection.

Sir Charles Portal believed that the solution might be to 'formalize' the committee, but Sir Arthur Tedder, with his experience of command in the Middle East and the Mediterranean theatres, and

¹ J.S.M. to C.O.S., 17th March 1944.

² C.O.S. to British Military Mission, Washington, 18th March 1944.

³ Dill to Portal, 21st March 1944.

⁴ Dill to C.O.S., 21st March 1944. C.O.S. to Dill, 22nd March 1944. Marshall to Eisenhower, 25th March 1944.

⁵ Letters Portal to Spaatz and Bottomley to Harris, 13th April 1944. The letters were in identical terms.

his long absence from Whitehall, had no inclination towards this method of strategic planning. 'I am steadily losing my optimism as to how this is going to work out', he told Sir Charles Portal on 22nd February 1944. General Spaatz had refused to take orders from Sir Trafford Leigh-Mallory and Sir Arthur Harris' representatives were concerned only with 'a series of adjustments' to the bombing statistics in order to prove that Bomber Command could undertake nothing other than 'mass fire raising on very large targets'. The only solution, Sir Arthur Tedder suggested, was to create a unified command of the air forces.¹

This argument may not, at the time, have convinced Sir Charles Portal, but it did meet with the entire approval of General Eisenhower, who told Sir Arthur Tedder on 29th February to proceed with the air planning which was now becoming so urgently necessary. General Eisenhower assured Sir Arthur Tedder that he would, if necessary, assert his authority to obtain the necessary powers.² At about the same time he gave Sir Arthur Tedder a draft directive instructing him to draw up these plans, calling upon General Spaatz, Sir Trafford Leigh-Mallory and Sir Arthur Harris as might be necessary.³ Thus, Sir Arthur Tedder, who had previously not even presided at the planning committee, became, in effect, the supreme air commander. He could now consult with General Spaatz and Sir Arthur Harris not on a basis of equality but upon one of superiority. Backed by the full and weighty authority of General Eisenhower, Sir Arthur Tedder now occupied, as far as the air command was concerned, the fixed prospects, not of an heir presumptive, but of an heir apparent. The resolution of the conflict between *Pointblank* and *Overlord* was in sight.

This, however, was not a simple proposition for the differences of outlook between the three Commanders whose efforts were to be directed by Sir Arthur Tedder remained, and before the new higher command constitution could come into effect they had to be adjusted by some form of compromise, which would obviously be neither easy to reach nor easy to enforce. The debate which followed was, in fact, a debate upon the conflict between *Pointblank* and *Overlord*, and in it, Sir Arthur Tedder played the part of a protagonist rather than an arbiter. Nevertheless, it was clearly his judgement of the situation which would be decisive in producing the outcome.

The three commanders principally concerned in this argument

¹ Letters Portal to Tedder, 18th Feb. 1944, and Tedder to Portal, 22nd Feb. 1944.

² Memo. by Eisenhower for Tedder, 29th Feb. 1944.

³ Draft Dir. Eisenhower to Tedder, undated. It is probable that this was sent with the memo. cited above at footnote 2. The senior Bomber Command representative at Supreme Headquarters Allied Expeditionary Force (S.H.A.E.F.) was Air Vice-Marshal Oxland who had formerly been Sir Arthur Harris' Senior Air Staff Officer.

were, of course, Sir Trafford Leigh-Mallory, General Spaatz and Sir Arthur Harris, and before proceeding to consider Sir Arthur Tedder's proposals, it is necessary to examine the viewpoint of each of these officers. The plan put forward by Sir Trafford Leigh-Mallory on 3rd March 1944 was, as might be expected from the relationship which had long existed between the Allied Expeditionary Air Force and General Morgan, the most closely related to the direct military requirements of *Overlord*. It revealed for the tactical and strategic air forces, two principal objects: the attainment of air superiority and the disruption of German communications in France and western Germany. These aims were to be achieved in two stages, the first, before the invasion, being strategic, and the second, after the surface assault had begun, tactical. The strategic aspect of the struggle for air superiority was to consist of a continuation of the attack on the *Luftwaffe* at its sources which had long been a part of the *Pointblank* plan. Its tactical aspect was to consist of the neutralisation of aerodromes and of aircraft in the areas from which the allied armies might be threatened by German air power. The strategic phase of the communications plan was to be accomplished by heavy bombing attacks upon focal points and especially railway marshalling yards and railway repair depots. The tactical phase would consist of attempts to cut specific lines leading to the Normandy area. In this way, it was hoped to deny the German army air support, render it vulnerable to allied air attack and to immobilise it in a 'railway desert' at the vital moment when the allied armies came ashore.¹

The plan had much to recommend it. It provided for a concentration of allied air power for it embraced the activities of British and American forces, of heavy and light bombers and of bombers and fighters. The common object to be achieved by the application of all this strength to the two complementary aspects of the plan was also directly and very closely related to the requirements of *Overlord* itself. Indeed, it could be and actually was argued that *Overlord* could not be successfully carried out unless this air plan was put into execution. Thus, it was really a part of *Overlord* and not simply an ancillary to it. Though the Leigh-Mallory plan did not necessarily or entirely exclude the continued attack on German strategic targets by the heavy bombers, it adopted none of the tenets of the 'independent' offensive and was, in fact, entirely adapted to the strategy of 'triphibious' war in which the operations of any single arm had to be related closely to those of the other arms.

This fact did not, however, recommend itself either to General Spaatz or to Sir Arthur Harris, both of whom were naturally more impressed than Sir Trafford Leigh-Mallory with the 'independent'

¹ A.E.A.F. Plan, 3rd March 1944.

potential of their heavy-bomber forces, and more particularly, with the opportunities for German recovery which a cessation, or even a slackening in the tempo of the strategic air offensive might afford. The common disagreement with Sir Trafford Leigh-Mallory which was shared by General Spaatz and Sir Arthur Harris was not, however, on common ground. General Spaatz's recommendations were a logical extension of the ideas which had inspired the American interpretation of the Casablanca directive and which had since attracted the increasing support of the British Air Staff. They centred upon the development of a selective attack against key points in the German war economy. To Sir Arthur Harris this was, of course, simply a further development of the 'panacea mongers' campaign.

General Spaatz was naturally not unaware of the imminence and overwhelming importance of *Overlord*, but he sought to adjust the course of his 'independent' offensive to the benefit of the coming military campaign rather than to sacrifice the former to the latter. There were, in General Spaatz's view, three fundamental principles to be observed. First, the policy adopted must lead to the achievement of air superiority by the time of the allied invasion and to its maintenance thereafter. Secondly, the policy must continue to give the heavy bombers the opportunity of bringing about the outright collapse and capitulation of Germany, and thirdly, in the event of this not materialising, the policy must be designed so as to confer a marked degree of assistance to the allied campaign on land.¹

It was on the second principle that General Spaatz was most closely in accord with Sir Arthur Harris and in most evident discord with Sir Trafford Leigh-Mallory. It revealed the extent to which General Spaatz still subscribed to the old belief in the 'independent' potential of the strategic air offensive. He was prepared, not to sacrifice this belief, but only to adapt it to the extent shown by his third principle. The bombing policy advocated by General Spaatz was, therefore, radically different to that postulated by Sir Trafford Leigh-Mallory's advice. General Spaatz had become convinced that there was a target system whose attack would fulfil the three basic requirements which he had stated. This was German oil, and particularly petrol production.

To General Spaatz, the achievement of air superiority was not only a question of attack upon aircraft factories and aerodromes. It was also a question of combat in the air. He was not concerned only with the destruction of the *Luftwaffe* in production and on the base. He also sought its defeat in the air and with the increasing numbers of P.51

¹ Plan for the completion of the Combined Bomber Offensive, 5th March 1944. This plan was submitted by General Spaatz to General Eisenhower and Sir Charles Portal. Also relevant is General Spaatz's memorandum on employment of air forces in support of *Overlord*, 24th March 1944.

Mustangs which he now disposed, this latter task was one which he could at last contemplate with some optimism. General Spaatz was, therefore, constantly seeking to produce the conditions for air combat. For this reason he believed that any major target system to be attacked must be one which the Germans would feel compelled to defend with all their resources. Oil seemed to him to be such a target system. General Spaatz also, of course, knew that the successful attack on oil would itself be a factor in bringing down the *Luftwaffe*. From the point of view of the achievement and maintenance of air superiority, oil was, indeed, an incomparable target.

The destruction of oil targets might, however, portend even more than the dislocation of the *Luftwaffe*. It might gradually lead to the downfall of Germany altogether. It was, therefore, a target system which offered the heavy bombers the continued prospect of achieving an outright victory. In the meantime, however, General Spaatz concluded that a reduction of oil supply would have first an inhibiting and then a crippling effect upon the German armed forces. Thus, the policy which he advocated was also calculated to conform to his third principle and to confer a marked advantage upon the allied military forces.

General Spaatz's advice was, in many ways, based upon convincing arguments, and it will presently be seen that his thesis could not be wholly overborne. The extent to which it was based upon a wise and realistic appraisal of the situation will also be seen in due course; but from the point of view of Supreme Headquarters, Allied Expeditionary Force, the Spaatz plan appeared to have serious defects.

Sir Arthur Harris' views, which also insisted upon the independent role of the heavy bombers, were, however, even more unwelcome. Sir Arthur Harris still believed that Bomber Command should continue with its general area assault upon the major German towns and, in spite of the imminence of *Overlord*, he saw no reason to depart from the bombing policy which had resulted from his interpretation of the Casablanca directive. As to *Overlord* itself, he was, by the middle of January 1944, prepared to admit no more than that it 'must now presumably be regarded as an inescapable commitment'. This, however, was a commitment which he clearly believed ought to be discharged with the minimum interference in the development of the Bomber Command area offensive.

The two principal arguments by which Sir Arthur Harris sought to fortify his case were firstly, that owing to operational limitations, Bomber Command was still tactically incapable of carrying out anything other than a continuing area offensive at night, and secondly, that to depart from this policy at this time would have the effect of neutralising all the achievement of his force in 1942 and 1943 and of allowing Germany a breathing-space in which to effect a general in-

dustrial recovery. This itself would, he considered, reduce the prospects of success for *Overlord*.¹

The latter point, which was a strategic argument, was highly controversial and we have seen the extent to which doubts as to the effectiveness of the general area bombing offensive were growing. These doubts had not been diminished by the course of the Battle of Berlin. Nor had confidence in Sir Arthur Harris' strategic arguments been increased by the somewhat extravagant claims and forecasts to which he had committed himself in the course of 1943. The former point, which was based upon an operational appreciation, was, however, more difficult to challenge, for the Commander-in-Chief was, at least in theory, the sovereign judge alike of what Bomber Command could do and what it could not do.

In his analysis of 13th January 1944, Sir Arthur Harris had argued that Bomber Command was a force which had become specialised for the destruction of 'industrial centres'. He had then proceeded to show how, in his view, it was impossible to adapt the weapon to any other role. Daylight operations, he said, were 'absolutely out of the question and could in no circumstances be undertaken'. This was because the Lancasters and Halifaxes lacked the necessary ceiling, armour and armament, and because the crews lacked the specialised training, especially in the tactics of formation flying. Thus, Sir Arthur Harris argued, operations must continue to be carried out at night and at night, he sought to show, the bombing results would be relatively inaccurate and appropriate only to area attack on large targets. He regarded *Oboe* Mark I as unreliable. The Mark II apparatus, known as *Album Leaf*, was better and he judged that by its use marker bombs could be dropped within three or four hundred yards of the aiming point. This, however, would not, he thought, result in the main bombing concentration achieving an error of less than one thousand yards, and even this would depend upon good weather and 'reasonable opposition'. Moreover, *Oboe* was liable to be jammed by the enemy and might at any time be put completely out of action. The *Album Leaf* equipment was also still in short supply. *H2S*, Sir Arthur Harris pointed out, was not a precision bombing device. Its functioning depended upon the nature of the target and was at its lowest efficiency against small precise objectives. *G-H* was even more accurate than *Album Leaf Oboe*, but in Sir Arthur Harris' view, not enough sets were available to make precision bombing worth while.

If these arguments were valid, then clearly the programme of bombing which Sir Trafford Leigh-Mallory had in mind for Bomber Command was entirely impracticable. Not only would it be impossible to hit the relatively small targets which he had selected but

¹ Note by Harris, 13th Jan. 1944, and letter Harris to Tedder, 2nd March 1944.

it would be undesirable to try, for the majority of them were in France and other friendly territories. In those parts of Europe it would be injudicious to broadcast bombs over wide areas as had been done in Germany. The destruction of a small target at the cost of a large town was, perhaps, reasonable in Germany, but much less so in France, Holland and Belgium.

Sir Arthur Harris, however, had yet other arguments against the policy with which he knew his force was threatened, and these too were based upon an operational appreciation of the possibilities. The plan to attack a large number of small targets in a relatively short time suggested that Bomber Command might have to divide its effort and operate against a considerable number of different, and perhaps widely separated targets each night. There were, however, in Sir Arthur Harris' view, severe limitations upon the extent to which this could be done. These night attacks, he pointed out, would all have to be initiated by Pathfinder Force marking, using the *Oboe* technique and the Pathfinder Force could, he said, maintain marking attacks by this means for not more than thirty minutes in the course of each night and, for technical reasons, there would have to be a break of not less than twenty minutes between the marking of two different targets.¹ Here, then, was another technical and tactical argument which seemed to favour the mass attack on single targets.

As to the direct support of the armies when they were actually in the field, Sir Arthur Harris was even more pessimistic. Bomber Command was, he said, incapable of operating against 'fleeting targets'. This was because, as he put it, 'the objective when once selected cannot be changed at will'. The time required to marshal the force, refuel it, bomb it up and brief the crews meant that seven hours were required between the time of the choice of the target at Headquarters and the take-off of the bombers from their bases. If the decision was taken at night, the time required, Sir Arthur Harris said, would be extended to nine or ten hours.²

A flexibility of this order was not likely to be appropriate to the requirements of the military commanders who were hoping to engage in a war of rapid movement. It led Sir Arthur Harris to conclude that 'programme bombing' in support of ground troops 'would be extremely unreliable and almost wholly futile'. The only type of operation of this nature about which the Commander-in-Chief was reasonably optimistic was a "drenching" attack' on a previously

¹ Sir Arthur Harris said that the thirty minutes' marking might occasionally be extended by ordering out some P.F.F. crews twice in the same night. The twenty-minute gap was to enable the technicians to re-align the ground stations.

² Naturally, separate briefing was required for each different target. Different petrol loads were required for different targets and the bomb load had to be related to the petrol load. Moreover, different kinds of target often called for different types of bombs.

selected beachhead, but he thought that the adverse effect on the morale of the enemy troops might be offset by the difficulty of movement created for the allied soldiers by the resulting devastation.

There undoubtedly was some force in all these arguments. The complexity of night bombing operations was imperfectly understood by most officers who lacked the experience of directing them which had been acquired by Sir Arthur Harris and the Deputy Commander-in-Chief, Sir Robert Saundby. As a result, mistakes were made, effort was wasted, and which was more serious, tragic accidents did occur which even to this day are the subject of some bitterness and some misrepresentation. The responsibility for these misfortunes cannot be attributed to Sir Arthur Harris or his staff. Nevertheless, the question remained as to whether Sir Arthur Harris' technical and tactical appreciation, which tended to support the strategy of area attack on large German towns so strongly, was, in fact valid, as it indisputably had been in 1942. The Air Staff viewed it with considerable doubt, and on 27th February 1944 Sir Charles Portal, who, as will be remembered, had for some time suspected that Sir Arthur Harris' operational appreciations were coloured by his strategic views, addressed a minute to Sir Norman Bottomley which was to have results of the utmost importance.

In this minute, Sir Charles Portal suggested that Bomber Command should be given a special directive ordering some experimental attacks against precise targets in France on moonlight nights with the object of finding out the real operational capacity of Bomber Command.¹ This showed the extent to which confidence in Sir Arthur Harris' appreciations was wearing thin. The directive was issued on 4th March 1944. It pointed out that the targets had been chosen in order 'to obtain experience of the effects of night attack on airfields, communication centres and ammunition dumps before operation "Overlord"'. It thus ordained that there should be a trial by battle of the operational objections which Sir Arthur Harris had raised against the policy suggested for Bomber Command by Sir Trafford Leigh-Mallory. Among the targets mentioned were six French railway marshalling yards. These were at Trappes, Aulnoye, Le Mans, Amiens/Louveau, Courtrai and Laon.²

These marshalling yards should be regarded as famous in the history of Bomber Command. The attack on Trappes was carried out on the night of 6th March 1944, and by the end of the month all the marshalling yards had been bombed.³ The results, though not uniformly successful, were outstanding. They showed that against this

¹ Min. Portal to Bottomley, 27th Feb. 1944.

² Dir. Coryton (A.C.A.S.(Ops.)) to Harris, 4th March 1944, App. 8 (xxxvii).

³ Le Mans and Amiens were attacked twice, and, in addition, the marshalling yards at Vaires were bombed.

kind of target and in these localities Bomber Command was already a force of great precision. They showed conclusively that Sir Arthur Harris' estimates of the operational capacity of the force which he commanded failed to take into account all the facts. They showed that a campaign on the lines suggested by Sir Trafford Leigh-Mallory was, for Bomber Command, a feasible proposition of war and that there, in fact, was an alternative to the policy of area attack on major German cities. This was, perhaps, fortunate in view of the prohibitive casualties which had lately been sustained in the latter type of operations.¹

The revelation had a profound effect upon the decisions which were about to be taken on the employment of the heavy bombers in the periods immediately before and after the launching of *Overlord*. It was also to exert a far from unimportant influence upon the later development of bombing policy when the Germans had been cleared from France and all arms were turned against Germany herself. Nevertheless, the demonstration of operational efficiency given by Bomber Command in March 1944 did not, in itself, resolve the issue between *Pointblank* and *Overlord*. While it did show that Bomber Command could play an effective part in the French railway campaign, it did not, of course, establish that the French railway campaign was necessarily a sound and a relevant strategy. The diminished influence which Sir Arthur Harris was now able to exert upon the decision meant, however, in effect, that the problem was now reduced to the issue which had arisen between the advice of General Spaatz and that of Sir Trafford Leigh-Mallory. It was thus that the policy to govern the operations of Bomber Command came to depend upon the outcome of a dispute between an American general and a Royal Air Force fighter commander. This outcome was, however, to be much influenced by the views of Sir Arthur Tedder.

The Deputy Supreme Commander had unique qualifications for the particular tasks and responsibilities which had now fallen upon him. His experience and his fame had been acquired neither as a

¹ In his memoirs, Sir Arthur Harris has expressed the surprise with which he learnt of Bomber Command's abilities. Speaking of the French railway plan he says, 'There was, of course, no reason to believe that the bombing would be as accurate as it proved to be, and I myself doubted whether we could achieve the extraordinary precision needed if the project was to succeed'. *Bomber Offensive*, p. 197. In his 'Summing up', Sir Arthur Harris wrote, 'Bomber Command's attacks in the three months before D-Day were so effective, and the new means and tactics of precision bombing were so rapidly mastered (I myself did not anticipate that we should be able to bomb the French railways with anything like the precision that was achieved) that the invasion proved an infinitely easier task than had been expected . . . do., p. 266. It should, all the same, be pointed out that the *means* of achieving these results were not new, and that it was, of course, Sir Arthur Harris who had distinguished himself by drawing attention to the difficulties and hazards which he expected would be attendant upon the invasion. Moreover, the suggestion that 'there was, of course, no reason to expect that the bombing would be as accurate as it proved to be' was evidently not shared by Sir Charles Portal or by Sir Trafford Leigh-Mallory. Nor was it reflected in the attitude of many of the crews who carried out these experimental operations.

fighter nor a bomber commander, but as an air force commander. His views upon air power had been developed in a war which had constantly embraced the three elements of land, sea and air. He had directed air operations in two major and victorious invasions against Sicily and Italy. Moreover, he was versed not only in the intricacies of joint-service undertakings, but also in those of coalition war. There was, perhaps, no officer of the Royal Air Force who had a wider and a more fruitful experience of Anglo-American co-operation in the field than Sir Arthur Tedder. His distinguished services to General Eisenhower in the Mediterranean theatre were recognised by all and not least by the Supreme Commander himself. Inter-allied, inter-service and inter-command rivalries and prejudices were foreign to Sir Arthur Tedder's mind. He rightly regarded them as prejudicial to the conduct of the war. His guiding principle was the search for a common object in the pursuit of which all arms could be deployed.

Thus, in considering the role of air power in the support of *Overlord*, Sir Arthur Tedder was primarily concerned with the discovery of a bombing policy which could be applied to the three forces involved, namely, the United States Strategic Air Forces, Bomber Command and the Allied Expeditionary Force, and, in a memorandum of 24th March 1944, he sought to show that a communications attack was the only means of achieving this. Sir Arthur Tedder did not disagree with General Spaatz about the importance of air superiority or about the need to continue and develop the struggle to achieve it and to increase it. Long-range operations against Germany would, he said, have to continue, so that the *Luftwaffe* might still be attacked in production, subjected to attrition in the air and contained in areas far removed from Normandy. But, he pointed out, there would also have to be a plan for the more direct support of the land campaign, and this plan must, he emphasised, be capable of fulfilment by the American day bombers, the British night bombers and the Allied Expeditionary Air Force light bombers. It would, he was convinced, be wrong for these three forces to pursue three different aims. Secondly, the plan must offer targets which could be attacked by the three forces with reasonable economy of effort, and thirdly, it must be sufficiently flexible to ensure the greatest possible employment of the forces available. The alternatives, Sir Arthur Tedder thought, were oil and communications.¹

The execution of the oil plan would, Sir Arthur Tedder admitted, ultimately have grave effects upon Germany, but he did not consider that these results could be achieved rapidly enough to influence the course of the land campaign in its opening and crucial phase. Though he thought the oil plan might be a good independent policy for

¹ Memo. by Tedder, 24th March 1944.

General Spaatz's forces, he did not believe that Bomber Command would be able to play an effective part, or the Allied Expeditionary Air Force any part at all in it. For these reasons, Sir Arthur Tedder rejected the oil plan and turned to the consideration of communications, and the endorsement of the policy advocated by Sir Trafford Leigh-Mallory.¹

Transport or communications bombing was, of course, a somewhat vague term which, to different minds, meant different things and aroused all sorts of controversies. Like many other issues of a similar nature which sprang to prominence in the last eighteen months of the war, this particular one had been recognised and given much consideration by those responsible for the Western Air Plans. There had been, as will be remembered, a prolonged controversy on the subject before the war between the French General Staff and the British Air Staff. The former, fearful of bringing down retribution from the *Luftwaffe* but also anxious to find means of delaying a German military advance, had advocated the use of Bomber Command to secure tactical cuts in particular roads and railways in the immediate vicinity of military operations. The latter, sceptical as to the effectiveness or the possibility of doing this, had favoured a strategic attack upon railway centres, not in the battle zone, but in the Ruhr. When the crisis came in the Battle of France, both types of operation were, as will be recalled, attempted.

The strategic operations which were symbolised in the public mind by the many reported attacks on the marshalling yards at Hamm, were not, however, designed only, or perhaps primarily, to delay the German military advance. They were also intended to cause industrial dislocation and morale effects. Thus, as a contribution to the independent and strategic air offensive against Germany, they continued to have a relevance after the fall of France had rendered any further tactical operations completely pointless. Indeed, transport bombing formed the central theme of the Air Ministry directive issued on 9th July 1941, and though the aim soon came to be sought mainly as a by-product of general area bombing, it was always much in mind and was from time to time supplemented by selective and precise attacks upon such targets as the Dortmund-Ems Canal or the Anthéor viaduct.

Nevertheless, when communications bombing came once again with the approach of *Overlord* to be associated with military operations, evil memories of the futile and costly tactical undertakings which had been forced on Bomber Command in 1940 tended to be

¹ This was not a coincidence of thought developed in isolation. The Leigh-Mallory plan, as also the views of Sir Arthur Tedder, had been much influenced by a report on air operations against Sicily and Italy in 1943 by Professor S. Zuckerman. See *Royal Air Force 1939-1945*, Vol. III, p. 86.

revived. Sir Arthur Tedder was, however, fully aware of these dangers. The war in the Middle East and in Italy had been above all else a battle of communications and supply, and as a result of his long experience in that struggle, Sir Arthur Tedder knew well the ways in which air power was liable to be misused, especially at the behest of harassed and sometimes imperfectly informed military commanders. But he also knew that the haunting problem of *Overlord* was primarily one of communications.

In this operation the Germans would be fighting upon interior and overland lines of communication and they would have at their disposal a railway system which was among the most comprehensive in the world. The allies, of course, held the initiative, but they would be operating on exterior and overseas lines of communication. This inevitably meant that in the crucial opening phase of the campaign the Germans would be able to concentrate in the battle zone more rapidly than the allies, and this, in turn, obviously raised the grave threat that the vanguard of the invading armies would be thrown back into the sea with consequences for the whole allied cause which were immeasurable. It was in communications bombing that Sir Arthur Tedder saw the means of neutralising this potential German advantage.

Like Sir Trafford Leigh-Mallory he did not, however, believe that this great object could be achieved by a short burst of tactical bombing at the time of the invasion. On the contrary, he envisaged and advocated a massive and sustained strategic offensive against key points in the railway system and against the railway repair organisation which was ultimately designed not merely to isolate the Normandy area, or even to isolate France from Germany, but to dislocate the entire railway system of German Europe.¹ Though Sir Arthur Tedder did not draw attention to the point at this particular time, it was quite clear that as far as *Overlord* was concerned, the principal aim of this strategic railway attack was to create a situation in which the later tactical operations designed to knock out particular trains and to cut particular lines would be effective, because, by that time, the Germans would no longer have the mobility or the resources to deal even with comparatively minor damage.

The implications of Sir Arthur Tedder's advice did, however, embrace a great deal more than the immediate and initial requirements of *Overlord*. They postulated a new direction for the entire strategic air offensive. The dislocation of the railway system in German Europe might later lead to the dislocation of German industry and the aims of the *Pointblank* offensive might thereby be achieved. Thus, the conflict between *Pointblank* and *Overlord* might be resolved by the application of the same bombing policy to both. This was the strategy

¹ Memo. by Tedder, 24th March 1944.

of the common denominator, but it could still be argued that the same common objects might be achieved by the destruction of German oil production. This too would immobilise the German armed forces and eventually German industries as well. The immediate decision between Sir Arthur Tedder's railway plan and General Spaatz's oil plan, therefore, came to depend upon the immediate requirements of *Overlord* and so upon the verdict of General Eisenhower himself. That is why the strategic air offensive against Germany cannot be considered in isolation from the *Overlord* campaign.¹

The historic occasion of General Eisenhower's decision was a meeting held on 25th March 1944. Sir Charles Portal was in the chair and among those present were General Eisenhower, Sir Arthur Tedder, General Spaatz, Sir Arthur Harris, Sir Trafford Leigh-Mallory and representatives of the War Office, the Joint Intelligence Staff and the Ministry of Economic Warfare. Sir Arthur Tedder opened the discussion by rehearsing his arguments in support of the communications campaign, but in the debate which followed his views were subjected to severe criticism. The War Office representative doubted whether the bombing of French railways would have any marked effect upon German military movement largely because, as was emphasised by Sir Andrew Noble of the Joint Intelligence Staff, the Germans would allow French industry to starve before they permitted any interruptions to their troop trains. Thus, French industry would act as an expendable reserve protecting the real objective of the attack. If, however, the communications plan was to be condemned, a superior alternative would have to be proposed. Everyone knew, of course, what was in General Spaatz's mind, but when Mr. Lawrence of the Ministry of Economic Warfare had completed his contribution to the discussion, there was no prospect of these views being adopted. Mr. Lawrence suggested that the Germans had considerable reserves of oil on the Western front and that the results of a strategic offensive against oil production would not have any significant effect upon military operations until four or five months after it had begun. Since it was already almost April and the invasion was due to be launched at the beginning of June, Sir Charles Portal intervened to say that this showed 'conclusively' that the oil plan could not possibly affect the issue of the invasion in its crucial opening phase. When, therefore, General Eisenhower said of Sir Arthur Tedder's suggestion that 'it was only necessary to show that there would be *some* reduction, however small, (in military traffic) to justify adopting the plan, provided there was no alternative', the decisive words were spoken and the decision had been taken. However much the communications plan

¹ Which is dealt with in the forthcoming volumes in this series by Major L. F. Ellis on *Victory in the West*.

might be disliked, no one could deny that 'some reduction, however small', in military traffic would be the result. It was also impossible to press the alternative of the oil plan in view of what Mr. Lawrence had said. Thus, the communications plan was adopted more in a spirit of desperation than of optimism.¹

This decision seemed to clear the way for the transfer of the direction of the strategic air forces from Sir Charles Portal to General Eisenhower and for the provision by Sir Arthur Tedder of a bombing directive to General Spaatz and Sir Arthur Harris. There were, however, still some important difficulties which continued to delay these transactions. General Spaatz now accepted the conclusion that the French railway plan, as also the continued struggle against the *Luftwaffe*, might be regarded as among the 'pre-requisites to the success of *Overlord*'. But, as he showed in identical notes to General Eisenhower and Sir Charles Portal on 31st March 1944, he was not convinced of the wisdom or the necessity of undertaking an attack on German railways as well. He doubted whether these operations would have much effect on *Overlord*, and though he admitted that the oil plan might have even less effect upon *Overlord*, at any rate initially, he thought that the eventual results of the latter plan would be much more disastrous for Germany than any attack on her railways could be. He, therefore, suggested that the directive for the Eighth and Fifteenth Air Forces should place the *Luftwaffe* and ball-bearings plants in the position of first priority. In the second place should come, for the Eighth Air Force, nineteen railway targets in France and other occupied territory, and for the Fifteenth Air Force, railways in Rumania, to isolate Ploesti, and in France to supplement the work of the Eighth Air Force. In the third place he wanted the directive to permit the Eighth Air Force to attack thirteen synthetic oil plants in Germany and the Fifteenth Air Force to take on further similar targets in south-east Germany.²

Thus, while accepting Sir Arthur Tedder's plan as far as it concerned railway targets in or near France, General Spaatz continued to resist it and to advocate his own oil plan as far as Germany was concerned.³ This, of course, tended to preserve the conflict between *Pointblank* and *Overlord* and it also threatened to divide the objects of allied air power which Sir Arthur Tedder was so anxious to unite. Nevertheless, General Spaatz's persistent and obstinate advocacy of the oil plan did bring its potential value to the notice of General

¹ Mins. of the Mtg., 25th March 1944.

² Memo. Spaatz to Eisenhower and Portal, 31st March 1944. Sir Charles Portal, with a most scrupulous regard for his agreement with General Eisenhower (which had not yet come into force), told General Spaatz that this matter must be decided by General Eisenhower and that he was sending a copy of General Spaatz's memorandum to Sir Arthur Tedder. Letter Portal to Spaatz, 31st March 1944.

³ There was no disagreement about the need to continue the attack on the *Luftwaffe*.

Eisenhower and, in view of what was about to happen, this was of importance. Oil and communications were, indeed, presently seen to be, not competing, but complementary target systems, and it was to be in the destruction, not of one or the other, but in that of both, that the long endeavour of the strategic air offensive was ultimately to be crowned with triumph and Germany, within a year, to be brought to the point of complete collapse. Moreover, neither of these target systems divorced the aims of the strategic air offensive from those of the assault on land. On the contrary, the attacks upon them contributed directly and indirectly to the success of the military operations while these military operations also contributed to success of the strategic air operations.

These developments, however, still lay in the future and their significance was not yet by any means generally appreciated. That they were ultimately able to take place was due to Sir Arthur Tedder's strategic theories and, no less, to General Spaatz's opposition to them, for it was in the eventual reconciliation of the viewpoints of Sir Arthur Tedder and General Spaatz that the conflict between *Pointblank* and *Overlord* was resolved. In the meantime, however, Sir Arthur Tedder had to contend with yet other difficulties before even as much of his plan as had commended itself to General Spaatz could be given the formal expression of a bombing directive. These difficulties arose from the scruples of the Prime Minister about the casualties to French civilians which were likely to be caused by the bombing of the French railway system.

The plan which was now put before Mr. Churchill involved the bombing of some seventy-four railway targets in France and Belgium. It had been approved both by General Eisenhower and Sir Charles Portal. It had been accepted by the British Chiefs of Staff who, like General Eisenhower and Sir Charles Portal, believed that it should be put into operation immediately so that it could be completed by D-Day. The probability that, in the estimation of R.E.8, its execution would result in from eighty to a hundred and sixty thousand French and Belgian casualties, of which about a quarter would be fatal, was regarded by all these high military authorities as another of the regrettable necessities of war. But to Mr. Churchill this was not acceptable and, instead of sanctioning the attack on the seventy-four proposed targets, some of which were in thickly populated areas, he would only extend his authority to the destruction of three. As to the rest, he referred the decision to the War Cabinet, but the War Cabinet did not reach a decision. Instead, it called for a report from the Joint Intelligence Committee and then it referred the matter to the Defence Committee.¹

¹ There is a mass of documentation on this matter which testifies alike to the grave

The passage of time was, however, more than General Eisenhower could bear, and though he was willing to consider every possible way in which French and Belgian casualties might be reduced to the minimum, he was not prepared to abandon the plan which he regarded as essential to the success of *Overlord*. He relied upon General de Gaulle to explain to his compatriots the hard necessities which would be imposed upon them by the exigencies of war.¹ This authoritative argument had some effect, and on 5th April 1944 the Defence Committee authorised a limited and 'experimental' application of the plan. The targets were, however, to be limited to those where the risk of civilian casualties would be small and Sir Arthur Tedder was invited to eliminate altogether those situated in densely populated areas.² This led to a certain recasting of the schedule of the plan and enabled Sir Charles Portal, on 13th April 1944, to present a revised estimate of the casualties which would be caused before D-Day. This now amounted to 10,500 killed and 5,500 seriously injured.³ This was the position which had been reached when the direction of the strategic air forces passed to General Eisenhower.

Sir Arthur Tedder was now constitutionally in a position to issue a bombing directive to General Spaatz and Sir Arthur Harris, but the Prime Minister's continued opposition to the plan which he proposed made it impossible for him to do so in practice. This difficult situation was considered at a meeting held on 15th April 1944 at Supreme Headquarters, Allied Expeditionary Force which was presided over by Sir Arthur Tedder himself. It was decided to issue and to operate the directive without waiting for any further authority from above and, in order to meet possible objections, to insert the phrase, 'it is understood that political aspects of this Plan, as affecting the French, will be kept under continuous supervision'.⁴

The directive which was issued by Sir Arthur Tedder on 17th April 1944⁵ stated that 'the overall mission of the strategical Air Forces remains the progressive destruction and dislocation of the German military, industrial and economic system, and the destruction of vital elements of lines of communication. In the execution of

concern which was felt about the fate of French and Belgian civilians and also to the urgency of the military argument that the plan should be carried out at an early date. Among these documents the most important are: Note by Leigh-Mallory to Eisenhower, 10th March 1944, and memorandum by Eisenhower for C.O.S., 15th March 1944. Note by Portal for C.O.S., 29th March 1944, and Draft Minute C.O.S. to Churchill, 29th March 1944. Approval by C.O.S. of the Draft Minute, 30th March 1944. Decisions of the War Cabinet, 3rd April 1944. J.I.C. Report, 4th April 1944.

¹ Letter Eisenhower to Churchill, 5th April 1944.

² Defence Cttee. Mtg., 5th April 1944. Conclusions of the Cttee., 6th April 1944.

³ Note by Portal for Defence Cttee., 13th April 1944.

⁴ Mins. of the Mtg., 15th April 1944.

⁵ It had, however, been drafted in the Air Ministry under the instructions of Sir Norman Bottomley.

this overall mission', the directive continued, 'the immediate objective is first the destruction of German air combat strength, by the successful prosecution of the Combined Bomber offensive. Our re-entry on the Continent', it went on, 'constitutes the supreme operation for 1944; all possible support must, therefore, be afforded to the Allied Armies by our Air Forces to assist them in establishing themselves in the lodgment area'. Under the heading 'particular mission' these same aims were again stated in slightly different words. The United States Strategic Air Forces were allotted as their 'primary objective' the German Air Force, which they were to attack by 'all means available, including attrition in the air and on the ground . . .' At 'equal first priority' single-engined fighter airframes and airframe component production, twin-engined fighter airframes and airframe component production and Axis-controlled ball-bearing production were to be attacked. At 'second priority' installations supporting German fighter air forces were to be bombed, and at 'third priority' came the German bomber forces and the installations supporting them. The enemy rail communications system was given to General Spaatz as a 'secondary objective'. Whenever the weather or tactical conditions were unsuitable for precision bombing, General Spaatz was invited to undertake blind bombing attacks on Berlin or other important industrial cities in Germany. These targets were to be selected with a view to inflicting casualties upon the German fighter force and dislocating the German communications system. There was no mention of oil in this or any other part of the directive.

The directive then turned to the particular role of Bomber Command which it briefly disposed of in a single paragraph. 'In view of the tactical difficulties of destroying precise targets by night', it said, 'R.A.F. Bomber Command will continue to be employed in accordance with their main aim of disorganising German industry'. The remainder of the paragraph merely stated that these operations were to be, as far as possible, complementary to those of the United States Strategic Air Forces in reducing the German air force and in disrupting rail communications. The rest of the directive was concerned with the usual qualifications made in the interests of the Admiralty and the Special Operations Executive. The possibility that Bomber Command and the Eighth Air Force might have to assist the Allied Expeditionary Force in the neutralisation of the V-Bomb threat was also mentioned.¹

This rambling document reproduced none of the clarity which had illuminated Sir Arthur Tedder's memorandum of 24th March. It made no attempt to reconcile the difference of view between General Spaatz and Sir Arthur Tedder, but it did make most substantial concessions to the objections which had been raised by Sir Arthur Harris,

¹ The Bomber Command copy of this directive is printed in full in App. 8 (xxxviii).

though these had seemingly been outmoded by experiments and overruled by Sir Charles Portal.

The continued belief, implicit in the directive, that Bomber Command could play only a subordinate role to the United States Strategic Air Forces on account of the operational limitations of night bombing was wholly unrealistic and, as far as the French railway campaign was concerned, almost the reverse of the truth. Bomber Command was in fact to play the leading part in executing the precision attacks which, within the short period before D-Day, were to contribute so much to the disruption of the French railway system. Many of the tasks successfully fulfilled by the British night bombers were quite beyond the technical and tactical capabilities of the American day bombers and Bomber Command, which had always been a more destructive weapon than the Eighth Air Force by virtue of its greater bomb-carrying capacity, now showed signs of being also a more precise weapon. Of these important trends and the great possibilities which they opened there was little hint in the directive of 17th April 1944. If Sir Arthur Harris had continued to devote the greater part of his effort to area attacks on German towns he could scarcely, with justice, have been accused of disregarding its terms, for, in the directive, the disorganisation of German industry was still referred to as the 'main aim' of Bomber Command. Nevertheless, the real intentions of General Eisenhower and Sir Arthur Tedder proved to be more important and much more influential than the curious wording of the directive. Sir Arthur Harris engaged in no arguments about the meaning of the various clauses. He carried out the plan with vigour. It was not from High Wycombe but from Downing Street that the objections came.

The Prime Minister continued in vigorous opposition to the plan. He told General Eisenhower on 29th April that the War Cabinet was nearly unanimously against it. He deplored the killing of 10,000–15,000 French civilians and said that experience in Italy had shown how difficult it was to stop traffic by bombing marshalling yards. He pointed out that the plan had been opposed by Bomber Command Headquarters, by the United States Strategic Air Forces, by the Directorate of Bomber Operations in the Air Ministry, the 'railway experts' at the War Office, the Ministry of Economic Warfare, the Joint Intelligence Committee and various civilian railway experts. He said that the railway system of northern France was estimated to have a capacity of seven to eight hundred trains a day, but that the German army only required about ten per cent of that number. It would, therefore, Mr. Churchill argued, be necessary to knock out ninety per cent of the system before any valuable effects began to occur.¹

¹ Letter and memo. Churchill to Eisenhower, 29th April 1944.

After a pause which momentarily gave rise to a rumour at Supreme Headquarters, Allied Expeditionary Force, that the French railway campaign had been abandoned,¹ General Eisenhower declared that these political arguments could not be allowed to overrule the military necessities of the situation. Nevertheless, General Eisenhower told Mr. Churchill that he had postponed attacks on two railway centres in Paris until within a few days of the invasion and he said that he might be able similarly to put off some other projected operations in the more heavily populated areas. Even these measures were regarded as a military handicap. Any direct use of air power in preparation for *Overlord* would, General Eisenhower pointed out, inevitably result in the killing of French civilians. He mentioned the fact that the bombing operations in 1943 against the Biscay ports had had this unfortunate effect,² but he did not expect that the French railway campaign would result in as many as ten to fifteen thousand deaths before D-Day.³ As to Mr. Churchill's objections to the plan itself, General Eisenhower thought that these arose from a misunderstanding. The object of bombing marshalling yards and other key points in the railway system before D-Day was not, in itself, to stop German military traffic. It was to disorganise the railways so that the tactical operations after the invasion would be more effective in creating particular stoppages and delays.⁴

The Prime Minister was still not satisfied. He had not been made less anxious by the fact that Bomber Command was playing the leading part in the railway plan which, he thought, would have the effect of Britain incurring greater odium than the United States in France.⁵ On 7th May, Mr. Churchill sent a message to President Roosevelt in which he said that despite the declared support for the plan of General Eisenhower, Sir Charles Portal and Sir Arthur Tedder it found no favour with himself and that the British Government was seriously disturbed. He asked the President whether these operations might not embitter the French against their liberators.⁶ Mr. Roosevelt replied that the decision was a military one and must be left to the military commanders.⁷

¹ This rumour was denied by Sir Arthur Tedder on 3rd May. Mins. of Mtg. at S.H.A.E.F.

² The Prime Minister had not opposed heavy area attacks on these towns at the beginning of 1943 though the Air Staff had predicted that they would have little effect upon U-boat operations. The object of these attacks was to devastate the towns. In the French railway campaign the object was never to devastate towns but, on the contrary, to hit specific railway targets with the absolute minimum of damage to anything else.

³ French civilian casualties appear, in the event, to have been approximately 10,000. *The Army Air Forces in World War II*, Vol. III, p. 79.

⁴ Letter Eisenhower to Churchill, 2nd May 1944. Extracts from the letter are printed in John Ehrman: *Grand Strategy*, (1956), Vol. V, pp. 301-302.

⁵ Note on Defence Cttee. Mtg., 26th April 1944.

⁶ Churchill to Roosevelt, 7th May 1944. Most of this telegram is printed in Churchill: *The Second World War*, Vol. V, pp. 466-467.

⁷ Roosevelt to Churchill, 11th May 1944. *The Second World War*, Vol. V, pp. 467-468. After

Thus, Bomber Command was first set and then confirmed upon the path of a new campaign in which its objects, as also its methods, were different from anything it had previously attempted on a large scale. In March 1944 the Command had despatched nearly ten thousand sorties and had dropped over 27,500 tons of bombs. About seventy per cent of this effort was directed against targets in Germany. In April over ten thousand five hundred sorties were despatched and about thirty-four thousand tons of bombs were dropped, but only just over fourteen thousand tons of these were aimed at German targets. In May, nearly twelve thousand sorties were despatched and over thirty-seven thousand tons of bombs were dropped. Three-quarters of the sorties and more than twenty-eight thousand tons of the bombs were directed to targets in France and other occupied territory outside Germany. In June, nearly eighteen thousand sorties were despatched and more than fifty-seven thousand tons of bombs were dropped. Only about five thousand tons of these were aimed at German targets.¹

The tremendous effort devoted by Bomber Command in these months to the French railway campaign and also to many other objectives outside Germany was not part of the strategic air offensive against Germany but it did have a profound bearing upon it. The most obvious and the most negative effect of this prodigious diversion was, of course, to reduce the pressure upon the heart of Germany herself, and this occurred at a time when the striking power of Bomber Command was approaching its zenith both in quantity and in quality. But even this effect was not entirely negative because it also took place when the German air defences were achieving their greatest successes in the night battle over their own territory and the breathing space which it afforded to the German towns was also afforded to Bomber Command. Though this breathing space proved to be only temporary, partial and in some ways deceptive, it undoubtedly was, in both cases, a factor of considerable, though not exactly calculable, importance. It was, however, not the only nor the most important consequence which the *Overlord* diversion had for the strategic air offensive.

The commitment of Bomber Command to support the allied armies in the field after June 1944 continued for the rest of the war in Europe and, in conjunction with various demands of the Battle of the Atlantic as well as first the threat and then the actuality of German V-weapon operations, it absorbed an enormous number of heavy

this Mr. Churchill ceased actively to oppose the plan but he kept a sharp and sometimes even suspicious eye upon the estimates of French dead which were supplied by Sir Arthur Tedder. Bomber Command was often warned of the need to keep this roll of honour as short as possible. For example, memo. Eisenhower for all aircrews, 2nd June 1944.

¹ Reports Portal to Churchill for March, April, May and June 1944.
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bomber sorties. Nevertheless, the strategic air offensive, which could not always be easily distinguished from these diversionary activities, especially as time went on, presently recovered much more than its former vigour and violence. By far the greatest part of the strategic damage done by Bomber Command to Germany in the whole war was achieved in the last year of the conflict through the agency of what may conveniently be called the final offensive.

It was not only the increased size of Bomber Command and the ever higher proportion of Lancasters and Mosquitos in it which characterised the final offensive and distinguished its results from anything previously achieved, nor was it simply a case of the war of attrition at last paying dividends after five years of endeavour, though both these factors were of great importance. The real distinction between the final offensive and the earlier campaigns lay in the change of the conditions bearing upon strategic bombing which is generally described as the achievement of air superiority, air supremacy or command of the air. As far as the daylight offensive was concerned these somewhat vague terms convey the correct meaning for it undoubtedly was the reduction and gradual defeat of the German day fighter force which gave the United States Strategic Air Forces the opportunity to begin in May 1944 the tasks which had been planned for January 1943. In the night offensive of Bomber Command the change of conditions was, however, due to somewhat different and more complex reasons.

The defeat of the German day fighter force, the supremacy of the P.51 Mustangs and the relative immunity of the B.17 Flying Fortresses as also of the Bomber Command aircraft, when they presently began to undertake daylight attacks, did not lead to the defeat of the German night fighter force. No really effective means of engaging night fighters in the air was ever devised. Moreover, relatively small numbers of them could inflict tremendous damage on a night bomber force as had often been shown.¹ Nor did the American daylight supremacy contribute in any way to the solution of Bomber Command's old problems of target identification and bomb aiming which, even with the advent of radar, the formation of the Pathfinder Force and the development of specialised techniques by 617 Squadron, still remained formidable. Yet in the final offensive Bomber Command did gradually come to exercise command of the air at night over Germany as is shown by the falling and ultimately very slight casualty rate which was sustained after July 1944 and especially after September 1944. Bomber Command also developed the ability to strike massive and highly effective blows at relatively small targets such as

¹ Sir Arthur Harris had been aware of this at least since the summer of 1942. Of the German night fighters he wrote, 'a large proportion of their successes are gained by a small number of expert pilots'. Letter Harris to Portal, 3rd July 1942.

oil plants and communications targets both at short and at extremely long range. Thus, two fundamental conditions of night bombing were radically changed in the final offensive, and, ironically enough, both these changes were intimately related to the diversion of the force caused by the *Overlord* preparations and to the success of *Overlord* itself to which these preparations contributed so much.

In the French railway campaign and the associated operations the main force of Bomber Command, under the leadership of the specialised squadrons, received its battle training in the technique of night precision bombing. Operational developments of the first importance took place, but these could not be applied to targets beyond the limited range of *Album Leaf Oboe* and later of *G-H*. Nor, of course, could the force be concentrated in sustained attack by these or any other means against limited target systems while the German night fighter force retained the effectiveness which had characterised its efforts in north and south Germany during the latter stages of the Battle of Berlin and over the Pas de Calais in the latter stages of the French railway campaign. Thus, in the diversion of Bomber Command to the preparations for *Overlord* the techniques of night precision bombing were learnt and developed, but the opportunity of applying them in Germany itself on a large and sustained scale was not guaranteed.

This opportunity arose, to a great extent, from the success of *Overlord* and the subsequent overrunning and occupation of France which was a crippling blow to the German night fighter force. It was bereft of its early warning areas, and another result was that the radar transmitters for the guidance of Bomber Command were pushed forwards almost to the Rhine. The changes in the conditions of the night bombing offensive corresponded with the geographical advances of General Eisenhower's soldiers and a connection between the efficacy of air power and the exercise of military power was established. The foundations of Bomber Command's contribution to the final offensive were laid in the preparations for, and the execution of, operation *Overlord*, and it is this which adds an unforeseen importance and relevance to the decisions which have been discussed in this section.

2. The origins of the final offensive: oil, communications and morale, June–September 1944

The approach of *Overlord*, it will now be realised, had tended to obscure the distinctions between so-called 'independent' and 'auxiliary' and even between strategic and tactical bombing, and these distinctions were still further blurred by the actual launching of the invasion on 6th June 1944. Thereafter, the farther the land forces advanced, the more difficult it became to see the difference between them. This was because in the last year of the war the land, sea and air forces were at last deployed in offensive action against Germany itself. In various ways, directly and indirectly, as also both by design and sometimes by chance, they contributed to the success of one another. The 'independent' air offensive became less independent than it had been between the evacuation from Dunkirk and the landing in Normandy.

Moreover, as the armies of the grand alliance closed in upon Germany from the east, the west and the south, it became increasingly difficult to draw a distinction between strategic and tactical bombing. In many operations near the fighting lines both roles could clearly be fulfilled by the same operation. Nevertheless, in the final offensive, it is possible to discern not only the continuation but the consummation of the strategic air offensive against Germany, which had been initiated by Bomber Command almost exactly four years earlier on the night of 15th May 1940. This is because the action of Bomber Command, now allied to the powerful United States Strategic Air Forces, was still, in one of its roles, designed to exert direct pressure upon the heart of Germany and to bring itself to bear against the sources rather than the manifestations of her armed strength.

The fact that the allied armies were on the Continent throughout the final air offensive and were, therefore, often able to turn to their own tactical advantage the consequences of these strategic operations did not destroy the fundamental design of the strategic air offensive, though naturally it exerted much influence upon the bombing policy by which the design was to be accomplished. Quite apart from the many supporting and primarily tactical operations which had to be undertaken by the heavy bombers, the aims and the requirements of the armies were important factors in the making of strategic bombing policy. Thus, in the four years of its activity, the bombing offensive had come full circle, for these were the same considerations as those which had governed the situation in May 1940, when, as in June 1944, a crucial land battle was developing in France. As was to be expected,

they had somewhat similar consequences. Now, in June 1944, as there had been in May 1940, there was the danger that the strategic potential of the bomber forces might be sacrificed to the need for immediate results and, in particular, to the need for direct army support. Now, as four years earlier, there was a formidable multitude of tasks which seemed appropriate to the heavy bomber force and there was, therefore, the danger that the effort might be dispersed over too wide a range of defensive, offensive, tactical and strategic roles.

The danger of dispersal did not, however, arise solely from 'diversionary' commitments, such as the support of the army and the Battle of the Atlantic, to which was now added the campaign against V-weapons. It arose also from differing views of how best the force might be directed when it was able to continue the strategic air offensive. In this respect, too, 1944 was like 1940. The solution in both cases had lain in what was now becoming known as the strategy of the common denominator, for, if the force was to be concentrated, it clearly had to be concentrated in the pursuit of some object which would meet, if not all, at least the most important of the requirements of the situation. In 1940, it will be remembered, an oil and a transport plan had vied and then mingled with each other as the principal elements in the offensive strategy of Bomber Command. Both were 'common denominator' target systems, for they were 'independent' in the sense of being thought worth pursuing after the fall of France, but, before that event, both had been designed to make a direct contribution to the land battle. They were offensive in their ultimate aim of bringing Germany to her knees, but they were initially designed to assist defensive operations. The transport plan was also in 1940 partly strategic and partly tactical, not only in the results it was intended to achieve but in its actual conception.

In 1944, as has been shown in the previous section, they again emerged as the leading alternatives in the pre-*Overlord* and initial *Overlord* period, but General Spaatz's oil plan was, it will be recalled, rejected on the grounds that its effects would not be sufficiently immediate to impede the German army in the opening phase of the allied invasion. Oil was not mentioned in the Supreme Headquarters, Allied Expeditionary Force directive of 17th April 1944. Nevertheless, the oil plan, having thus apparently competed with and failed against the communications plan, did eventually mingle with it to become, as some have suggested, the most important part of the final offensive.¹ Before proceeding to explain this important development

¹ Professor Fagg, the American official historian of these events, writes, for example, 'During the climax of the pre-invasion bombings the Eighth and Fifteenth Air Forces launched what was to become their most rewarding campaign in the strategic air war, the destruction of enemy oil production'. *The Army Air Forces in World War II*, Vol. III, p. 172.

it is, however, necessary to refer to the third principal element in the final offensive, namely, the continuation of general area bombing.

The decision to adopt the policy of area bombing had, it will be realised, been initially dictated by operational facts though there were, of course, strategic arguments to support it. Moreover, the development of the area offensive along general, in distinction to particular or selective lines, was also largely determined by operational facts. The resulting campaign, however, was not intended simply as a senseless or retaliatory slaughter. On the contrary, its design was to dislocate the German war economy by the destruction of what were regarded as profitable targets in it, namely, the residential centres of the industrial population. The general area offensive was, therefore, a kind of 'panacea', regardless of whether its effect was to be produced primarily either by the physical or the psychological consequences.¹ In this respect it did not greatly differ in principle from selective attacks upon oil or transport, but in other respects there were, of course, fundamental differences.

General area bombing worked almost on the principle that in order to destroy anything it is necessary to destroy everything, and its success had already been shown to depend upon a much greater effort than Bomber Command had been able to make in 1943 and at the beginning of 1944. It was, therefore, as Sir Charles Portal had implied in December 1943, an uneconomical form of attack.² The general area offensive also had a less direct connection with other forms of offensive, and notably with military operations, than did the oil or the communications campaigns, and to this extent it was more an 'independent' and less a 'common denominator' target system than they were. Naturally the success of the general area offensive would, by reducing German morale and war production, make the task of the invading armies easier, but, at any rate while they were still fighting at a considerable distance from the German frontier, few tactical and immediate advantages would accrue for them. The oil and communications plans might equally reduce German war production and, perhaps, morale as well, and they were also likely to produce great and obvious tactical advantages for the army.³

¹ Sir Arthur Harris never used the word 'panacea' to describe the general area offensive. He reserved it for attacks upon 'key points' such as oil production, ball-bearings plants, railway centres, and so on. Nevertheless, he clearly believed and frequently stressed that city centres were keys to the functioning of the German war economy. There was always some doubt as to whether the physical or the psychological (morale) effects of area bombing were more important, and the relative values placed upon them varied greatly from year to year. On the whole Sir Arthur Harris seems to have expected more from the former than the latter. See, for example, *Bomber Offensive*, pp. 79 and 88.

² This suggestion is implicit in a minute of Sir Charles Portal's to Sir Norman Bottomley of 23rd December 1943 which is cited in Vol. II, pp. 67-68.

³ It must be remembered that among the great number of incidental effects of area bombing was damage to communications and oil production. Oil plants and even marshalling yards are, however, seldom in the centres of towns, and the more accurate

It was, nevertheless, still much more difficult to hit an oil plant or a marshalling yard in Germany at night than to strike a blow against a large city, and the operational arguments in favour of area bombing, though of diminishing force, were by no means exhausted. Moreover, the conditions of the last year of the war produced certain new strategic arguments in favour of an all-out attack on German morale. Neither of these reasons, however, fully explains the gigantic effort devoted to general area bombing by Bomber Command in the final offensive, nor, as will duly be seen, did Sir Charles Portal regard this either as inevitable or desirable.

The successful establishment of General Eisenhower's armies on the Normandy beachheads in June 1944 and their break-out towards the end of July did not permit Bomber Command and the United States Strategic Air Forces to resume a full-scale strategic air offensive against Germany. Great supporting operations by the heavy bombers were still called for and there were other formidable diversions from the main air offensive, notable among which was the counter V-weapons campaign, which at times was elevated to the position of first priority. In June, July and August 1944, Bomber Command dropped over 180,000 tons of bombs, but only about 32,000 of them were aimed at targets in Germany.¹ This indicates the extent to which, for Bomber Command, the strategic air offensive against Germany had become a marginal effort. Moreover, the situation of the Eighth Air Force was not radically different.² Nevertheless, it was at this time and, so far as the Americans were concerned even before it, that the oil campaign began. By September, when France was virtually liberated and General Eisenhower relinquished the direction of the strategic air forces, this 'marginal' oil offensive had already produced the most remarkable results, and had established a claim for absolute priority in the final offensive.

Oil had long been recognised as a strategic target of outstanding importance and attraction and ever since the abortive conclusion of

the area attacks became the less likely they were to be hit. But it must also be remembered that by no means all area bombing was general area bombing.

¹ Monthly reports to the Prime Minister by Portal. The actual figures given by Sir Charles Portal were:

<i>Month</i>	<i>Total Tonnage</i>	<i>Tonnage on Germany</i>
June	57,267	4,902
July	57,615	13,222
August	65,855	14,438

These figures should not be accepted as precise.

² The figures were:

<i>Month</i>	<i>Total Tonnage</i>	<i>Tonnage on Germany</i>
June	58,594	13,235
July	45,465	29,841
August	47,696	24,081

Monthly Summary of Operations. U.S. Eighth Air Force.

the Bomber Command attack upon it in March 1941 numerous and vigorous attempts had been made to get this target system restored to the bombing directive. These efforts, with which Lord Hankey, Sir Archibald Sinclair and Mr. Attlee were from time to time much concerned, all came to nothing for a variety of strategic and operational reasons such as the initial probability of the Germans capturing the Caucasian oil fields, the inaccessibility of the Ploesti plants, which were regarded as fundamental in the German oil position, and the operational limitations of night bombing. Nevertheless, a great volume of oil intelligence was constantly put before those directing the bombing and later the Combined Bomber Offensive. In the Casablanca directive, it will be remembered, oil had appeared in the list of selective targets, and in the *Pointblank* plan it had, if Ploesti could be bombed, been elevated to the status of a 'primary objective'. No specific attacks of any great weight had, however, taken place when, in the spring of 1944, General Spaatz presented the case for an oil offensive not from the point of view of a strategic theorist or an intelligence expert but from that of an operational commander. Nevertheless, in view of the formal decisions reached at the end of March and expressed in the directive of 17th April, it did not seem likely, at least on the face of it, that any such attacks were imminent.¹

Formal decisions and official directives were, however, by no means the only ways in which the policy of the combined bomber offensive was made. Indeed, before the issue of the April directive, the oil offensive had already begun, and before the allied soldiers went ashore in Normandy it had already achieved some significant effects. Before the break-out from the beachheads Bomber Command had followed the American initiative and was also embarked upon an oil plan. All this took place without any mention of it in a directive and it was largely the result of the initiative taken by General Spaatz.

The campaign began at Ploesti, which had already been the scene of a heroic but inconclusive American attack in August 1943. On 17th March 1944 General Arnold told General Spaatz that the Combined Chiefs of Staff had raised no objection to the employment of the Fifteenth Air Force against this objective, and though it was thought necessary to give out that the targets were marshalling yards, substantial attacks on the oil plants there were, in fact, carried out on 5th, 15th and 24th April 1944. Meanwhile, on 19th April, General Eisenhower had, by word of mouth, authorised General Spaatz to initiate a limited offensive against German oil production with the Eighth Air Force. The beginning was delayed, first by the claims of the campaign against V-weapons and then by a spell of bad weather,

¹ Professor Fagg calculates the total percentage of allied bombs aimed at 'petroleum targets' up to 1st May 1944, to be 1.1. *The Army Air Forces in World War II*, Vol. III, p. 172.

Bergius Hydrogenation

Location	Name of Plant or Company
Blechhammer	Oberschlesische Hydrierwerke (I.G. Farbenindustrie)
Böhlen	Braunkohle-Benzin A.G.
Bottrop (Weiheim)	Ruhrroel A.G.
Brux	Braunkohle-Benzin A.G. Sudentenlaendische Triebstoffwerke Brabag
Buer	Hydrierwerke Scholven A.G.
Gelsenkirchen	Gelsenkirchener Bergwerke A.G. Nordstern
Leuna	Ammoniakwerke Merseburg G.m.b.H. (I.G. Farbenindustrie)
Ludwigshafen	I.G. Farbenindustrie
Lutzkendorf	Wintershall A.G.
Magdeburg (Rothenaue)	Braunkohle-Benzin A.G. Brabag
Oswiecim	I.G. Farbenindustrie
Pölit	Hydrierwerke Pölit A.G.
Wessling	Union Rheinische Braunkohlen-Kraftstoff A.G.
Zeitz	Braunkohle-Benzin A.G. Brabag

Fischer Tropsch

Location	Name of Plant or Company
Castrop Rauxel	Kloeknerwerke A.G. and Wintershall A.G.
Deschowitz	Schaffgotsch'sche Benzin G.m.b.H.
Dortmund (Wambelerholz)	Hoesch Benzin G.m.b.H.
Harnes	Courrières
Homburg (Meerbeck)	Rheinpreussen A.G.
Kamen	Chemische Werke Essener Steinkohle A.G.
Ruhland (Schwarzheide)	Braunkohle-Benzin A.G. Brabag
Sterkrade Holten	Ruhrchemie Holten Ruhr Benzin A.G.
Wanne Eickel	Krupp Treibstoffwerke A.G.

Benzol Plants

Location	Name of Plant or Company
Bochum (Langendreer)	Gelsenkirchener Bergwerke A.G. Carolinenglueck
Bottrop (Osterfeld)	Harpener Bergbau A.G. Robert Muser Gelsenkirchener Bergwerke A.G. Bruchstrasse Prosper Rheinische Stahlwerke Mathias Stinnes Stinnesche Zechen Gutehoffnungshuette
Bruckhausen	Gelsenkirchener Bergwerke A.G. Vereinigte Stahlwerke
Buer	Hugo II
Castrop Rauxel	Ges. fuer Teerverwertung G.m.b.H. and Ruetergerwerke (Tar Benzol)
Dahlbusch	Zeche Dahlbusch
Datteln	Emischer Lippe
Dortmund	Gelsenkirchener Bergwerke A.G. Minister Stein Gelsenkirchener Bergwerke A.G. Hansa Harpener Bergbau A.G. Gneisenau Hoesch A.G. Kaiserstuhl II Hoerder Verein (part of Vereinigte Stahlwerke A.G.)
Essen	Emil
Gelsenkirchen	Gelsenkirchener Bergwerke A.G. Alma Pluto Gelsenkirchener Bergwerke A.G. Erin Mannesmannroehren Werke A.G. Consolidation Graf Bismarck
Hattingen	Heinrichshuette
Hüls	Auguste Viktoria
Killwinkler	Sachsen
Königsborn	Kloeknerwerke
Linz	Hermann Goering
Meiderich	Gelsenkirchener Bergwerke A.G. and Ges. fuer Teerverwertung (Tar and Benzol)
Molbis	Saechsische Werke
Moosbierbaum	Donau Chemie A.G.
Moravská Ostrava	Privozer Mineral
Neuenkirchen	Eisenwerke A.G.
Recklinghausen (Erksenschwick)	Zeche Ewald (Fortsetzung)
Saltzgirter	Hermann Goering
Vienna	Nova Oel und Brennstoff A.G.
Schwechat	Gelsenkirchener Bergwerke A.G. Erin
Wanne Eickel (Herne)	

Refineries

Location	Name of Plant or Company
Almas Fuzito	Vacuum Oel A.G.
Balaruc	Raffinerie du Midi
Bohumin	Fanto
Bosanski Brod	Vacuum Oel A.G.
Brasov	Vacuum Oel A.G.
Bratislava	Apollo
Brazi	Creditul Minier
Bremen (Oslebhausen)	Deutsche Vacuum Oel A.G.
Bucharest (Prahova)	Prahova Petrolul
Bucharest	Titan
Budapest	Fanto Magyar Petroleum Ipar Shell
Caprag	Shell
Courchelettes	Société Huiles de Petrole
Czechowice	Vacuum Oel A.G.
Dedenhausen	Phoenix
Dubova	State Refinery
Dollbergen	Deutsche Gasolin A.G.
Dortmund	Harpenerweg
Drohobycs	Polmin Galicija Nafta
Emmerich	Deutsche Gasolin A.G.
Fiume	R.O.M.S.A.
Freital	Rhenania Ossag Mineraloelwerke A.G.
Hamburg	Deutsche Petroleum A.G. Ernst Schliemann's Oelwerke Europäische Tanklager und Transport A.G. (Eurotank)
Harburg	Julius Schindler Oelwerke G.m.b.H. and Deutsche Erdoel A.G. Mineraloelwerke Albrecht A.G. Mineraloel und Asphalt Werke A.G. Rhenania Ossag Mineraloelwerke A.G. Rhenania Ossag Mineraloelwerke A.G. Ebano Asphalt Werke A.G. Deutsche Erdoel A.G.
Heide	Vacuum Oel A.G.
Kolin	Kralupy Min.
Kralupy	Berat
Kucove	Trzebina
Malopolska	Société Huiles Antar
Merchweiler	Gewerkschaft Deutsche Erdloel Raffinerie A.G. (Deurag)
Miaburg	Rhenania Ossag Mineraloelwerke A.G. Gewerkschaft Elwerath und Deutsch Erdloel
Monheim	Ipoil
Nienhagen	Mineraloel and Asphalt Werke A.G.
Osijek	Fanto
Ostermoor	Peter Nitrogen
Pardubice	Astra Romana
Petfurdo	Concordia Vega
Ploesti	Dacia Romana Redeventa S.A.R. and Xenia Romana Americana Steaua Romana Standard Block Unirea Sperantza
Reisholz	Rhenania Ossag Mineraloelwerke A.G.
Rositz	Deutsche Petroleum A.G.
Salzbergen	Wintershall A.G.
Schulau	Deutsche Vacuum Oel A.G.
Smederovo	Sumadiska Kreditava
Szoeny	Magyar Olaj Muvek
Trieste	Aquila
Vallo	Tonsberg
Vienna	
Kagran	Vacuum Oel A.G.
Lobau	Ostmaerkische Mineralswerke A.G. Wintershall A.G.
Florisdorf	Shell
Vosendorf	Fanto
Korneuburg	Creditul Minier

Oilfields

Heide	Lippe	Nienhagen
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Oil Storage

Bad Berka	Ehmen	Magdeburg
Brasov	Farge	Neuburg
Buchen	Freiham	Regensburg
Derben	Ghedl	Riesa
Duisburg	Hamburg	Roudnice
Dülmen	Hitzaecker	Ruthen
		Straubourg

(The plants have been classified according to contemporary Allied sources)

but, on 12th May 1944, 935 heavy bombers of the Eighth Air Force took off for targets which included the oil plants at Zwickau, Merseburg-Leuna, Brück, Lutzkendorf and Böhlen. Thus, first from the south and then from the west, the oil offensive was begun.¹

This effort and the further attacks which took place in May were, apart from the activity of some Royal Air Force fighters, purely American, but the British Air Staff was also now regarding the oil offensive with increasing favour. Though it was not felt that the time had come to seek for any official change in bombing policy, Sir Charles Portal endorsed the view at the end of May that '... when "OVERLORD" is firmly established, we should at once consider directing against oil objectives such effort of the strategical air forces as can be spared from the task of continuing the neutralising of the enemy's aircraft production and air forces.'²

Accordingly, on 3rd June 1944, Sir Norman Bottomley invited Sir Arthur Harris to give an appreciation of the operational possibilities of attacking ten synthetic plants in the Ruhr area as soon as the *Overlord* situation might make that possible.³ In his reply, ten days later, Sir Arthur Harris said that attacks on these targets would result in the wastage of many bombs, but he thought they could be destroyed by the expenditure of thirty-two thousand tons of bombs. Rather less effort might be required because, Sir Arthur Harris pointed out, the average aiming error, which he expected to be two thousand yards, might prove to be less than that. The Commander-in-Chief reminded the Air Staff that any plans for the employment of his effort must be submitted for the approval of the Deputy Supreme Commander and he added the somewhat surprising information that, by arrangement with Sir Arthur Tedder, he had already agreed to take on oil plants with his marginal effort.⁴ Thus, by informal arrangement between General Eisenhower and General Spaatz and between Sir Arthur Tedder and Sir Arthur Harris, oil became an objective of the strategic air offensive.

¹ For a fuller account of these developments, upon which the above is mainly based, see *The Army Air Forces in World War II*, Vol. III, *The Beginning of the Campaign against Oil*, pp. 172-177. On 7th June 1944 Sir Charles Portal sent a message to General Wilson, which was repeated to General Spaatz and J.S.M., Washington, in which he said that the weakness of the German oil position justified first priority for the bombing of Ploesti and other oil targets in Hungary and Austria, by Air Forces in S.E. Europe. For the moment, he said, communications should have a lower priority.

² Sir Charles Portal literally endorsed this view with the pencilled word 'Yes' on the Air Staff brief which contained it, and he spoke from this brief, which was dated 29th May, at a C.O.S. meeting held on 30th May 1944.

³ Letter and memo. Bottomley to Harris, 3rd June 1944. The plants mentioned and their estimated annual capacities were: Gelsenkirchen (Nordstern) [400,000 tons], ditto (Scholven) [375,000 tons], Wesseling [200,000 tons], Homberg [190,000 tons], Wanne-Eickel [130,000 tons], Sterkrade-Holten [125,000 tons], Castrop-Rauxel [100,000 tons], Dortmund-Kamen [100,000 tons], Dortmund [90,000 tons] and Bottrop-Welheim [75,000 tons].

⁴ Letter and memo. Harris to Bottomley, 13th June 1944.

The strategic air offensive was, however, an emasculated affair because of the continuing need to support the army tactically and because of the great effort being made to reduce the V-weapon attack by bombing the launching sites. General Spaatz, indeed, thought that the heavy bombers were being seriously misdirected. Their main contribution to the success of *Overlord* had, he suggested in a letter to General Eisenhower on 28th June 1944, been their effective neutralisation of the *Luftwaffe* and this, he claimed, had been achieved not by operations in France but by attacks on aircraft production in Germany and by the 'bitter air battles over the Reich' which they had produced. Strategic operations against Germany should again, he suggested, have priority, and the only exceptions he would allow were in the event of a major emergency in the land battle, or for attacks upon large rocket-firing installations. Normal tactical army support and attacks on the small V-1, or flying bomb, launching sites were not, in his view, justifiable diversions from the main strategic offensive. He allowed, however, for the fact that a high proportion of the bombing effort would in any case be devoted to tactical army support because the weather over Germany was often unsuitable for strategic operations.¹

Though General Eisenhower was not prepared to accept all the implications of this advice, he clearly thought that it had much force. He told Sir Arthur Tedder that *Crossbow* would have to continue as the first priority, but he thought a new policy might be written for the heavy bombers in which it could be clearly laid down that when they could not all be employed upon *Crossbow* and when the conditions over Germany were favourable, their objectives should be the aircraft industry, oil production, ball-bearings plants and motor vehicle production. This was to be subject to an overriding emergency in the land battle and the Supreme Commander thought it would merely confirm what, in any case, was already being done.²

However this may have been, and such a policy scarcely represented the pattern of Bomber Command operations, no new directive was in fact produced, and the effort of the strategic air forces continued to be governed by arrangements which were informal and also sometimes obscure. On 4th July 1944, Sir Charles Portal enquired what oil targets had been allotted to Bomber Command, on what date the directive had been issued and how many of the targets had been attacked.³ Air Commodore Bufton told him that no directive

¹ Letter Spaatz to Eisenhower, 28th June 1944. General Spaatz later reported to General Arnold, according to the latter, that the reason for the enemy's failure to use rail communications was not so much blocked lines as his unwillingness to commit strategic reserves. General Arnold was not in agreement with this view and suggested that General Spaatz might make a further report and reach a different conclusion. Letter Arnold to Spaatz, 11th July 1944 (written 6th July). F.R.C. Central File 312-1-J.

² Min. Eisenhower to Tedder, 29th June 1944.

³ Min. Portal to Bufton, 4th July 1944

had been issued but that Bomber Command had, nevertheless, carried out a number of attacks on oil plants at Gelsenkirchen, Sterkrade, Wesseling and Homberg. Most of these had been executed by small Mosquito forces, but on two occasions over a thousand tons of bombs had been dropped by forces of about three hundred heavy bombers. It was not thought that any great damage had been achieved by these attacks except by the first, which took place on the night of 12th June 1944. On that occasion, 294 aircraft had been despatched to the Nordstern plant at Gelsenkirchen and it was estimated that its output, which had amounted to thirty-three thousand tons of oil in May 1944, would amount to nothing in July.

The importance of the oil offensive had fully impressed itself upon Air Commodore Bufton and he was eager for Bomber Command to 'achieve success against the Ruhr plants' not only on account of their great value but also in the interests of Royal Air Force prestige *vis-à-vis* the Americans who, he thought, would themselves destroy these targets if Bomber Command did not first do so.¹

The value of the oil offensive was, however, more readily apparent to the Air Staff than the methods by which it was being directed and the extent to which it was going to be pressed in the future. So far as Air Commodore Bufton could see, the only indication which Sir Arthur Harris had received as to which targets ought to be attacked was that contained in Sir Norman Bottomley's letter of 3rd June which was an enquiry and not a directive.² Thus, as they read in the reports of the Joint Intelligence Committee of the increasingly desperate position to which the comparatively minor allied attacks had already apparently reduced German oil production, the Air Staff may well have felt a certain frustration at their inability either to control operations or even to know fully the decisions which were being reached at Supreme Headquarters, Allied Expeditionary Force.³

This feeling was, no doubt, responsible for Sir Charles Portal's momentary thought that, perhaps, the time had come for him to resume the direction of at least a part of the effort of the strategic bombing forces, but in the event, he did not press this suggestion until September.⁴ In the meantime, however, other courses of action were open. On 9th July 1944, the Air Ministry announced the formation of a joint Anglo-American oil targets committee which was to keep the Axis oil position under review, to assess the damage inflicted and

¹ Min. Bufton to Portal, 7th July 1944.

² Letter and memo. Bottomley to Harris, 3rd June 1944.

³ The J.I.C. oil reports were issued fortnightly from 3rd July 1944. On each occasion, they summarised the damage achieved and estimated the resulting overall German oil position. The information was immediately made known to the Chiefs of Staff.

⁴ Mins. Portal to Bottomley, 13th July 1944, and to Sinclair, 17th July 1944.

to determine the priority of further attacks.¹ Armed with the expert and detailed advice which this committee produced, the Air Staff was in a better position to follow the course of the oil offensive and, therefore, also to make recommendations about its direction.

This was an important development because the oil offensive, though still a purely marginal and even somewhat haphazard affair, was making the most striking progress and, by the end of July, had even produced a situation which seemed to offer the long-range bombers the chance of an imminently decisive contribution to the defeat of Germany. The importance of attacking the correct targets in sufficient force and with adequate frequency, therefore, became greater and greater. This, indeed, clearly emerged from the fortnightly reports of the Joint Intelligence Committee, but the detailed lines of desirable action were indicated by the Joint Oil Targets Committee.

In their report at the end of July, the Joint Intelligence Committee reached the conclusion that 'Germany will be unable to continue the struggle beyond December given intensive fighting on three fronts and the continued success of allied air attacks'. At the beginning of August they stated that German consumption had exceeded finished production of oil by about three hundred thousand tons. The Joint Intelligence Committee also, however, noted that the Germans were now giving the highest priority to the repair of damaged oil installations and they recorded the appointment of Geilenberg to direct these efforts. If the bombing ceased in August, they believed that Geilenberg would be able to restore production to the level of consumption in that month.² A further report of 21st August suggested that every hydrogenation plant in Germany had been damaged, that five of the ten known Fischer-Tropsch plants had been damaged and that the recent activities of the Fifteenth Air Force had retarded the recovery of mineral oil refining in Rumania from the effects of its previous attacks.³

These indications and the prospects which they offered produced a vigorous reaction from the Air Staff which was in full accord with the enthusiasm of General Spaatz for the oil offensive. In an Air Staff brief of 21st August 1944, Air Vice-Marshal D. Colyer, the Assistant Chief of the Air Staff for Policy, and Air Commodore Bufton, the Director of Bomber Operations, suggested that 'serious consideration should be given to according overriding priority to the attack of oil targets by the Allied Strategical Bomber Forces'. In particular, they felt that oil targets in the Ruhr should be attacked by Bomber Com-

¹ Air Min. to S.H.A.E.F., Bomber Command, U.S.S.T.A.F. and M.A.A.F., 9th July 1944.

² J.I.C. Oil Reports, 24th July and 7th Aug. 1944.

³ do. 21st Aug. 1944.

mand in preference to city centres there or elsewhere, and they criticised the recent attack by Bomber Command upon Bremen as a misdirection of effort. They thought that *Crossbow* should no longer enjoy priority over oil and, as far as the *Luftwaffe* was concerned, they believed that the oil offensive would produce more damaging effects than further attacks upon aircraft production or ball-bearings plants. '... a shortage of fuel', they said, 'rather than a shortage of aircraft or aircrews already promises to be the immediate factor in G.A.F. operations'. They recognised that synthetic and refining oil plants would not always provide a sufficient number of targets in suitable weather areas on any given day or night. Nevertheless, in suggesting that oil should be accorded 'overriding priority', the Assistant Chief of the Air Staff for Policy and the Director of Bomber Operations had really meant what they said, for, in these circumstances, they advised that attacks should be carried out against oil storage depots and tactical dumps. These recommendations, they hoped, would be brought to the attention of the Supreme Commander.¹

A few days later the prospects of the oil campaign looked even brighter. The advance of the Red Army had already neutralised the principal Polish oil fields and it was about to seal off any further supplies from the much more important Rumanian source. Further progress had also been made with the bombing of synthetic plants and refineries in Germany and central Europe. The result was, as the Air Ministry suggested to Supreme Headquarters, Allied Expeditionary Force on 30th August 1944, that 'we are presented with an exceptionally favourable opportunity in the next few weeks of imposing on the enemy a critical situation in his war economy which, if exploited to the full, may prove decisive to our efforts.'²

These decisive results, however, depended upon a concentrated and sustained effort by the heavy bombers, for it was evident from photographic reconnaissance that the Germans were not abandoning even their most heavily damaged oil plants. On the contrary, as was observed in a Joint Intelligence Committee report of 18th September 1944, repair activities were everywhere continuing with 'undiminished vigour'.³ Winter was also approaching and the weather, especially for precision bombing, was likely to become more difficult. On the other hand, the military campaign in France was rapidly coming to a victorious conclusion. The allied armies were closing up to the Rhine and on the way they had overrun the flying-bomb launching sites. On 6th September 1944, General Eisenhower declared the virtual ending of the French railway campaign. There

¹ Air Staff brief for Portal, 21st Aug. 1944.

² Air Min. to S.H.A.E.F., repeated to Bomber Cmd., U.S.S.T.A.F., M.A.A.F. and Fifteenth Air Force, 30th Aug. 1944.

J.I.C. Oil Report, 18th Sept. 1944.

were now, he said, only eight departments of France which offered targets suitable for heavy attack and, even in these cases, he did not want the damage to exceed anything which could be rapidly repaired.¹

These developments inevitably and vastly increased the geographical concentration of the bombing offensive and, it seemed, would much reduce the diversionary commitments which had lately restricted its application. The opportunity for a final and overwhelming strategic air offensive against Germany appeared at last to have arrived, and it seemed that it might be possible to concentrate this effort primarily upon the destruction of what was obviously a most vulnerable and equally fundamental target system; namely, the remaining sources of German oil supply with the object of forcing the Germans to capitulate to the allied land forces by the end of the year.

The oil campaign was not, however, regarded as the sole means of achieving this result. Sir Arthur Tedder had only recently been considering a suggestion from the British Chiefs of Staff to the effect that the Battle of Berlin might presently be renewed with the object of dealing a *coup de grâce* to German morale, and he himself, as he told Sir Norman Bottomley on 9th September 1944, was planning a major bombing campaign against German communications.² Both these plans were, as will presently be seen, to have a great influence on future operations.

The plan for renewing the Battle of Berlin had its origin in July 1944 when the British Chiefs of Staff declared 'that the time might well come in the not too distant future when an all-out attack by every means at our disposal on German civilian morale might be decisive' and suggested to the Prime Minister 'that the method by which such an attack would be carried out should be examined and all possible preparations made'.³ As a result, Sir Charles Portal submitted a memorandum to his colleagues at the beginning of August 1944 in which the problem was analysed by the Air Staff after consultation and agreement with the Foreign Office, the Political Warfare Executive and the Ministry of Economic Warfare.

This memorandum showed that the object of the plan was not primarily, as had been the case in previous attacks on targets of this nature, to reduce war production, nor was it designed to throw Germany into utter chaos. On the contrary, it appeared as a measure intended to preserve rather than to destroy some form of German government in Germany. 'It is of great importance', the memorandum stated, 'that once the issue of the war is clear beyond doubt the German High Command should decide that Germany must accept

¹ Eisenhower to Armies and Air Forces, 6th Sept. 1944.

² Note for Tedder, 14th Aug. 1944. Tedder to Bottomley, 9th Sept. 1944.

³ Min. C.O.S. to Churchill, 5th July 1944.

the necessity of organised surrender. Otherwise', it continued, 'the war might be continued into a guerrilla phase which would force the Allies to undertake the entire responsibility for the whole administration of Germany.' The object of the plan was, therefore, in the words of the memorandum, 'to influence the minds of German high political and military authorities in the desired direction to the point where the High Command must either accept the necessity of surrender or be replaced by an alternative Command which does so'.

These authorities, the memorandum suggested, would be influenced mainly by considerations of foreign policy, by the fortunes of the German armed forces and by the condition of the economic and administrative system on which they depended. 'In the final crisis', the memorandum, however, stated, 'they may also be affected by certain moral factors', and among these it was found possible to distinguish three principal types. The first was the morale of the German political and military leaders themselves which, it was suggested, might be directly attacked by bombing 'the traditional centres of Governmental and military control . . .' The second was the morale of the armed forces and, though this would largely depend upon 'conditions in the field', it was thought that it might also depend upon the condition of civilian morale which, itself, formed the third principal factor.

The condition of civilian morale might, the memorandum suggested, exert its influence in various ways. In an 'extreme case' there might be outbreaks of rioting, strikes or uncontrolled looting. In less severe circumstances there might, nevertheless, be an increase in voluntary absenteeism from work and in an attitude of general 'unhelpfulness' towards the Government. Even if morale was not impaired, an attack upon it might force the German authorities to divert increasing resources towards its maintenance at the expense of other vital commitments. In distinction to earlier appreciations, the Air Staff did not, however, take an optimistic view of any of these possibilities. They now believed that German civilian morale was 'negative rather than positively good or bad'. They did not believe that the average German saw much to be gained from resistance to the authorities and they recognised that he was preoccupied with the task of living from one day to the next. In any case, the memorandum observed, there were few able-bodied men between the ages of seventeen and forty-five still outside the Army or the Police. Moreover, police control had proved adequate to check any public expression of dissatisfaction 'even in areas where morale has been greatly affected for a time by prolonged and intensive air attacks'. Foreign workers, the memorandum admitted, constituted a more promising target for morale attack, but they, of course, would be under even more stringent police control than Germans. 'In this situation', the memorandum stated,

it is unlikely that fluctuations in civilian morale will have any decisive influence upon the High Command until its authority has already been greatly weakened by other causes and the machinery of repression has begun to break down.'

Thus, it appeared that the war could not be won by an attack on German civilian morale but it seemed that victory, when virtually gained by other means, might be consolidated, hastened and controlled by this means of attack. 'The occasion for an attack on civilian morale as such will not arise', the memorandum said, 'until it is generally believed even in Germany that the Nazi system is collapsing, and that total defeat is imminent. This opportunity to enforce surrender', it was recognised, 'may be a fleeting one; if it is not seized either the extremist elements may succeed in rallying the Army for a further stand or the collapse may spread so rapidly that central government ceases to exist'.

The various means of carrying out a blow of 'catastrophic force' were then considered. The suggestion that widespread strafing attacks should be made by fighters on civilian objects was rejected on the grounds that it would produce 'uneasiness' but not a 'calamity'. A proposal for a form of air control under which a warning would be issued that on a given date all road and rail movement in Germany should cease and that any vehicles disregarding the warning would be attacked was judged to be impracticable on the grounds that the threat could not be adequately executed with the forces available. A third suggestion to the effect that a number of relatively small towns with populations of about twenty thousand should be obliterated, also found little favour. Such attacks, it was shown, would require visual aiming and would, therefore, depend for their success upon good weather, and the activity of the American bomber force in daylight. It was unlikely that more than thirty such towns could be destroyed in a month, and even if a hundred were eventually devastated only three per cent of the German population in relatively unimportant areas would be affected.

A shattering blow against Berlin was, however, viewed in a quite different light. The operational advantage was that owing to the size of the target the attacks could be carried out at short notice and, if necessary, in bad weather with blind bombing devices. In all but the very worst weather a sustained series of attacks could therefore be guaranteed. The scale of attack envisaged amounted to no less than twenty thousand tons of bombs dropped in four days and three nights. Such a concentration, it was thought, would have a 'sufficiently catastrophic effect to suspend all ordinary life in Berlin' where five per cent of the German population lived, where the centre of government was still located and where there were important industrial and transport complexes. The memorandum did not suggest that the capital would,

in the long run, be incapable of sustaining such a blow. On the contrary, it was pointed out that essential facilities could be restored and the homeless rehoused 'in a relatively short time', but the plan was not designed to achieve long-term effects. In the short run, it was believed that a blow of this character might cause 'at least a temporary breakdown in the morale of the population of Berlin' and that this might be sufficient to realise the aim of the plan. The admitted fact that forty-eight thousand tons of bombs had already been dropped on Berlin 'with very great, but not with catastrophic destruction' was not held to invalidate the hope because this total had been reached over an extended period and much of it had been delivered in the suburbs and not in the centre of the city. Moreover, 'the general situation' at the times of these earlier attacks 'was such that it could be controlled, and that the High Command was not facing a crisis in which it would be influenced by it. The conditions now postulated', the memorandum stated, 'are different and the weight of attack would be much more concentrated'.

The possibility that, as an alternative, similar blows might be struck against other great towns such as Hamburg, Cologne, Frankfurt or Munich was also considered. Though it was thought that this version of the plan would produce somewhat less effect than the concentration against Berlin, the advantage that it might be cheaper in bomber casualties was stressed. A final suggestion which was ultimately to be of the greatest importance was put forward in these words:

'Immense devastation could be produced if the entire attack was concentrated on a single big town other than Berlin and the effect would be especially great if the town was one hitherto relatively undamaged'.¹

These proposals were approved by the Chiefs of Staff on 5th August 1944 and General Eisenhower was invited 'to prepare plans for an attack on Berlin on the lines suggested in the memorandum by the Chief of the Air Staff'.² In the event, however, as will duly be seen, another 'hitherto relatively undamaged' town was preferred and when the blow of 'catastrophic force' came to be delivered it fell not on Berlin, but on Dresden. Though this did not take place until February 1945 and though, as will also presently be seen, the Anglo-American desire to assist the Russian land campaign had by that time added a powerful motive for the selection of that particular town, it is necessary now to grasp the full implication of this Air Staff memorandum which may be regarded, if only indirectly, as the title deed of that controversial operation.

¹ Memo. Portal for C.O.S., 1st Aug. 1944.

² C.O.S. Mtg., 5th Aug. 1944, Item 5.
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Much of its significance will already have become evident, and it will be seen that in some respects it constituted a severe judgement by the Air Staff upon the strategic reasons which had led to the adoption by Bomber Command of the policy of general area attack. It did clearly suggest that in a long-drawn-out war of attrition, such as Bomber Command had been waging since 1940, German morale was unlikely to be decisively affected by the destruction of cities unless the situation was for other reasons already desperate. It even suggested that the discharge of twenty thousand tons of bombs on the centre of Berlin within the space of seventy-two hours would, in the absence of that condition, have little effect upon the outcome of the war. Yet the hope that less severe and much more widely dispersed attacks would have a decisive effect upon German morale and war production had been one of the principal strategic foundations of the policy of general area bombing. Certainly this reasoning of August 1944 was at considerable variance with that of August 1943 which had led Sir Charles Portal to urge upon Sir Arthur Harris the importance of attacking Berlin. But, of course, this change had occurred in the light of experience including, no doubt, especially that of the Battle of Berlin itself. The belief expressed in the memorandum that an attack on morale was unlikely to be a profitable pursuit except in the special circumstances which were so carefully defined undoubtedly removed one of the principal strategic justifications of general and sustained area bombing, but there was a second strategic argument in favour of this form of attack.

Area attacks upon towns were certainly aimed primarily at the populations, but the intention was to deny them the means to work by the destruction of public utilities such as gas, communications, electricity supplies and housing, as well as to break their will to work. It was also intended to divert the efforts of the people from war production to the repairing of their losses. Area bombing of town centres was an attack upon industrial morale, but it was also and in its main aim an attack on industry itself. A belief that industrial morale was unlikely to be severely affected did not, therefore, necessarily invalidate the policy of general area bombing. But the Air Staff, as will have been noticed, had for some time been losing confidence in general area bombing as an efficient means of attack upon industry. As the operational abilities of Bomber Command improved and as the requirement for a 'common denominator' target system became more apparent, so this confidence declined still further. Even while area bombing was regarded as operationally inevitable, the Air Staff had shown an increasing anxiety that it should be selectively applied to towns particularly associated with key points in the German war economy such as ball-bearings, aircraft and latterly oil production. Moreover, their advocacy of the oil plan showed that they no longer

regarded area bombing as always, or even generally, operationally inevitable for the main force over German targets.

The strategic arguments in favour of general area bombing of German towns had, therefore, been largely abandoned by the Air Staff, and it appeared that there might be only three principal objects in the final strategic air offensive; the oil campaign, already so strongly supported by the Air Staff, the communications campaign, now being prepared by Sir Arthur Tedder, and the final concentrated and catastrophic blow against morale which had been considered in the Air Staff memorandum of August 1944. There were, of course, sure to be diversions, and, perhaps, large diversions, from these three aims which would be made necessary by the tactical needs of the advancing armies, by the continuing activity of the war at sea and possibly also by other causes. There were also likely to be many occasions when the weather or the condition of the German air defences would make some other form of attack, including, perhaps, general area bombing, inevitable. All the same, it was difficult to see how, if the Air Staff viewpoint endured and prevailed, the main offensive effort of Bomber Command could in the future, as it had been in the past, be largely devoted to the general area bombing campaign. Nevertheless, in the final offensive, the principal effort of Bomber Command was devoted, not only to a resumption, but to a vast expansion of the general area campaign. The Air Staff viewpoint did, on the whole, endure, but at crucial moments it wavered and, therefore, for much of the time, it did not prevail.

While the direction of the strategic air forces was vested under General Eisenhower's authority, Sir Charles Portal could in so far as the strategy of Bomber Command was concerned, act only in an advisory capacity but, as a result of arrangements made in September, much, though not all, of his previous power was restored. On 1st September 1944 General Eisenhower assumed operational control of the armies in north-western Europe and moved his headquarters from Britain to France. Two days later British troops occupied Brussels and on 4th September they moved into Antwerp. On 8th September United States troops captured Liège. The campaign in France was virtually over and, as will be recalled, General Eisenhower had, on 6th September, declared what amounted to the ending of the heavy bombing offensive in France. The reasons for which the direction of the strategic air forces had been given to General Eisenhower had, at any rate to some extent, ceased to apply.

At this time Sir Charles Portal and his colleagues were in the Prime Minister's company on board the *Queen Mary* outward bound for the allied conference at Quebec. During the voyage, the Chiefs of Staff had regular meetings and Sir Charles Portal took the opportunity to suggest that the forthcoming conference would be an appropriate

occasion to propose to the Americans new arrangements for the direction of the strategic air forces. In a report, which he circulated to his colleagues on 9th September 1944, Sir Charles Portal argued that the preparatory and critical phase of *Overlord* had now passed. The allied armies were firmly established on the Continent and their operations were proceeding 'most favourably'. The need for the heavy bombers to afford direct support to the armies had, the Chief of the Air Staff said, 'greatly diminished' and, he was optimistic enough to suppose, it was unlikely in the future to require 'more than an occasional commitment or to absorb more than a fraction of the available effort'. Yet, as Sir Charles Portal argued, the Supreme Allied Commander was only concerned with direct support for land operations and not with the main strategic air offensive which was still referred to as *Pointblank*. Moreover, he was not responsible for activities on the Russian front, in the Mediterranean theatre or in the war at sea, though these were, or might soon become, concerns of the strategic air forces.

Experience had shown, Sir Charles Portal submitted, that the direction of the strategic air forces by the Supreme Allied Commander was 'unsatisfactory as a long-term arrangement'. As far as *Pointblank* was concerned, General Eisenhower 'necessarily' directed operations in accordance with target priorities laid down by the British and American Air Staffs, but this method of indirect control had, Sir Charles Portal claimed, resulted in 'considerable practical difficulties' in getting the priorities 'properly observed' by the operational commands. 'It is not possible under the present system', Sir Charles Portal stated, 'for the Air Staffs to keep the close day-to-day control of the activities of the bomber forces which is essential for the effective implementation of the agreed policy.' There was, Sir Charles Portal said, 'a striking illustration of the need for centralising control of all strategic bomber forces once again under the Combined Chiefs of Staff acting through the Air Staffs', and this, he suggested, was 'provided by the present offensive against enemy oil targets'. Sir Charles Portal continued:

'It has become abundantly clear over the past few months that the enemy is faced with an increasingly critical situation in regard to his oil supplies. To exploit his difficulties fully it is essential that the attack of his oil resources be pressed home at maximum intensity and on the widest scale possible. Any relaxation in the *tempo* of our attacks against his oil installations will provide opportunity for rehabilitation and dispersal. On the other hand, a successful campaign against enemy oil at this time may well have repercussions upon the enemy's ability to fight on the French, Italian and Russian fronts which may prove decisive. To ensure that the bomber effort available for the

attack of the enemy's oil supplies is directed to full effect, it is essential that control should be exercised directly through the British and American Air Staffs, who have jointly acquired the experience of planning and developing the Combined Bomber Offensive over the past two years. The weaknesses now appearing in the enemy's deteriorating economic structure can be exploited most rapidly and effectively in this way.'

Moreover, Sir Charles Portal observed, 'rapid developments in the strategic situation are now taking place. It may become desirable in the immediate future', he said, no doubt with his memorandum of August 1944 in mind, 'to apply the whole of the strategic bomber effort to the direct attack of German morale.' The psychological moment for this overwhelming blow could, Sir Charles Portal believed, best be determined by the Combined Chiefs of Staff and it could best be implemented if the latter 'exercised direct control of the strategic bomber forces'. Finally, Sir Charles Portal argued, the move of General Eisenhower's headquarters to France, which separated him from the British Air Staff and from the advisory organisations upon which it depended as well as from the operational commanders of the strategic air forces, meant that the Supreme Commander could not 'possibly exercise the fine control of the strategic effort now demanded by the rapid progress of events'.

Sir Charles Portal did not overlook the necessity of meeting in full what he evidently expected to be the diminished requirements of the land forces for direct air support. He proposed that the emergency requirements of the land battle should be accorded the first priority in any policy for the heavy bombers and that the control of these supporting operations should continue to be exercised by the Supreme Commander under the existing arrangements. The control of all other heavy bomber operations should, however, he submitted, be returned to the authority of the Combined Chiefs of Staff and exercised on their behalf by himself and General Arnold jointly. They, in turn, he suggested, should be represented 'for purposes of local consultation' by the Deputy Chief of the Air Staff, Sir Norman Bottomley, and the Commanding General, United States Strategic Air Forces, General Spaatz.¹

There was much force in these arguments but in some respects they were of a doctrinaire character. The suggestion that the control of the strategic air forces should be 'centralised' under the Combined Chiefs of Staff did not fully recognise the fact that in directing the strategic air forces as in everything else he did, General Eisenhower was no less an agent of the Combined Chiefs of Staff than Sir Charles Portal had been under the Casablanca arrangement or, with General

¹ Report Portal to C.O.S., 9th Sept. 1944.

Arnold, was to be under that now proposed. The suggestion that the new arrangement would confer upon the Combined Chiefs of Staff the power to direct the bombers, if such a course of action was decided upon, to carry out a final catastrophic blow against German morale was, for similar reasons, not wholly apposite. The Combined Chiefs of Staff already possessed such power which was subject only to the overriding political authority of the Prime Minister and the President. Even so, General Eisenhower's position as a commander in the field was, of course, quite different from that of Sir Charles Portal or General Arnold, who were not only agents of, but also members of, the Combined Chiefs of Staff.

The criticism of the Supreme Headquarters, Allied Expeditionary Force's control on the grounds that it led to difficulties in getting the *Pointblank* priorities 'properly observed' was hardly fair to General Eisenhower and to his Deputy, Sir Arthur Tedder. Sir Charles Portal himself had enjoyed only very limited success in getting these priorities observed, at any rate by Sir Arthur Harris, in earlier phases of the *Pointblank* campaign. It also seemed to be overlooked that one of the principal difficulties had been not so much in getting the priorities observed as in arriving at an agreed and clear definition of what they were and whether attack upon them was operationally feasible. Finally, it took no account of the undeniable fact that it was by arrangement with General Eisenhower and Sir Arthur Tedder respectively that General Spaatz and Sir Arthur Harris had, earlier in the year, embarked upon the oil offensive, which was now advanced as an important reason for curtailing their influence.

On the other hand, there was a certain logic in the suggestion that, on the eve of the greatest strategic air offensive in the history of war, the direction of the bomber forces should be placed in the hands of the supreme British and American air officers. Whether there was also wisdom in it depended upon whether the Air Staffs would succeed in exercising the 'fine control of the strategic effort now demanded by the rapid progress of events' which Sir Charles Portal believed General Eisenhower could not 'possibly exercise'.

The Chiefs of Staff, however, accepted Sir Charles Portal's argument and the only change made to his report as a result of their discussion was the introduction of a few words to safeguard the army support requirements of the Supreme Commander in the Mediterranean.¹ With that modification incorporated, the proposal was circulated for the consideration of the Combined Chiefs of Staff.²

¹ C.O.S. Mtg. on board *Queen Mary*, 10th Sept. 1944. At this meeting Sir Charles Portal suggested that if the Americans declined to accept the arrangement it should, nevertheless, be brought into effect in so far as Bomber Command was concerned.

² It was circulated on 12th September 1944 as a British C.O.S. memorandum for the Combined Chiefs of Staff.

General Arnold at once showed that he was unconvinced by its arguments. On being told by Sir Charles Portal, in answer to his question as to why the existing arrangement was considered to be unsatisfactory, that one of the reasons was the small size of Sir Arthur Tedder's Air Staff, General Arnold asked why large staffs were necessary to control strategic bombing. General Marshall thought that an arrangement might be made to detach a small part of the strategic air forces and place them permanently under the Supreme Commanders. Sir Charles Portal was, however, able to show that this might result in inadequate air support during an emergency and at other times in underemployment of the detached forces.¹ Within twenty-four hours, on 13th September, the United States Chiefs of Staff circulated a paper under the terms of which 'while not accepting all points' in the British memorandum, they did accept the command proposals which it contained. They were, however, dissatisfied with the draft directive which the British Chiefs of Staff had suggested should be sent to General Spaatz and Sir Arthur Harris.²

This British draft had opened with the phrase, 'The overall mission of the strategical air forces remains the progressive destruction and dislocation of the German military, industrial and economic system and the destruction of vital elements of lines of communication'. It had then listed the 'primary objectives' of the offensive as the petroleum industry with special emphasis on petrol including its storage, the ball-bearings industry, the tank industry and ordnance depots and the motor transport industry. The first two objectives were said to have an 'over-all importance' in the German war economy. The second two were said to have 'special importance' as affecting ground operations. Under the heading of 'other objectives' were then listed 'counter Air Force action' to which, in view of the decline of the *Luftwaffe*, less significance was attached than hitherto, 'direct support of land operations' which, in an emergency, were to have overriding priority and 'Berlin and other industrial areas', which were to be attacked 'by both Bomber Command R.A.F. and U.S.St.A.F.E. (the latter using blind bombing technique as necessary) whenever weather or tactical conditions are suitable for such operations and unsuitable for operation against the primary objectives'. Also under this heading were the usual provisos about targets in south-east Europe, Special Operations Executive activities and units of the German fleet.³

The United States Chiefs of Staff, however, felt that the directive should not be addressed to General Spaatz and Sir Arthur Harris,

¹ C.C.S. Mtg., Chateau Frontenac Hotel, Quebec, 12th Sept. 1944.

² Memo. U.S. J.C.S. for C.C.S., 13th Sept. 1944.

³ British draft directive attached as enclosure to C.O.S. memo. of 12th Sept. 1944.

but to General Spaatz and Sir Norman Bottomley in their capacity as representatives of General Arnold and Sir Charles Portal. In the first two paragraphs of the draft which they proposed, they, therefore, announced the command changes to which they had just agreed. They altered the phrasing of the paragraph defining the overall mission so as to include the 'direct support of land and naval forces' and instead of listing the four primary objectives which had appeared in the British draft they simply said that objectives were to be attacked 'in the order of priority now established by the Supreme Commander, Allied Expeditionary Force', and added that a new directive should be issued when it was decided to change these priorities. From the British list of 'other objectives', the American Chiefs of Staff omitted Berlin and other industrial areas.¹

In a further memorandum of 14th September 1944, the British Chiefs of Staff, however, insisted upon the inclusion of this heading though the word Berlin was now omitted and it read simply 'important industrial areas'. The British Chiefs of Staff at the same time suggested the addition of a new item: 'attacks in support of the Russian Armies'. Otherwise they accepted the draft submitted by the United States Chiefs of Staff, who, in turn, accepted both these British amendments.² The Combined Chiefs of Staff thus expressed, on British initiative, a clear intention of bringing their heavy bomber forces to bear in support of the Russian campaign. This was to be an important factor in the selection of targets. In its final form the directive was despatched to General Spaatz and Sir Norman Bottomley, on 14th September 1944.³

The American modifications, inspired in one respect no doubt mainly by the desire to guard the status of General Spaatz, had not improved the clarity of the directive especially as the priorities 'now established' by the Supreme Commander were by no means self-evident. There was no specific mention either of the oil campaign or the communications plan which were clearly the main alternatives lying ahead of the strategic bombers. Nor was there any mention of the morale plan which should not be confused with the proposal of general area bombing of 'important industrial areas'. The former, it must again be emphasised, was designed to be applied at a vital moment with a view to bringing the war to an immediate conclusion. The latter was intended as an alternative employment for the bombers when the weather or tactical conditions made it impossible to attack the primary targets. One was intended to be a concentrated blow of calamitous proportions. The other was a continuation of the

¹ American draft directive attached as enclosure to J.C.S. memo. of 13th Sept. 1944.

² Memo. C.O.S. for C.C.S., 14th Sept. 1944. C.C.S. Mtg., 14th Sept. 1944.

³ Dir. Portal and Arnold to Bottomley and Spaatz, 14th Sept. 1944, App. 8 (xxxix).

war of attrition. Thus, the *Octagon* directive, as it was called, shed little light upon the major issues of bombing policy, and its importance seemed to be largely confined to the formal announcement which it contained, of the new command organisation. But even this was of less significance than might be supposed.

General Eisenhower's powers of demand and control in matters relating to the direct air support of the armies were, as will have been noted, carefully preserved, but, though the formal arrangements appeared to eliminate the influence of Sir Arthur Tedder over the direction of strategic bombing policy, this was not by any means the actual effect which they had. On 13th September 1944, the day before he received the *Octagon* directive, Sir Norman Bottomley met Sir Arthur Tedder and Air Vice-Marshal Robb, the Deputy Chief of Staff (Air) at the Supreme Headquarters of the Allied Expeditionary Force, and General Spaatz at the latter's headquarters. It was agreed that the strategic air offensive should be directed firstly against oil, secondly against communications, and thirdly, in certain circumstances, against the *Luftwaffe*. The communications campaign was to consist partly of tactical operations near the fighting front but also of strategic attacks on targets, including vehicle production, deep in Germany. Special attacks on the *Luftwaffe* were to take place only if the oil and communications operations failed to produce an adequate German air reaction and, therefore, an adequate *Luftwaffe* casualty rate.¹ This agreement, in which Sir Arthur Tedder's communications plan figured so prominently, and not the *Octagon* directive, was, in fact, the basis of the directive for the control of the strategic air offensive which was issued by Sir Norman Bottomley and General Spaatz soon after they had received their instructions from Quebec. The mistake made at Casablanca of assuming that a vague declaration of policy by the Combined Chiefs of Staff would serve as a bombing directive to commanders in the field was not repeated.

The new directive was sent by Sir Norman Bottomley to Sir Arthur Harris on 25th September 1944 and it marked the beginning of the final air offensive. In it the Commander-in-Chief was told that 'first priority' was, 'subject to the exigencies of weather and tactical feasibility', to be accorded to the oil campaign. At equal 'second priority' came the German rail and waterborne transport systems, tank production plants and depots, ordnance depots, and motor vehicle production plants and depots. Counter air force action was mentioned but, for the time being, accorded no definite priority. The direct support of land and naval operations was said to be 'a continuing commitment' and the *Octagon* phrase about 'important industrial areas' was included. There was, however, no mention of

¹ Note by Robb for Air Min., and U.S.St.A.F.E., 17th Sept. 1944.

supporting the Russian armies. At the same time Sir Arthur Harris received a covering letter in which Sir Norman Bottomley described the new command arrangements and enlarged upon the methods by which direct support to the armies was to be afforded.¹

Oil had thus been officially designated as the principal aim of the strategic air offensive and communications had been placed among the secondary aims. In what ways these aims would govern Bomber Command's operations now remained to be seen.

¹ Dir. and letter Bottomley to Harris, 25th Sept. 1944, App. 8 (xl).

3. The problem of concentration October–November 1944

The prejudice against communications as a target for heavy bombers died hard and slowly. At Quebec Sir Charles Portal had said that communications offered good tactical targets for fighter and medium bombers, but that they were not a profitable strategic objective.¹ Soon afterwards, thinking no doubt of the tremendous consequences which had followed the strategic bombing of the French railways, he warned Sir Arthur Tedder that 'it would be dangerous to apply wholesale to Germany the lessons of France.'² Nevertheless, as has just been seen, Sir Arthur Tedder's views had been sufficiently influential to secure for communications a position among the second priorities in the directive of 25th September 1944. Nor had this related merely to tactical operations against communications in support of the land battle. It had related also to strategic operations against them which, as had been the case in France, might be expected to render the tactical operations more effective but which, as had also been the case in France, might have devastating effects upon industry as well, for industry was dependent upon communications.

Now that the allied armies everywhere stood on or near the German frontier and in some places even beyond it, an increasing difficulty arose of distinguishing between tactical operations against military communications which, by virtue of his position as Deputy Supreme Commander, Sir Arthur Tedder was still empowered to demand and, in the name of General Eisenhower, to control, and strategic operations against industrial communications, which, by virtue of the Quebec arrangements, were not a concern of Sir Arthur Tedder. This kind of difficulty, as has already been suggested, arose from the approach of military forces towards the zones of strategic air operations, and it was by no means associated only with communications targets but, in their case, the obscurity tended to be greater than in other cases such as oil plants or city centres. This obscurity, to some extent, accounted for the influence which Sir Arthur Tedder was still able to exert over the direction of the strategic air offensive in general and the communications campaign in particular.

Sir Arthur Tedder's belief in the efficacy of a German communications plan was not, however, the only challenge to the intention of the Air Staff to concentrate upon the oil campaign. There were other

¹ C.C.S. Mtg., 12th Sept. 1944.

² Letter Portal to Tedder, 22nd Oct. 1944.

factors, some of which, like the communications plan, had been accepted and recognised in the September directive, and some of which had not. Among the former were the firm commitment to continue army support operations, especially in times of emergency, and the direction to attack the sources of tank production. Among the latter were various American schemes for hastening the end of the war by means other than the bombing of oil production and, above all, the continuing faith of Sir Arthur Harris, expressed at this particular time, more in deeds than words, in the general area bombing offensive.

This challenge from the Commander-in-Chief was reflected in the activities of Bomber Command during October 1944. During that month a colossal effort was put forth. About 17,500 operational sorties were despatched and more than 13,000 of these were directed against targets in Germany. More than sixty-one thousand tons of bombs were dropped and over fifty-one thousand of these fell on German territory. This weight of attack was more than twice as great as the previous highest tonnage dropped on Germany by Bomber Command in a single month. On Duisburg alone, within the space of twenty-four hours, Bomber Command dropped about the same weight of bombs as the Germans had brought to bear against London in the entire war up to that time. Autumn weather was, of course, beginning to set in, but the versatility of Bomber Command, arising from the declining effectiveness of the German air defences and the increasing technical and operational abilities of the force, had grown almost beyond previous comparison. It was, as Sir Charles Portal was presently to tell the Prime Minister, 'well shown by the successful attacks carried out against industrial areas, synthetic oil plants, capital ships, U-boat bases, canals, sea walls and gun emplacements'. Nor were these developments confined only to night bombing. More than 4,500 of Bomber Command's sorties in October were carried out in daylight, and the cost of the whole of this vast and varied effort in terms of casualties was, by comparison with earlier standards, negligible. The overall loss rate amounted to 0.79 per cent of the sorties despatched. The losses against German targets only amounted to 0.8 per cent and even for the daylight operations the loss rate was only one per cent.¹

These figures give an indication of the extent to which the conditions of the strategic air offensive had been changed by the increased size and efficiency of Bomber Command, by the growth of allied air superiority and by the allied reoccupation of France. But though the versatility of the force was so clearly demonstrated, the effectiveness of the September directive was not. About two-thirds of

¹ Min. Portal to Churchill, 27th Nov. 1944.

the Bomber Command effort in October was devoted to a resumption of the general area offensive against German towns. There was no great concentration upon either oil or communications. Indeed, only about six per cent of the Command's tonnage for the month was devoted to oil targets and a smaller weight of attack was brought to bear upon them than had been delivered in the previous June, when oil had not figured in the directive and there had been an almost overwhelming diversion of the bombing effort in connection with the invasion of Normandy.¹ It was obvious that the September directive was not being carried out in the manner expected by Sir Charles Portal.

But, of course, the weather conditions of the autumn were not the same as those of the summer. Even so, as he presently revealed, adverse weather was by no means the only reason for which Sir Arthur Harris was reluctant to devote a greater part of his attack to oil targets. The directive was, perhaps, less clear than it might have been, but it was more incisive than most of its predecessors and scarcely left scope to doubt that oil was the principal objective and that city areas were an alternative to suit the exigencies of the weather. Army support was the cause of some diversion of effort, but from the total weight of bombs of over sixty-one thousand tons dropped by Bomber Command in October, less than seven thousand five hundred tons were, in fact, devoted to this particular purpose. Clearly the attitude of Sir Arthur Harris was a factor in this divergence between the pattern of Bomber Command operations during October and the terms of the September directive. But, as far as this aspect of the problem was concerned, Sir Charles Portal took no overt action until the month had run its full course.

In the meantime other, and somewhat less formidable, questions were considered. Among these was one which related to the machinery of target selection. This was an old problem in the solution of which it was necessary to reconcile the three primary factors of strategic intention, economic intelligence and operational ability, and the organisations designed to deal with it have been described elsewhere in this work. Now, however, the problem had grown yet more complex. The bombing offensive was no longer controlled by a single agent, as it had been by Sir Charles Portal under the Casablanca agreement, or by General Eisenhower between April and September 1944. This direction was now shared between Sir Charles Portal and General Arnold and, in effect, between their delegates, Sir Norman Bottomley and General Spaatz. Thus, the task of combining the allied air offensive, which had always been difficult, now became also elaborate. Moreover, there were increasing numbers of ministries, agencies and organisations seeking to attract to their various purposes

¹ Distribution of bombs in September (25th-30th), October, November and December 1944. A.M.W.R. Manual of Bomber Command Operations 1939-45.

the effort of Bomber Command and the United States Strategic Air Forces. In particular, the influence and requirements of the Supreme Headquarters, Allied Expeditionary Force could not be ignored.

For these reasons, which were not in themselves new but only more intense than before, it was decided to establish a new Anglo-American organisation, known as the Combined Strategic Targets Committee.¹ The intention was that it should act as a clearing house for submissions relating to bombing policy and issue weekly target priority lists for the guidance of Sir Norman Bottomley and General Spaatz.

Its ultimate value was considerable, but its initial activities, which were related chiefly to the oil plan, had no immediate or measurable influence upon the course of the air offensive as a whole, though the tendency of Bomber Command to concentrate upon city areas did not pass unnoticed.² Among the more complicated items which had been included in the terms of reference of the new committee was the question of how much of the strategic air effort ought to be diverted to the direct support of the armies in the field, but this was a problem which for some time had been attracting the anxious attention of Sir Charles Portal himself, especially since he had heard that General Marshall was thinking of putting forward some new proposals. These were apparently designed to make possible a supreme effort to finish the war with Germany by the end of 1944, but, according to Sir Charles Portal's information, their effect was likely to be a great increase of direct air support to the armies and a corresponding reduction in the scale of the strategic air offensive. This possibility was, as he explained to Sir Arthur Tedder on 22nd October, extremely unwelcome. He recognised that the armies should have 'whatever weight of heavy bomber support may be necessary' when about to undertake either 'an offensive that may be decisive' or 'a smaller attack which is really essential to the land campaign and which would be unlikely to succeed without the help of the strategic bombers', but, apart from these occasions, he thought that 'the proper application of the strategic bomber forces to targets behind the front is likely to shorten the war more than their application to the battlefield'. The anxiety which beset Sir Charles Portal was:

'. . . that the constant application of heavy bomber power to the land battle, when it is not essential and when its only purpose is to save casualties, must eventually lead to the demoralisation of the Army. If one division captures an objective with strong heavy bomber support and loses only a few men other divisions will naturally be reluctant to attack without similar support,

¹ Which is described below, p. 213 ff.

² C.S.T.C. Mins. 1st and 2nd Mtgs., 18th and 25th Oct. 1944. The Committee did, with some reluctance, begin at its second meeting to consider Sir Arthur Tedder's proposals for the communications campaign.

and we shall sooner or later reach a stage where almost the whole of the heavy bomber effort has to be frittered away in small packets if the Army is to attack at all'.¹

This was a serious possibility and it was not discounted by the Deputy Supreme Commander whose opinion Sir Charles Portal had invited. On the contrary, Sir Arthur Tedder admitted that the army was 'drugged with bombs'. The demoralisation, to which Sir Charles Portal had referred, was, in his view, already becoming evident. The 'repeated calls' by the Canadian Army for heavy bomber support in dealing with a battery on Walcheren and their evacuation of Breskens because of the 'intermittent harassing fire' from it was, in Sir Arthur Tedder's view, 'only too clear an example'. Nevertheless, since the British Army had for some months 'been allowed to feel that they can, at any time, call on heavy Bomber effort and that it will be laid on practically without question', it was, Sir Arthur Tedder said, 'going to be a difficult process to cure the drug addicts—particularly since the troops are undoubtedly getting pretty tired.'

Sir Arthur Tedder, with considerable reason, did not, however, regard these army expectations as the only *malaise* from which the strategic air offensive was suffering. He was evidently concerned about the actual conduct of the main offensive as well. He had, as he now told Sir Charles Portal, 'for some time been very uneasy about the way things were going', and though he knew that his views would 'not be acceptable in some quarters' he thought that 'the time for debates and compromises is past. In my opinion,' he said, 'we can only make the full weight of our Air power felt if we set all our various Air Forces to work at once towards one common objective; if we do that,' he concluded, 'I believe Air power will be decisive—and quickly'. To show his view of this 'common objective' Sir Arthur Tedder enclosed a memorandum.²

There were, Sir Arthur Tedder said in the opening paragraph of this memorandum, two methods of ending the war; one was by military invasion and the other was by strategic bombing, but he did not regard them as alternatives, nor did he think that they need conflict with each other. On the contrary, he regarded them as complementary. He did not believe 'that by concentrating our whole Air effort on the ground battle area we shall shorten the war. Nor do I believe that we would shorten the war by putting our whole Bomber effort against industrial and political targets inside Germany'. As far as the land campaign was concerned, the immediate objective was the Ruhr. The Army commanders wished to use air power to disrupt the flow of German reinforcements and supplies across the Rhine and

¹ Letter Portal to Tedder, 22nd Oct. 1944.

² Letter Tedder to Portal, 25th Oct. 1944.

also, as a secondary object, to hinder the withdrawal of heavy equipment back across the Rhine, but the only direct strategic contribution made towards the fulfilment of these aims had, Sir Arthur Tedder said, been the oil offensive, the attack on the Dortmund–Ems Canal and some operations against ordnance and motor transport depots. Tactical air operations had included some railway-line cutting by bombers, firing upon trains by fighters and some mainly unsuccessful attacks on bridges. ‘I am not satisfied’, Sir Arthur Tedder said, ‘that, on these lines, we are using our Air power really effectively. The various types of operations should fit into one comprehensive pattern, whereas I feel that at present they are more like a patchwork quilt.’

Equally ‘patchwork’, it seemed to Sir Arthur Tedder, was the pattern of the strategic air offensive. Oil targets, city areas, depots, marshalling yards, canals, factories, and so on, did not, in his view, ‘build up into a really comprehensive pattern’. Having thus suggested the extent to which the strategic air offensive and the air effort in direct support of the armies lacked a design and a relationship, Sir Arthur Tedder turned to the controversial question of what ought to be done. ‘The one common factor in the whole German war effort, from the political control down to the supply of troops in the front line, is’, he said, ‘communications’, and these, he suggested, should be the ‘primary Air objective’. The attack should fall on road, rail and canal communications. The oil plan, Sir Arthur Tedder now admitted, in addition to restricting air movement, was the key to the paralysis of the roads, but the railways and canals could be directly attacked, as, in the former case, they had been in France and, in the latter, when the banks of the Dortmund–Ems Canal had more recently been successfully breached.

Sir Arthur Tedder did not think it necessary to spread these operations all over Germany. The main strategic concentration should, he thought, be against the rail centres, oil plants, canal system and centres of population in the Ruhr. Similar targets could be selected in the areas of the middle and upper Rhine so that the offensive could continue when the weather over the Ruhr was impossible. These strategic operations, Sir Arthur Tedder believed, would greatly increase the effectiveness of the tactical attacks on railway embankments, trains, motor vehicles and bridges by which they would be complemented. Both the strategic and tactical air forces would ‘be operating towards one objective’ and this, Sir Arthur Tedder believed, would ‘rapidly produce a state of chaos which would vitally affect not only the immediate battle on the West Wall, but also the whole German war effort.’¹

These views, which in many respects were a logical extension of

¹ Memo. Tedder to Portal, 25th Oct. 1944, App. 25.

those put forward by Sir Arthur Tedder earlier in the year when the role of air power in operation *Overlord* was being debated, were of great significance. They showed the extent to which Sir Arthur Tedder was preoccupied with the need to concentrate and relate not only the various elements of air power varying from light short-range fighters to heavy long-range bombers upon a single object, but also the whole contribution of air and land power. It is impossible to know what the effect of such a concentration of this enormous power would have been because it was never achieved. As Sir Arthur Tedder had expected, his views were not everywhere acceptable, but they did, nevertheless, exercise a great influence upon the course which events were about to take.

One of the disadvantages of accepting Sir Arthur Tedder's advice, which was apparent both to the members of the Combined Strategic Targets Committee and to the Air Staff, both of whom were, in this matter, much influenced by Air Commodore Bufton, was the effect which it would have upon the oil plan, which had for some time been regarded by the Air Staff as a fundamental and potentially war-winning target system. Sir Arthur Tedder's communications plan was not apparently designed to displace the oil plan, which was to remain the first priority, but it was, all the same, in the view of the Air Staff, likely to compete with it. Sir Arthur Tedder's advice had indicated that the oil attacks should be confined mainly to the area of the Ruhr, but there were, of course, many supremely important oil plants, such as those at Leuna and Pölitz to mention only two, which lay far beyond that district. Moreover, as he had specifically made clear in his letter of 25th October to Sir Charles Portal, Sir Arthur Tedder did not envisage these oil attacks as amounting to much more than 'policing' operations. Yet the clear implication of most of the intelligence reports, including those of the Joint Intelligence Committee, was that a really heavy and sustained onslaught was required owing to the ingenuity and the speed with which the Germans, under Geilenberg's direction, could get damaged installations back into at least partial production.¹

In view of the ultimate outcome of the oil offensive, it may be thought that, in his preoccupation with communications bombing, Sir Arthur Tedder had failed fully to appreciate the significance of the oil plan. On the other hand, in view of the eventual strategic and tactical achievements of the communications campaign, there can be no doubt that the Air Staff was slow to realise the real force of Sir Arthur Tedder's argument. Oil and communications thus still appeared to be competing target systems and the extent to which this was so was clearly shown in the development of a plan known as

¹ A J.I.C. Report of 30th October 1944, for example, made this point again, see App. 26.

Hurricane I. This was designed to deal a crushing blow at the immediate object of the land offensive, namely the Ruhr, and in some respects it corresponded with the viewpoint of Sir Arthur Tedder. It provided, at least geographically, for a concentration of the efforts of Bomber Command, the Eighth Air Force, the Tactical Air Forces and, if possible, also the Fifteenth Air Force. The object was to cause mass havoc, panic and disorganisation in the Ruhr valley, to disrupt the immediate German front-line communications by driving the rail heads back east of the Rhine and to demonstrate to the Germans the futility of further resistance. Thus, the plan had a moral as well as a material aim. It was to be executed in daylight with massive fighter cover and the idea was that the Eighth Air Force should aim at oil plants, Bomber Command at built-up areas and the Tactical Air Forces at communications targets. The plan showed that there was no real intention to achieve a functional concentration and it was, perhaps, by more than a coincidence that each of the elements involved was to attack targets which corresponded with the wishes of the various Command Headquarters concerned. There was, however, no doubt as to the extent of the concentration in time and space which was intended. Within one or two hours, some two thousand five hundred heavy bombers were intended to appear over the Ruhr with no less than 12,000 tons of bombs, and it is interesting to note that the Bomber Command aircraft were to be armed with high-explosive bombs which it was now thought would, 'as opposed to incendiary attack . . . inflict heavy casualties'.¹

This plan owed something to the wishes of the Army Commanders, but it also bore a generic similarity to the blow of catastrophic force which Sir Charles Portal had outlined in the previous August as a possible means of influencing the war-will of the German High Command. Nevertheless, the Air Staff did not regard it as an alternative to the oil plan which they thought should still provide the principal precision target system of the strategic air offensive. Neither the object of shattering German morale nor of disrupting German communications should, they thought, be allowed to interfere with the primary task of draining the enemy's oil resources, and communications bombing, they frequently affirmed, should in any case be largely confined to tactical operations near the military front.²

Such, broadly speaking, was the view of the Air Staff before Sir Arthur Tedder's memorandum of 25th October 1944 was received and such, as will presently be seen, it substantially remained afterwards. But the policy of the Air Staff, or that of Sir Arthur Tedder, or of the compromise between the two which was eventually achieved,

¹ Dir. Bottomley to Harris, 13th Oct. 1944, App. 8 (xlii). Air Staff note, 2nd Oct. 1944.

² Air Staff note, 2nd Oct. 1944, and other papers.

depended for execution, in so far as the most destructive element of allied air power was concerned, upon the orders of the operational commander concerned, namely, Sir Arthur Harris, and Sir Arthur Harris, as will also presently be seen, was equally sceptical of both plans. Nor, as the pattern of Bomber Command operations in October had shown, was Sir Arthur Harris' scepticism a factor of anything less than the first importance.

In the meantime, the directive was felt to be in need not only of observance but also of revision, and on 1st November 1944 a new one was issued by Sir Norman Bottomley and General Spaatz. It closely followed the lines of its predecessor and oil was again accorded the position of 'first priority'. Communications, however, became the only 'second priority' and the wording of the clause showed a significant change. 'The operations of the Strategic Air Forces based in the United Kingdom are to be directed against enemy lines of communication, with particular emphasis upon the Ruhr'. This offered a somewhat more restricted prospect than had been indicated in the corresponding clause of the September directive which, without mentioning any particular area, had referred to the 'German rail and waterborne transportation systems'. Moreover, the different phrasing of the two clauses was significant. The 'enemy lines of communication' might be taken to imply a largely military and tactical objective, whereas the 'German . . . transportation systems', perhaps, suggested an industrial and strategic target system.

Tank and motor transport production plants and depots which, with ordnance depots, had been included in the second priority of the September directive, were now omitted, with the result that in the new directive there were only two main targets; oil at the first priority and the enemy lines of communication at the second. The status of the oil plan was accordingly somewhat increased, but this was not all. The only other important change which the new directive showed by comparison with its predecessor was in the clause dealing with 'important industrial areas', and this too strengthened the position of the oil plan. These area bombing targets were, as had previously been the case, accorded no priority and, as had also been the case in the September directive, they were included as objectives for attack 'when weather or tactical conditions are unsuitable for operations' against the primary targets. Now, however, an additional proviso was added. 'As far as operational and other conditions allow', it was stated, these area bombing attacks were 'to be directed so as to contribute to the maximum destruction of the petroleum industry and the dislocation of the target systems indicated above'.¹

¹ Bottomley and Spaatz Directive No. 2, 1st Nov. 1944, App. 8 (xlili(b)). The only other 'target systems indicated above' consisted of that embracing 'The German lines of communication'.

This, it may be thought, was a fairly clear directive but, in a covering letter to Sir Arthur Harris, Sir Norman Bottomley, on behalf of the Air Staff, sought to make it clearer still. Oil, he said, 'continues to hold the highest priority so as to prevent rapid recovery which would immediately be reflected in the enemy's strength and war economy'. As to the communications campaign, Sir Norman Bottomley emphasised that it was to be undertaken 'in conjunction with, but subordinate to the offensive against oil targets'. He also said that the tank, motor transport and ordnance depots and plants had been dropped from the directive in order to reduce the diversion of effort from the oil and communications plans. With regard to the choice of area bombing targets, Sir Arthur Harris' attention was particularly drawn to the Ruhr, and he was reminded of the objects for which operation *Hurricane I* had been designed.¹

The clarity of the November directive, especially when it was associated with the reinforcing phrases of Sir Norman Bottomley's covering letter, was undoubted. There was no room, as there had been in most previous bombing directives, for conjecture as to what was meant. But clarity was not, of course, the only ingredient of a good directive. After all, the directive of 15th January 1941, which had also set oil in the position of first priority, had done so with even greater incisiveness than was now found appropriate. Among the many requirements of a good directive, realism was clearly an important factor, and this could only be achieved if the intelligence upon which the plans were based was reasonably accurate and, equally, if the plans took adequate account of the operational limitations of the force which was to carry them out. About these matters there was much room for disagreement, but in pinning their faith to the oil plan in November 1944 there can be no doubt that the Air Staff were acting upon intelligence which was fundamentally, though not, of course, in all details precisely, correct. Nor can there be much doubt that they were requiring of Bomber Command no more than this great force now had the operational strength and ability to perform. This, however, did not necessarily mean that the major part of the Bomber Command aim would now be devoted to the oil campaign. Between the selection of the aim and its actual pursuit there are usually many difficulties, and in this case, as will now be seen, they were of a particularly intractable nature.

¹ Letter Bottomley to Harris, 1st Nov. 1944. For the rather caustic marginal comments on this letter made by Sir Arthur Harris, see App. 8 (xliii(a)) where the letter and the comments are printed.

4. The reward of dissension November 1944-January 1945

At the Quebec Conference in September 1944 the allied cause in Europe had seemed to be on the verge of fulfilment. The greatest amphibious operation in the history of war had been successfully accomplished by a union of the air, sea and land power of the Anglo-American coalition. A victorious and relatively inexpensive campaign in France had subsequently been brought almost to a conclusion and little more than Germany herself was left between the allied and the Russian armies. Even in the neglected Italian campaign the German position was becoming desperate. Moreover, as a result of the loss of so much of her occupied territory in the west and the decline of her air defences, the heart of Germany was exposed to the power of the strategic bomber forces which, after years of painful endeavour, had grown to maturity in the Royal Air Force and the United States Army Air Forces. Final victory in Europe, which had long been inevitable, now seemed also to be imminent. But at this critical moment allied strategy faltered. Where there should have been agreement, there was dissension, where there should have been decision, there was compromise and where there should have been concentration, there was dispersal. Thus, at the end of the year, when peace in Europe might have been imminent, there was still the prospect of months of war.

This work is not concerned with the tragic consequences of this failure nor with all the strategic and political factors which contributed to it. It is concerned only with one of the elements, namely, the strategic air offensive. All the same, this was a fundamental element, for it seems at any rate possible that the action of heavy bombers could have decided the issue in the sense of enabling other forces to end the war in the first months of 1945. The opportunity was singular. Tremendous striking power was available. Undreamt-of versatility had been acquired. Command of the air had been won. Huge armies stood ready to exploit the injuries which could be inflicted. Already, even after the limited effort which had been devoted to it, the German oil position was one of acute crisis.

The bombing offensive could not, of course, be concentrated exclusively upon anything. Some division of effort between the strategic and tactical roles was still inevitable. Even a measure of defensive bombing might be required and would certainly be asked, for the Germans, even at this stage, led the world in the development of high-speed flight, of unmanned missiles, which found such a sinister

expression in the V2 rocket, and of submarines. Moreover, the weather would, as always, present difficulties which were likely to become greater as winter approached, and the German defences, though mastered, could not be ignored. Even the full application of Sir Arthur Tedder's common denominator theory could not, in practice, prevent a degree of dispersal. Nevertheless, the opportunity for concentration was greater than ever before. Further radar aids and other kinds of device were coming either into service or into more general service and they marked another advance in the struggle with the weather and in the effort to increase the accuracy of bombing. The German day fighter force had been largely neutralised by the associated action of the United States day bombers and long-range fighters and the German night fighter force could no longer operate effectively or consistently since it had lost the bulk of its early warning infrastructure. Both forces were also now acutely short of fuel for training and even for operational purposes. Thus, as a factor in preventing concentration and in delimiting the gulf between what could and what ought to be done, the operational limitations of the allied bomber force had become appreciably less important. But the differences of opinion between those with the power to influence the course of bombing policy had become correspondingly more important.

As far as Bomber Command was immediately concerned, the power of direction was, as has been seen, principally divided between Sir Charles Portal, Sir Arthur Tedder and Sir Arthur Harris, with the result, as has also been seen, that there were three principal policies before Bomber Command, namely, the oil plan, the communications plan and the general area offensive. The first two were not, however, necessarily alternatives since both could be carried out, at least in substantial measure, at the same time. The difficulty raised by these two plans was really not so much that of deciding between them but that of appraising a target system as complicated as communications.¹ Such differences of opinion as existed between Sir Charles Portal and Sir Arthur Tedder were, therefore, not the cause of fundamental disadvantage. On the contrary, their nature was shown by the ultimate outcome of the final offensive to have been particularly fortunate. The issue between Sir Charles Portal and Sir Arthur Harris was, however, quite different. A certain amount of area bombing was, of course, inevitable if the offensive was to be constantly maintained. Moreover, as has been shown, an element of area bombing was included in the communications plan, notably in the case of the Ruhr, and area bombing could, and, in fact, did, make an

¹ For this problem of appraisal and the difference of opinion which existed about it, see below, Chap. XIV.

important contribution in many other ways both to the oil and communications plans. Even so, the general area offensive, because of the scale on which it necessarily had to be waged, was far more of an alternative to the oil and communications plans than either of them were to each other. Nor did general area bombing, which sought its results from a cumulative effect, have any connection with the plan for a sudden and catastrophic blow which, as will be recalled, had been envisaged as a possible *coup de grâce* to German morale. Thus, the disagreement between Sir Charles Portal and Sir Arthur Harris was of fundamental importance.

The basis of it could, Sir Charles Portal had told the Secretary of State for Air in January 1944, 'be accurately described by the saying that the Air Staff advocate throwing the weight of Bomber Command round about the weak places in the German structure, whereas the A.O.C.-in-C. believes more in piling the maximum on to the structure as a whole'.¹ At the time, before the development of precision bombing techniques in the French railway campaign which Sir Arthur Harris found so surprising, before the decline of the German fighter forces and before other developments of almost equal importance, this was, perhaps, no more than a slight understatement and over-simplification of the real situation. After all, at that time, the Battle of Berlin was still joined and its outcome, though it could, perhaps, be predicted, was not yet certain. The attitude of the Air Staff was neither unanimous nor definite and the various pronouncements of Sir Charles Portal showed more hesitation and less conviction than those of Sir Arthur Harris. But by November 1944 the issue had become more sharply focused. By then, the oil plan seemed to the Air Staff clearly to offer the prospect of decisive results, and, also in their view, the means of executing it seemed equally clearly to be at hand. Nevertheless, the increased conviction and clarity with which the Air Staff presented their case did not have a corresponding effect upon Sir Arthur Harris, with the result that what had previously been a difference of opinion now became a serious dispute. Nor was this dispute ever resolved, and there can be no doubt that it diminished the effectiveness of Bomber Command in the final phase of the war.

It may seem curious that such a dispute between the Chief of the Air Staff and a Commander-in-Chief could endure in this way without either a solution being reached or a change in command taking place. The ultimate responsibility for its consequences must, of course, be attributed to the senior of the two protagonists, Sir Charles Portal, who, it may be judged, should either have changed or enforced his view. Nevertheless, the explanation undoubtedly lies in the

¹ Min. Portal to Sinclair, 29th Jan. 1944.

character and prestige of Sir Arthur Harris. These were such that the Commander-in-Chief could not be prevailed upon to change his mind and, even then, could scarcely be removed from his command. Before considering the course of this dispute, it is, therefore, appropriate to reflect upon the underlying causes of the deadlock.

Sir Arthur Harris had assumed his command at a time when the force was in dire need of inspired leadership. Its operations up to February 1942 had revealed themselves as gravely disappointing to anyone who knew anything about them. Confidence in the future of Bomber Command had seriously diminished in high, as also sometimes in public, places. Thus, the force, which represented the original and fundamental idea behind the creation of the Royal Air Force as a separate service, was in danger of eclipse before it had received many of its basic requirements such as more effective aircraft, better bombs, and radar guidance, and also at a time when the American air generals were striving for acceptance of related ideas in the preparation of their own strategic air forces. Nor was it only from above that Bomber Command was threatened. Its effectiveness ultimately depended upon the behaviour of the crews who manned it and, though the morale of the force was by no means broken, there were signs that it was delicately poised. Severe casualties had been sustained and little compensating success had been achieved. The public showed little appreciation either of the hazards or the hardships which confronted those who night after night embarked upon what was often a fruitless search in the dark.

Moreover, Sir Arthur Harris, unlike some more fortunate commanders, did not inherit a force which, while still appearing to be in the doldrums, had, in fact, surmounted its growing pains. In some respects, it is true, Bomber Command was, in February 1942, upon the verge of significant advances. The Lancaster was about to come into operational service and the introduction of *Gee* was imminent. To this extent things were getting better, but in other ways, apart from the facts that for so long so few Lancasters were available and that, in some ways, *Gee* was a disappointment, things were getting worse. The German night fighter force, for example, was growing incomparably more effective and Bomber Command casualties were more likely to rise than to decline. The great material reinforcements which had once been expected from the United States had also been gravely curtailed. It was not, indeed, until after Sir Arthur Harris had been at High Wycombe for a whole year and Bomber Command had at last received substantial numbers of Lancasters and had to some extent been equipped with *Oboe*, *H2S* and efficient marker bombs that the whole prospect began to change. Yet, in the meantime, dynamic leadership had achieved a conversion of Bomber Command. The morale of the crews had been restored and raised. The

confidence of the Government and, in particular, of the Prime Minister, had been regained. The world knew of the Thousand Bomber Raid on Cologne. Such was the initial and immeasurable achievement of Sir Arthur Harris as Commander-in-Chief. But this great man defied most of the rules which can generally be applied to successful commanders.

Sir Arthur Harris was rarely seen by his aircrews and by the great majority of them, never, for he seldom left the remoteness of his headquarters at High Wycombe. Nevertheless, the strength of the Commander-in-Chief's personality penetrated and pervaded the whole force where it mingled with and, perhaps, to a great extent, created, the spirit of Bomber Command. In legend, Sir Arthur Harris was seen by his men as a forceful, ruthless, single-minded and great leader, able and willing to chastise the enemy, to secure rewards for those who did their duty and condign punishments for those who did not. Nor, perhaps, was the legend far removed from the fact. The response was inevitable and it was enduring. To the Commander-in-Chief was given, in all but miraculously few cases, an absolute obedience, and in him was reposed an absolute confidence which lasted until the end. The judgement of him by his men as a great commander to be held in awe and also in affection was just and intuitive. Though there will be many who still wonder how Sir Arthur Harris achieved this transformation of his Command, there will be none who can deny that a transformation is what he did achieve.

The stimulating impact of Sir Arthur Harris' personality was not, of course, restricted to his own Command. Because of the effect which it had there, and also on its own account, it was much more widely spread than that and it is hardly surprising that an intimate relationship sprang up between the Commander-in-Chief and the Prime Minister. This was nourished by many informal meetings at Chequers and by a personal correspondence in the course of which Sir Arthur Harris frequently expressed his views upon great issues, often without prior reference to the Air Staff. Thus was the position of the Commander-in-Chief *vis-à-vis* the Air Staff enhanced beyond the theoretical limits of the constituted system of command. Though it did not last until the end of the war, this relationship with the Prime Minister was an important factor in the extraordinary position which Sir Arthur Harris occupied. Mr. Churchill always displayed an anxiety to get into direct touch with and to learn at first hand the views of the various Commanders-in-Chief, but in no other case was the opportunity for a continuous contact so favourable as in this. It was not only that the characters of the two men were cast in such a way as to make mutual respect likely, but High Wycombe was separated from Chequers by no more than a short motor journey. Never, indeed, in British history had such an important Commander-in-Chief been so

continuously close to the centre of government power as Sir Arthur Harris was to Mr. Churchill.¹

Sir Arthur Harris' prestige did not depend upon a reputation for good judgement. He had, after all, opposed the introduction of the incendiary technique, the creation of the Pathfinder Force and the development of the bomb with which the Möhne and Eder dams were breached. He had confidently supposed that the Battle of Berlin could win the war, and he had declared that Bomber Command would be operationally incapable of carrying out the French railway campaign. In all these, and many other judgements, he had been shown to be, or at least by his superiors been supposed to be, wrong and he had repeatedly been overruled, in theory if not always in practice. On the contrary, his prestige depended upon great acts of courage like the launching of the Thousand Bomber Raid and, above all, upon the undying spirit with which he had mysteriously imbued the whole of Bomber Command. His great qualities, without which he would assuredly have failed in 1942, were the fearless conviction with which he approached his tasks and the single-minded courage with which he carried them out. It was his power of command and unshakable determination which distinguished him as a giant among his contemporaries. But these priceless and rare qualities inevitably found their reflections in serious and inconvenient defects.

Sir Arthur Harris made a habit of seeing only one side of a question and then of exaggerating it. He had a tendency to confuse advice with interference, criticism with sabotage and evidence with propaganda. He resisted innovations and he was seldom open to persuasion. He was sceptical of the Air Staff in general, and of many officers who served upon it he was openly contemptuous. Seeing all issues in terms of black or white, he was impatient of any other possibility, and having taken upon himself tremendous responsibilities, he expected similar powers to be conferred. Only while serving under the 'direction' of General Eisenhower did he really subordinate himself. From the British Air Staff he required to receive absolute and unquestioning confidence or dismissal. In the event he received neither, but because of the policy which he advocated and the prestige which he had acquired this was, perhaps, not surprising.

With these fundamental considerations in mind, it is now possible to proceed and to consider the measures taken by the Air Staff in an attempt to enforce the terms of the directive issued by them, and by General Spaatz, on 1st November 1944. It will be remembered that a short time before this Sir Charles Portal had sought the advice of

¹ Air Vice-Marshal Kingston McCloughry suggests that one of the consequences of these informal meetings at Chequers was '... a good deal of sniping and lobbying against the Transportation Plan in high circles'. This refers to the period before the launching of *Overlord*. See *The Direction of War*, (1955), p. 125.

Sir Arthur Tedder and that the latter had sent him a memorandum in which the principles of a common denominator bombing offensive were outlined and strong arguments in favour of a communications campaign were advanced. The sense of this memorandum, in which the oil plan was only a secondary consideration, did not, of course, by any means entirely correspond with the prevailing wishes of the Air Staff, but it was, nevertheless, a somewhat severe criticism of the policy being carried out by Bomber Command and it was, perhaps, for this reason and also, no doubt, in the expectation that it would serve as a kind of sounding board, that Sir Charles Portal sent a copy of it to Sir Arthur Harris. Whether this was the intention or not, it was certainly the result, and it was Sir Arthur Tedder's memorandum which set in motion an exchange of opinions between Sir Arthur Harris and Sir Charles Portal which became increasingly acrimonious and which was the key to the closing stages of the final offensive.

As might have been expected, Sir Arthur Harris was not favourably impressed by the criticisms and suggestions of the Deputy Supreme Allied Commander, but, in his reply on 1st November 1944, the Commander-in-Chief did not confine himself to rebutting them. He also clearly had it in mind to rebut other arguments which he must have known were on the point of being expressed by the Air Staff. Once again, Sir Arthur Harris inveighed in his familiar style against the possibility of imparting any sort of detailed pattern or set schedule to the bombing offensive other than those required for the general area destruction of the leading German cities. He insisted upon the ignorance of those 'outside the immediate Command' as to the 'decisive effect' of weather and tactical factors. He enlarged upon what he still regarded as the necessity of spreading and dividing the offensive in order to spread, divide and deceive the German defences and, without mentioning the spectacular decline upon which the *Luftwaffe* had now entered both by day and night, he claimed that the 'comparative freedom from casualties' which Bomber Command had recently enjoyed had been 'mainly due to foxing the enemy by such methods'. To illustrate the point Sir Arthur Harris referred to the successful attack which had been carried out on the Dortmund-Ems Canal and remarked that the next related and logical target would be the Rothensee Ship Lift, but he said he could not despatch his specialised force upon that task without giving it 'very heavy cover'. He went on to explain that the 'very heavy cover' required would mean 'putting an incendiary and H.E. attack of great weight on some neighbouring city such as Magdeburg or Halle—or both'.

This novel and ingenious reason for continuing the general area offensive on an apparently operational argument was not very convincing. It ignored the decline in the effectiveness of the German defences and it overlooked the fact that when it was intended to

divert the German defences, the normal method was to mount a comparatively small-scale feint, to make a number of attacks on widely separated targets, or to employ ruses in the approach of the main attack itself. The suggestion that in order to attack the Rothensee Ship Lift it was also operationally necessary to destroy Magdeburg and Halle was, in fact, somewhat unconvincing, but it did at least have the merit of making abundantly clear Sir Arthur Harris' strategic intentions. Magdeburg and Halle, as he stated later in the same letter, were now, in fact, the two towns which stood at the head of those listed by Sir Arthur Harris for destruction. But Sir Arthur Harris did not rest his case solely upon what were given the appearance of being operational arguments. 'In Bomber Command', he said, 'we have always worked on the principle that bombing anything in Germany is better than bombing nothing'. This, indeed, was an important principle, but it was no longer thought by the Air Staff to be sufficient.

Another difficulty in the way of building the offensive into 'a real comprehensive pattern' which occurred to Sir Arthur Harris was 'the number of cooks now engaged in stirring the broth'. He bitterly complained of the conflicting demands made by the 'panacea mongers', the Admiralty, whom he accused of resuscitating a U-boat threat, and the Special Operations Executive. Bomber Command, he said, had to steer a sort of *via media* through the maze, but in the concluding passages of his letter Sir Arthur Harris made it clear that he intended this *via media* to take the form of a reinvigorated general area offensive. Bomber Command had, he claimed, 'virtually destroyed', within the last eighteen months, forty-five out of the sixty leading German cities. Despite the 'invasion diversions', he had, he said, succeeded in maintaining a destruction rate of two and a half cities per month and in starting the destruction of many others. 'Are we now to abandon this vast task which the Germans themselves have long admitted to be their worst headache', Sir Arthur Harris asked, 'just as it nears completion?' All that was now required, he said, was the destruction of Magdeburg, Halle, Leipzig, Dresden, Chemnitz, Breslau, Nuremberg, Munich, Coblenz and Karlsruhe and the further destruction of Berlin and Hanover.

It seemed obvious to Sir Arthur Harris that this task could be performed without denying to the army any of the direct support it required, and it seemed to him that its accomplishment would 'do more towards accelerating the defeat of Germany than the armies have yet done—or will do'.¹ However this might be, it was, of course, equally obvious that Sir Arthur Harris' plan could not be completed without continuing to emasculate the oil plan. Indeed, Sir Arthur Harris'

¹ Letter Harris to Portal, 1st Nov. 1944.

reaction to Sir Arthur Tedder's memorandum consisted not only of an unrepentant defence of his grounds for neglecting the bombing directive of 25th September 1944, but also of a defiant challenge to any further directives of that nature in the future.

Such a situation could not, of course, be accepted by Sir Charles Portal. 'At the risk of your dubbing me "another panacea merchant",' he wrote to Sir Arthur Harris on 5th November 1944, 'I believe the air offensive against oil gives us by far the best hope of complete victory in the next few months'. In the oil campaign, which he described as a battle between destruction and repair, Sir Charles Portal did not believe that the bombers could afford to give 'a single point away over and above the many that we shall be compelled to give away in direct support of the land forces and in deference to the Admiralty's uneasiness about the coming U/Boat offensive'. He said that 'in the light of all available intelligence I feel that the whole war situation is poised on "oil" as on a knife edge, and that by a real concentration of effort at this time we might push it over on the right side'. Failure to concentrate in this manner might well, Sir Charles Portal told Sir Arthur Harris, 'prolong the war by several months at least'.¹

In his reply on 6th November 1944, Sir Arthur Harris was principally concerned with a somewhat lengthy explanation of the reasons which had recently led him to order major attacks upon Cologne and Bochum, both of which had been questioned by Sir Charles Portal on the grounds that neither target had any connection with the oil plan. Though he again questioned the accuracy of the intelligence upon which the oil plan was based and though he once more emphasised his view of the operational difficulties which stood in the way of its execution, the Commander-in-Chief did, nevertheless, make some apparent concessions. He told Sir Charles Portal that he agreed 'about the urgency and effectiveness of the oil plan', and he regretted that it should be thought that he did not 'understand the importance of the oil war, because that is entirely wrong'.² Sir Charles Portal, however, evidently and, perhaps, excusably, had some difficulty in reconciling these assurances with the earlier comments of Sir Arthur Harris and also, no doubt, with the actual conduct of Bomber Command operations. At any rate, in a further letter of 12th November 1944, the Chief of the Air Staff sought to penetrate to the foundations of the issue. He admitted the difficulties which confronted the Commander-in-Chief in attempting to reconcile the factors of weather, tactics and target priorities and he conceded that the decision 'must lie with you alone'. On the other hand, it was, he said, his duty to see that Bomber Command lost no opportunity of

¹ Letter Portal to Harris, 5th Nov. 1944.

² Letter Harris to Portal, 6th Nov. 1944.

'attacking the primary targets which are laid down in the directive'. The issue, he continued, was a more fundamental one than the question of whether in two instances, namely the Cologne and Bochum operations, Sir Arthur Harris had taken a right or a wrong decision. It, in fact, Sir Charles Portal now suggested, was concerned with broader matters. 'In the closing paragraphs of your letter of 1st November', Sir Charles Portal wrote:

'you refer to a plan for the destruction of the 60 leading German cities, and to your efforts to keep up with, and even to exceed, your average of 2½ such cities devastated each month; I know that you have long felt such a plan to be the most effective way of bringing about the collapse of GERMANY. Knowing this, I have, I must confess, at times wondered whether the magnetism of the remaining German cities has not in the past tended as much to deflect our bombers from their primary objectives as the tactical and weather difficulties which you described so fully in your letter of 1st November. I would like you to reassure me that this is not so. If I knew you to be as wholehearted in the attack of oil as in the past you have been in the matter of attacking cities I would have little to worry about.'¹

These direct expressions of view by Sir Charles Portal which were supplemented by official communications from the Air Staff, and notably by one of 13th November 1944 in which an attempt was made to convince Sir Arthur Harris that effective damage could be done to the oil plants at Leuna and Pölitz without suffering prohibitive casualties, did have some effect.² In November a considerably greater proportion of the Bomber Command effort was devoted to the oil campaign than had been the case in October, and the tonnage of bombs dropped on oil targets in the later month was, in fact, about four times more than in the earlier.³ This was not, however, sufficient to push the issue of the war 'over on the right side'.

¹ Letter Portal to Harris, 12th Nov. 1944.

² Letter Bottomley to Harris, 13th Nov. 1944, App. 27.

³ Proportions of bomb tonnages (long tons) aimed at oil targets in October and November 1944 by Bomber Command, the Eighth Air Force and Fifteenth Air Force were as follows:

	<i>Total Bomb Tonnage</i>	<i>Tonnage on Oil Targets</i>	<i>Percentage</i>
BOMBER COMMAND			
October	61,204	3,653	6·0
November	53,022	13,030	24·6
EIGHTH AIR FORCE			
October	38,942	3,979	10·2
November	36,091	14,182	39·0
FIFTEENTH AIR FORCE			
October	11,806	2,245	19·0
November	13,093	3,721	28·4

Distribution of Bombs table. Eighth Air Force Statistical Summary 1942-45. Narrative, *The R.A.F. in the Bombing Offensive Against Germany*, Vol. VI, p. 175. Fifteenth Air Force Statistical Summary.

The problems and difficulties of the oil campaign had indeed grown much greater than they had been in the summer months. As was to be expected, the weather became worse and the chances of making accurate attacks became less. Also, and for the same reason, it became more difficult to repeat attacks and, owing to the difficulty of obtaining photographic reconnaissance in bad weather, to know the most appropriate time at which these repeat attacks should be attempted. Thus, there was the double danger of wasting bombs upon oil plants which were already out of action and of not attacking others which had recovered at least a proportion of their previous production capacity. These factors, which tended to weight the scales of the battle against the forces of destruction and in favour of those of reconstruction, were, however, fully apparent to the Air Staff and were constantly impressed upon Sir Arthur Harris by them. They made the case for increasing the amount of destruction to the greatest possible extent in the hope that the damage would last through possibly longer periods of bad weather, and, also, for not missing any possible opportunity for inflicting such damage. These considerations were the underlying reason for Sir Charles Portal's acute anxiety to enlist Sir Arthur Harris' wholehearted support for the plan. He knew well enough that such formidable difficulties could only be overcome if the Commander-in-Chief's full powers of drive and determination were applied to them, and, as he had himself categorically stated, any failure in this direction 'might well prolong the war by several months at least'.

If, however, Sir Charles Portal ever fully believed that his efforts of November 1944 had produced any real change of heart in Sir Arthur Harris, he must soon have become disillusioned. By 12th December 1944, Sir Arthur Harris seems to have found it possible to overcome his agreement with Sir Charles Portal of the previous month 'about the urgency and effectiveness of the oil plan'. In a letter of that date to Sir Charles Portal, he announced that his Operational Research Section had reached the conclusion that the completion of the oil plan would require the despatch of some 56,500 sorties and the discharge of 226,000 tons of bombs. He went on to remind Sir Charles Portal

'that in the past M.E.W. experts have never failed to overstate their case on "panaceas", e.g. ball-bearings, molybdenum, locomotives, etc., in so far as, after the battle has been joined and the original targets attacked, more and more sources of supply or other factors unpredicted by M.E.W. have become revealed. The oil plan has already displayed similar symptoms. The benzol plants were an afterthought. I am quite certain that there are dozens more benzol plants of which we are unaware and when and if we knock them all out I am equally certain we shall

eventually be told by M.E.W. that German M.T. is continuing to run sufficiently for their purpose on producer gas, steam, industrial alcohol, etc., etc. However,' he concluded, 'we should be content if we can deprive them of adequate supplies of aviation fuel. That in itself will take enough doing.'¹

'I am', Sir Charles Portal replied ten days later, 'profoundly disappointed that you still appear to feel that the oil plan is just another "panacea". Naturally,' he added, 'while you hold this view you will be unable to put your heart into the attack of oil'. Sir Charles Portal patiently explained that the success of the oil plan did not depend upon the complete destruction of every oil installation down to the smallest benzol plant in Germany. Nor, he pointed out, did it depend upon the unaided efforts of Bomber Command. There were also, he reminded Sir Arthur Harris, the American Eighth and Fifteenth Air Forces. 'The essence of the immediate task before the Allied strategic bomber forces is', Sir Charles Portal said, '*to put out and keep out of action the 11 synthetic plants in Central Germany*', which, he believed, were producing seventy per cent of the enemy's surviving supplies of aviation and motor spirit. 'There is no doubt in my mind', Sir Charles Portal continued, 'that their immobilisation and the continued immobilisation of the remaining major producers would represent by far the greatest and most certain contribution that our strategic bombers could make to the achievement of an early decision in the German war.'

As to Sir Arthur Harris' strictures upon the Ministry of Economic Warfare, Sir Charles Portal suggested that 'if we had tried harder in our attack on ball-bearings I have little doubt that the full effects forecast by M.E.W. would have been achieved'. In the case of the oil plan, Sir Charles Portal warned Sir Arthur Harris, 'if you allow your obvious doubts in this direction to influence your conduct of operations I very much fear that the prize may yet slip through our fingers. Moreover,' he said, 'it is difficult for me to feel that your staff can be devoting its maximum thought and energies to the accomplishment of your first priority task if you yourself are not wholehearted in support of it.'²

Sir Arthur Harris' response to these suggestions and, indeed, censures, consisted of an unrestrained outburst against the oil plan and an uncompromising defence of the policy of general area bombing. The tone of the letter which the Commander-in-Chief addressed to Sir Charles Portal on 28th December 1944, suggested that his patience was now exhausted and it was indicative of the intolerable sense of frustration now so clearly felt by Sir Arthur Harris. 'I repeat',

¹ Letter Harris to Portal, 12th Dec. 1944.

² Letter Portal to Harris, 22nd Dec. 1944.

he wrote, 'that I have no faith in anything that M.E.W. says'. After dwelling once again upon the reasons for which he expected the Germans to be able to survive the oil campaign, he told Sir Charles Portal that nothing could disillusion him of the view that the oil plan was simply another 'panacea'. But he resented the Chief of the Air Staff's suggestion that his lack of belief in the plan was being reflected in the conduct of operations.

'It has always been my custom', he wrote, 'to leave no stone unturned to get my views across, but, when the decision is made I carry it out to the utmost and to the best of my ability. I am sorry', he said, 'that you should doubt this, and surprised indeed if you can point to any precedent in support of your statement. I can', he claimed, 'certainly quote precedent in the opposite sense.'

This assurance and the challenge which followed it were, however, rendered less convincing by the two examples which Sir Arthur Harris mentioned of tasks which he apparently thought he had carried out to the 'utmost' of his ability. He claimed to be unaware 'that we lost any feasible opportunity of prosecuting' the ball-bearings plan and he even suggested that 'nobody could say that every possible effort was not made, and brilliantly executed, in the best of conditions, to knock the German fighter forces out on the ground and in their factories' during 1943. These were, indeed, extraordinary statements, but, of course, they found their places in an extraordinary letter.¹

Though it might well have been supposed that further arguments would be useless, Sir Charles Portal still persisted with his attempt, if not to convert Sir Arthur Harris to the oil plan, at least to persuade him that there was considerably more to be said for it than he had yet admitted. Indeed, since he was evidently unwilling to replace Sir Arthur Harris, Sir Charles Portal had no alternative but to do this, for he still believed, in spite of the Commander-in-Chief's 'assertions to the contrary', that the oil campaign could 'be pressed home harder and more certainly' if it was backed not only by Sir Arthur Harris' 'sense of loyalty' but by his 'enthusiasm' as well.

First, Sir Charles Portal sought to substantiate his reasons for believing this. He returned to his point to the effect that the Bomber Command Staff would hardly put their backs into the prosecution of a plan in which they knew their Commander-in-Chief did not believe. He suggested that in the recent attack on Pölitz, Sir Arthur Harris might well have despatched a force three times the size of that which he had actually sent. He rejected Sir Arthur Harris' alarmist arguments about casualties and observed that the oil campaign had in the

¹ Letter Harris to Portal, 28th Dec. 1944, with the marginal comments of Sir Charles Portal.

past three months been waged at a cost of about one per cent in missing aircraft. Sir Charles Portal then turned to the question of the intelligence upon which the oil plan rested. He pointed out that the Ministry of Economic Warfare was only one element among the many which were involved in the collection and presentation of this intelligence, and he told Sir Arthur Harris that the Combined Chiefs of Staff had, in fact, adopted the oil plan not on the advice of the Ministry of Economic Warfare but on that of the Joint Intelligence Committee which, in turn, was advised by specialised joint-intelligence bodies. Thus, Sir Charles Portal suggested, the facts did not support the Commander-in-Chief's assertion that the oil plan and also the ball-bearing plan were simply 'panaceas enthusiastically put forward by the amateurish, ignorant, irresponsible and mendacious M.E.W.' He added that it was 'an unworthy and inexcusable travesty of our conduct of the war to suggest that our policy is determined on that kind of basis.'

Though Sir Charles Portal seems at first to have been inclined to accept Sir Arthur Harris' claim not to have lost any feasible opportunity of prosecuting the ball-bearings plan he was, of course, soon reminded of the actual events by his staff.¹ He, therefore, now reminded Sir Arthur Harris that ball-bearings had been listed as primary objectives in the directive of 10th June 1943 and that no specific attacks had been made on them by Bomber Command until 1944 and that even then little more than three thousand tons of bombs had been involved. 'I should have thought', Sir Charles Portal wrote, 'that at least you could have tried harder to destroy Schweinfurt'. Having, as he perhaps hoped, disposed of these matters, Sir Charles Portal once more embarked upon a reasoned argument of the merits of the oil plan and the soundness of the intelligence which supported it. He then came to what he had for some time recognised as the fundamental question of whether the general area offensive offered a better prospect than the oil plan. 'Knowing as we do', he wrote, 'the energy, resource and resilience of Germany, it would be too big an undertaking to try to defeat her with only a part of our total fighting power. If cities, once attacked, were', he continued, 'entirely destroyed, the chances would be better; but', he said, 'as you yourself admit, cities recover their industrial output—in four or five months'. As to Sir Arthur Harris' claim that Germany had already more than once nearly collapsed under the impact of area bombing, Sir Charles Portal admitted that she had been 'seriously alarmed' by the Hamburg attacks and by the beginning of the Battle of Berlin, but, he said, 'as far as I am aware, there is no evidence to show that she was near

¹ This letter by Sir Charles Portal was written after consultation with the Air Staff. It was based on a long minute by the Director of Bomber Operations. Min. Bufton to Portal, 3rd Jan. 1945.

collapse. She weathered successfully the storm of the subsequent Berlin attacks'. Because of the doubt 'as to the point to which area attacks must be carried to be decisive in themselves, it is', Sir Charles Portal said, 'clearly the sounder policy now to employ the bomber forces so that they can make a calculable contribution to the offensive as a whole. Such a policy', he added, 'has been adopted in the attack of oil and communications'. But Sir Charles Portal's objection to the policy of general area bombing as a main aim did not turn only upon his belief that it was unlikely to be decisive in itself. In what may be regarded as the most significant passage of this letter, he said that

'while area bombing, if it could have been continued long enough and in sufficient weight, might in the end have forced the enemy to capitulate, his counter-measures would have prevented us from maintaining such a policy to the decisive point. We would have been forced to precision attack to maintain the air situation needed to continue the offensive at all. The Americans did this for themselves in 1943/44 with a little help from Bomber Command. Under cover of the favourable air situation which was created "OVERLORD" was launched successfully, and the advance to the German frontier gave night bombing a new lease of life. But for this', Sir Charles Portal concluded 'it is possible that the night blitzing of German cities would by now have been too costly to sustain upon a heavy scale'.

This, of course, was not only an argument against general area bombing but it was also one in favour of the oil campaign, for, as Sir Charles Portal explained at the end of his letter, one of the consequences of bombing oil would be to continue and extend the immobilisation of the *Luftwaffe*.¹

The important judgement, which Sir Charles Portal would, perhaps, have hesitated to make in a wholly official communication, contained an admission that, while the German air defences had been effective, the general area offensive had been a largely self-defeating policy, and that after the German air defences had ceased to be effective, it had been revealed as an uneconomic and even irrelevant policy. The suggestion was that in the pursuit of general area bombing, Bomber Command had been involved in a vicious circle from which escape had been made possible only by the results of the American day offensive, the success of *Overlord* and the development of precision techniques by Bomber Command. This was a recognition of the change which had been produced by the achievement of air superiority which, as far as the hours of darkness were concerned, Sir Charles Portal rightly attributed to the chain of events initiated by the neutralisation of the German day fighter force and culminating in the

¹ Letter Portal to Harris, 8th Jan. 1945.

overrunning by the allies of the German night fighter early warning posts. It was also, of course, in the oil campaign that, in addition to all the other arguments supporting it, Sir Charles Portal saw the chief means of maintaining and extending this vital air superiority.

Though this point of view was utterly unacceptable to Sir Arthur Harris and, as we shall presently see, continued to be so, it did, undoubtedly, reflect a true and realistic appreciation of the situation. This, nevertheless, did not entirely undermine Sir Arthur Harris' arguments, for in many respects Sir Charles Portal had oversimplified the issue and in some he had misunderstood it. For that reason it requires further analysis.

The apparent stalemate in the general area offensive up to the end of the Battle of Berlin, which Sir Charles Portal had mentioned, was due to a kind of balance which had been struck between the destructive power of Bomber Command and the resources of repair, reconstruction and improvisation mobilised by the Germans. It meant, as had long been recognised, that the offensive was necessarily one of attrition in which the cumulative effect over a period of years was the only important result to be expected. But it was this latter factor which had provided the opportunity for active defence against bombing. The fact that Bomber Command had to engage in a war of attrition and that it could, therefore, only secure its objects by an offensive sustained over a period of years meant that the German fighter force was afforded an opportunity of waging a somewhat similar war of attrition against the attacking bombers. Though these German fighters never developed the ability to intercept, let alone destroy, the whole of major attacking forces and, on the contrary, could only shoot down a relatively small percentage of the bombers on each occasion, it was clear that these casualties, if inflicted constantly over a long period, might well ultimately disrupt Bomber Command or at least deny it the ability to maintain an adequate concentration and continuity in its offensive. Thus, as had been so much more obvious in the case of the American day offensive, the British night offensive was more than a battle between destruction and repair. It was also a race between the rate of attrition inflicted by the bombers upon the German economy and that inflicted upon them by the German fighters, and as the Battle of Berlin came to an end, it was by no means clear that the bombers were winning.

These possibilities had, of course, been more than evident both to the Air Staff and to Sir Arthur Harris. The Commander-in-Chief had sought by many means to neutralise the German night fighter force. He had introduced tactical measures of evasion and deception which were backed by the provision of scientific devices both of simplicity and also of extraordinary complexity. Sir Arthur Harris had also, on a number of occasions, vigorously appealed for long-range night

fighter support on a comprehensive scale.¹ By April 1944 it was, however, apparent to Sir Arthur Harris that the measures of evasion were exhausting themselves² and, in spite of the somewhat limited efforts of Fighter Command to engage the German night fighter force by *Serrate* and other kinds of operations, no effective means of doing so had been or, for that matter, were ever to be devised. Though the Air Staff had not by any means resisted Sir Arthur Harris' aims in all these directions, they had, perhaps, too readily and for too long continued to accept the primarily defensive role of Fighter Command, nor had they shown adequate zeal in overcoming admittedly powerful but nevertheless pusillanimous counsels which had often delayed the introduction of radio counter-measures and notably *Window*. Indeed, the reaction of the Air Staff to the rise of the German night fighter force had been somewhat different from that of Sir Arthur Harris.

The Air Staff believed that the solution to the problem was the same as that proposed in the case of the German day fighter force by the *intermediate objective* of the *Pointblank* plan, namely, the bombing of German aircraft production sources and supporting industries such as ball-bearings plants. This, as has appeared, was one of the reasons which had led the Air Staff to urge upon Sir Arthur Harris the policy of attacking what, it will be remembered, were called the 'associated towns'.³ This idea, which, as has also appeared, led to the crisis of *Pointblank*, was, however, based upon a fallacy. The combined bomber forces were no more capable of delivering a 'knock-out blow' against the German aircraft industry than Bomber Command was capable of delivering a 'knock-out blow' against the leading German towns. The targets were not much fewer in number. They were also much smaller and in other ways more difficult to disrupt. All that could be attempted against the German aircraft industry was, therefore, a war of gradual attrition in which the German fighter force would still have its opportunity for active defence. It was fundamentally unreasonable to suppose that when the casualty rate of the bombing offensive became too high, the situation could be redressed by adopting another kind of offensive which took the bombers to the same, or even more dangerous, areas of attack. The only way in which such a situation could really be redressed was by an enormous increase in the power of destruction or by a series of effective measures against the enemy fighters already in action, for, by either

¹ In July 1943, for example, he asked that a force of about 100 long-range night fighters should be directed to the support of his command. The Air Staff refused the request. Letter Harris to Portal, 3rd July 1943, and letter Portal to Harris, 9th July 1943.

² See below, p. 147 ff. This was another occasion on which Sir Arthur Harris called for night fighter support on 'a substantial scale'.

³ i.e. the towns associated with aircraft and ball-bearings production.

method, the balance between the rate of attrition being inflicted by the bombers and that inflicted upon them could be tipped in favour of the former.

If, however, as events had shown, the *intermediate objective* of the *Pointblank* plan was a fundamentally unsound conception, it was even less reasonable for Sir Charles Portal now to suggest that its execution had, 'with a little help from Bomber Command', in fact, secured the object, and not even to mention other and far more significant agencies in the collapse of the *Luftwaffe* such as the operations of the long-range daylight fighters and especially the Mustangs of the Eighth Fighter Command, the consequences of the German positions in Russia and the Mediterranean theatre and, indeed, the indirect effects of the general area bombing offensive.

These arguments related mainly to what was already history and, though the tendency to repeat rather than to analyse them has since led to a considerable misunderstanding of the events and decisions to which they refer, it may be doubted whether they had much bearing upon the immediate problems of the bombing offensive in 1945 except for the unfortunate but important consequence they had of further embittering the already strained relations between the Air Staff and the Commander-in-Chief, Bomber Command. Indeed, Sir Arthur Harris seems to have been well aware of this, and in a letter of 18th January 1945 he told Sir Charles Portal that he would have preferred 'for reasons of brevity' to have confined his remarks entirely to the oil plan. Nevertheless, he could not be blamed for suggesting that Sir Charles Portal had raised other points which needed 'elucidation or reply'.

Sir Arthur Harris in the course of a severe attack upon the principle of selective bombing and even upon the personal advisers of the Chief of the Air Staff complained that he was not adequately consulted about the policies which were under consideration for Bomber Command. He also suggested that his own opportunities for discussion with Sir Charles Portal were no longer frequent enough, but he claimed that he never questioned official policy except 'when invited, or on grounds of practicability, tactical feasibility or the appropriateness of throwing over the previous strategic policy, which has been 7/10ths implemented at enormous cost in blood and effort, in favour of something entirely different'.

Though this last point clearly begged the whole question, it was, equally clearly, the operative reason for which Sir Arthur Harris described the oil plan as 'another attempt to seek a quick, clever, easy and cheap way out'. He once more asserted that its execution would show that it was none of these things and that in adopting it 'we are forsaking a most substantial substance for a most tenuous shadow . . .' The 'substantial substance' was now expressed as the destruction of

Magdeburg, Leipzig, Chemnitz, Dresden, Breslau, Posen, Halle, Erfurt, Gotha, Weimar, Eisenach and the rest of Berlin.¹ After again saying that he had 'no faith' in selective bombing policies and 'none whatever in this present oil policy', Sir Arthur Harris asked Sir Charles Portal to 'consider whether it is best for the prosecution of the war and the success of our arms, which alone matters, that I should remain in this situation'.²

Thus, the ultimate stage of the argument was reached. Though he still categorically claimed that he had not failed 'in any *worth-while* efforts to achieve even those things which I knew from the start to be impracticable, once they had been decided upon', Sir Arthur Harris had shown, equally categorically, that there was no prospect whatsoever of Sir Charles Portal converting him as to what was worth while and what was practicable. He had, therefore, suggested that it might be appropriate if he was replaced in his command. This confronted Sir Charles Portal with a most delicate decision. If he replaced Sir Arthur Harris he would be sacrificing a Commander-in-Chief with greater prestige than any other in the Royal Air Force. If he did not, he would undoubtedly experience much difficulty in pressing his views further upon Sir Arthur Harris and, therefore, in getting the policy in which the Air Staff so firmly believed fully reflected in the operations of Bomber Command.

He chose the latter course. 'I willingly accept your assurance', Sir Charles Portal wrote to Sir Arthur Harris on 20th January 1945,

'that you will continue to do your utmost to ensure the successful execution of the policy laid down. I am very sorry that you do not believe in it but it is no use my craving for what is evidently unattainable. We must wait until after the end of the war before we can know for certain who was right and I sincerely hope that until then you will continue in command of the force which has done so much towards defeating the enemy and has brought such credit and renown to yourself and to the Air Force'.³

In this way the realities of the situation were made apparent. No other course at this stage of the war was open to Sir Charles Portal which would not have been a remedy worse than the disease. He might also hope that this long discussion, in spite of the result, would cause Sir Arthur Harris to make the attack on oil more effective. But

¹ The list which Sir Arthur Harris had mentioned on 1st November 1944 consisted of Magdeburg, Halle, Leipzig, Dresden, Chemnitz, Breslau, Nuremberg, Munich, Coblenz, Karlsruhe and the rest of Berlin and Hanover. In each case, it will be noted, twelve targets were listed. Thus, on his own admission, the general area bombing plan displayed the same characteristic as that which Sir Arthur Harris so much deplored in the case of the oil plan. This was the characteristic of the hydra.

² Letter Harris to Portal, 18th Jan. 1945.

³ Letter Portal to Harris, 20th Jan. 1945.

in the outcome, as was shown by a further exchange of letters, there was neither success nor satisfaction either for Sir Arthur Harris or for Sir Charles Portal.¹ Though Bomber Command in concert with the United States Strategic Air Forces had already achieved outstanding results in the destruction of the German ability to continue the war by attacks on oil, communications and other targets, and though these forces were yet to achieve even more important results, their ultimate success was delayed and eventually merged with and, to some extent, was even overtaken by, the general victory of all allied arms operating from all directions.

¹ Letters Harris to Portal, 24th Jan. 1945, and Portal to Harris, 25th Jan. 1945.

5. Anti-climax and climax January–May 1945

The year 1945 opened with a severe sense of anti-climax in the western camp of the Grand Alliance. It was obvious that great opportunities had been lost or at least only partially exploited in the closing months of 1944, and nowhere was the feeling of frustration more pronounced than in the minds of those concerned with the direction of the strategic air offensive. Sir Arthur Harris believed that the culmination of the general area offensive, which he regarded as seventy per cent completed, was being delayed by unwarranted or ill-informed interference. Sir Arthur Tedder had been able to win only qualified and reluctant approval of his plans for a communications offensive. The dissatisfaction of General Spaatz and of his superiors in Washington was shown by their constant search for some new and more decisive air strategy. Though Sir Charles Portal and the Air Staff could look back with some satisfaction upon the progress made by Bomber Command and the United States Strategic Air Forces in the execution of the oil plan, they also recognised the extent to which their aims had been frustrated by competing ideas. All were gravely concerned by the extent to which the strategic bombers were being diverted to the role of direct army support. The command arrangements made at Quebec in September 1944 had not secured the desired results.

Meanwhile, the German counter-offensive in the Ardennes had come as a rude shock to any who were still complacent about the general war situation. Though the ensuing battle soon turned in favour of the allies, the initial strength of the thrust had the effect of suggesting that the Germans were stronger than had been supposed and, in fact, than they actually were. This, of course, was a purely moral effect, but there was also a material result. Not only was there a renewed diversion of the strategic bomber effort to the urgent call of the battlefield, but General Eisenhower's plan for an advance into Germany was delayed. The cause of Russia was thereby served better than that of Germany, but the cause of Britain and the United States was retarded with results which only became fully apparent some years later.

Moreover, the feeling that final victory in Europe was overdue was rendered more acute by a sense of foreboding which arose from the sinister pace and scope of weapon developments. The imminent possibilities of atomic power were, of course, realised only by a few, but the Germans in retreat had already demonstrated that security

does not always march with the big battalions. It had been a disquieting coincidence that, almost as the allied soldiers went ashore in Normandy, the first flying bombs reached London and that as, in turn, their launching sites were overrun, the V-2 rockets began to come over at much more than the speed of sound. Now the Germans were operating further new weapons to which the allies seemed to have no obvious nor immediate counter. The most important of these were the *Schnorkel*-equipped submarine and the jet-propelled fighter. They threatened not merely the nerve of the British population as the V-weapons had done, but they seemed to offer a prospect that the great issues of the Battle of the Atlantic and of general air superiority might be reopened. Upon these issues the whole position of the western alliance was founded.

In a more robust frame of mind the allies would doubtless have counted their overwhelming strength and recognised that the most prudent course lay in an intensification of the offensive, for the only real security lay in complete victory. But the allies were by no means in an entirely robust frame of mind and powerful thoughts were turned back to defensive strategies. As Sir Arthur Harris had put it, the U-boat threat was 'resuscitated' and General Spaatz, with his painful experiences of daylight combat, began to express grave concern about German jet-propelled fighters. These fears found expression in a new directive issued by Sir Norman Bottomley and General Spaatz in the middle of January 1945.

The two agents for the direction of the Combined Bomber Offensive did not feel that German jet developments constituted an immediate threat to the reasonably free operation of the heavy bomber forces, but they did agree, as Sir Norman Bottomley explained to Sir Charles Portal on 13th January 1945, that 'a dangerous situation' might be created in the future if the development was not in the meantime checked. They also thought that the only way in which it could effectively be checked was 'by offensive measures begun at once against jet engine production centres, training establishments and appropriate storage units'. Though Sir Charles Portal was told that 'the petroleum industry and communications' remained 'primary objectives' and that the attack on the *Luftwaffe* had been given no particular 'order of priority', he, nevertheless, found that in the proposed directive it was stated that 'The G.A.F. and primarily its jet production, training and operational establishments now become primary objectives for attack'.¹

Naturally, Sir Charles Portal was left in doubt as to what was meant but he thought that what might be concluded was that the German jet industry had been accorded 'supreme priority'. Such a

¹ Min. Bottomley to Portal, 13th Jan. 1945, covering proposed directive 12th Jan. 1945.

change of policy could only be justified, he believed, if it was likely that the war would continue until towards the end of the year. If, on the other hand, there was a chance of victory by about May, which, Sir Charles Portal believed, would largely depend upon the success of the new Russian land offensive, then, he thought, it would be reduced by any substantial diversion of effort from oil and communications to aircraft production. The issue was one of major strategy which Sir Charles Portal thought could only be determined by the Combined Chiefs of Staff, but, in the meantime, he said he would accept the directive on a provisional basis.¹

These comments and reservations were passed on to General Spaatz by Sir Norman Bottomley who added that he proposed to draw attention to them in his letter to Sir Arthur Harris covering the directive. Sir Norman Bottomley suggested that General Spaatz might do the same in the case of his two commands.² General Spaatz, however, did not intend to reduce the force with which the directive restored the intermediate objective of the *Pointblank* plan. On the contrary, in almost identical letters to the Commanding Generals of the Eighth and Fifteenth Air Forces, he sought to strengthen it. Unless 'adequate measures' were taken promptly, he told his commanders, the Germans would have between four and five hundred jet aircraft 'available for operations against us by early summer . . .' The production and preparation of this force had, therefore, he told them, been made 'a principal objective for attack'.³ It may seem surprising that General Spaatz thus completely rejected the advice he had received from Sir Norman Bottomley, but it is more surprising to find that the latter did not even act upon his own advice. In his covering letter of 19th January 1945 to Sir Arthur Harris, Sir Norman Bottomley made no mention of any of the points raised by Sir Charles Portal. He merely paraphrased or simply repeated the terms of the directive which was, at the same time, enclosed. The directive also referred to 'the growing menace of the German U-boat developments' and called for a 'marginal' and an 'incidental' bombing effort against them.⁴

Though oil and communications were still listed, nominally at least, as the first and second priorities in this perplexing directive, most of the rest of it showed the extent to which confidence in an early victory had been shaken by the apparent revival of German military strength. But this frame of mind was rendered obsolete, or at

¹ Min. Portal to Bottomley, 14th Jan. 1945.

² Bottomley to Spaatz, 14th Jan. 1945.

³ Memos. Spaatz to C.Gs Eighth and Fifteenth Air Forces, 16th Jan. 1945.

⁴ Letter Bottomley to Harris, 19th Jan. 1945, enclosing directive for Strategic Air Forces in Europe, 15th Jan. 1945, App. 8 (xliv(a)) and (b). Instructions about the U-boat menace had been sent to Sir Arthur Harris on 23rd December 1944. Admiral King had, however, continued to press for the subject to be mentioned in an official directive, Min. Bottomley to Portal, 13th Jan. 1945.

any rate irrelevant, even before the despatch of the directive gave it formal expression. Events on the Eastern front, where a new Russian offensive had begun during the second week of January, produced an entirely different prospect, the significance of which, it will have been noticed, had not escaped Sir Charles Portal. This offensive, the Joint Intelligence Committee reported on 25th January 1945, was likely to have a decisive effect upon the length of the war and it seemed to the Committee 'that the assistance which might be given to the Russians during the next few weeks by the British and American strategic bomber forces justified an urgent review of their employment, to this end'.

In considering what might be done, the Joint Intelligence Committee reported that the execution of the oil plan was causing 'such an acute overall and immediate shortage of oil that it is directly affecting the mobility and operational employment of the German land and air forces on all fronts'. They, therefore, recommended that the continuation of the oil plan should '*take precedence over everything else*'. They then suggested that the Germans were delivering tanks directly from factories to units and that they had apparently exhausted their reserves after heavy losses on the Western front and still heavier losses on the Eastern front. In view of the important part which German tanks might play in stemming the Russian advance, the Joint Intelligence Committee recommended that the bombing of tank factories should '*take precedence second only to oil*'. The Committee also thought that attention should be paid to the possibility of preventing or delaying reinforcement of the Eastern front by bombing communications. In addition, they referred to the possible effects upon the Russian advance of 'heavy and sustained attacks on Berlin'.¹

This matter, it will be remembered, had, in a different connection, been under active consideration since August 1944 when Sir Charles Portal had laid before the Chiefs of Staff an idea for delivering a *coup de grâce* to German morale by such a means. Sir Charles Portal had emphasised at the time that this catastrophic blow would be unlikely to achieve important results unless it was delivered at a finely chosen moment between the virtual defeat of Germany and the outbreak of anarchy in that country, accompanied, perhaps, by an underground movement. The idea was, in fact, conceived, not as a means of bringing about the defeat of Germany, but of inducing an organised surrender after that had occurred. Except on that basis, the Air Staff never showed any enthusiasm for the plan which came to be known as *Thunderclap*. The Joint Planners had reported on 17th August 1944 that they did not think the plan was 'likely to achieve any worthwhile degree of success' and Air Commodore W. L. Dawson, the

¹ J.I.C. Report, 25th Jan. 1945.

Director of Plans, had, at the time, told Sir Norman Bottomley that 'the game is not worth the candle'. All that had been done was that the Joint Planners had recommended that the Joint Intelligence Committee should be invited to report to the Chiefs of Staff whenever they thought that an appropriate situation for the execution of *Thunderclap* had arisen, and the Chiefs of Staff had subsequently given instructions to that effect.¹

Though this recommendation may not have appeared at the time to have much importance, it did, in fact, presently lead to a further examination of the *Thunderclap* plan, though the objects became very different from those which had originally been envisaged.² The Director of Bomber Operations, Air Commodore Bufton, had already come to the conclusion that the new Russian advance might present a favourable opportunity for the launching of *Thunderclap*. 'If', he suggested to Sir Norman Bottomley on 22nd January 1945,

'the operation were launched at a time when there was still no obvious slackening in the momentum of the Russian drive, it might well have the appearance of a close co-ordination in planning between the Russians and ourselves. Such a deduction on the part of the enemy would greatly increase the moral effect of both operations.'

Air Commodore Bufton thought that the main attacks on Berlin might be supplemented by simultaneous assaults on Breslau and Munich by bombers based in the Mediterranean theatre, and, since the plan would involve an Anglo-American effort, he thought that Sir Norman Bottomley might wish to discuss it with General Anderson.³ In this way, the Air Staff began to think of *Thunderclap* in association with the Russian offensive. At the same time, the Joint Intelligence Committee drew attention to the possibility that the aims of the plan might be modified. Instead of seeking to use *Thunderclap* in association with the Russian offensive as a means of crushing German morale, which they did not think could be done, they now suggested that the plan might be adopted as a direct means of assisting the Russians in the conduct of their operations.

In a second report of 25th January 1945, the Joint Intelligence Committee examined this possibility in some detail. They did not believe that the devastation of Berlin, even if it was timed to coincide with a favourable stage of the Russian advance, would, of itself, lead

¹ J.P.S. Report, 17th Aug. 1944. Air Staff Brief Dawson to Bottomley, 18th Aug. 1944. C.O.S. Mtg., 19th Aug. 1944.

² Air Commodore Dawson explained to Sir Norman Bottomley in the Air Staff Brief cited above that he had subscribed to it only as a concession to the War Office and that he did not think that it did 'any harm'.

³ Min. Bufton to Bottomley, 22nd Jan. 1945. General Anderson was Deputy for Operations to General Spaatz.

to a breakdown in the German will to continue the war. They thought the plan should, therefore, be considered 'by reference to the effect on the military situation on the Eastern Front'. If this was accepted as the criterion, the Committee believed that important consequences might be produced. A heavy flow of refugees from Berlin coinciding with the trek westwards of civilians fleeing before the Russian advance 'would be bound to create great confusion, interfere with the orderly movement of troops to the front and hamper the German military and administrative machine'. Such a blow, amounting to the delivery of some twenty-five thousand tons of bombs by the Anglo-American bomber forces within four days and four nights, should, the Joint Intelligence Committee concluded, 'materially assist the Russians in the all-important battle now raging on the Eastern Front and would justify temporary diversion from attacks against communications or indeed from any targets other than oil plants and tank factories'. Even if the full scale of attack could not be mounted and the operations had to be intermittent, it was still considered that very valuable results might be achieved. There might, the report said, even be a 'political value in demonstrating to the Russians, in the best way open to us, a desire on the part of the British and Americans to assist them in the present battle'.¹

This report produced an immediate reaction. On 25th January, the day of its issue, Sir Norman Bottomley telephoned to Sir Arthur Harris and discussed its implications. The Commander-in-Chief said that he regarded the task of attacking Berlin as being already 'on his plate', but Sir Norman Bottomley explained that, since the full *Thunderclap* plan was now in prospect, it would be necessary to co-ordinate the preparations with the United States Strategic Air Forces and, probably, to consult the Chiefs of Staff as well. Sir Arthur Harris suggested that the main attack on Berlin should be supplemented by simultaneous operations of a like nature against Chemnitz, Leipzig and Dresden which, equally with Berlin, would share the task of housing evacuees from the East and, again equally with Berlin, were focal points in the German system of communications behind the Eastern front.²

If anything like the whole of this plan was to be carried out it was clear, as Sir Norman Bottomley had told Sir Arthur Harris, that General Spaatz's participation would have to be sought. Since the operations were designed to support the battle on the Eastern front, it might also be supposed that the Russians would be consulted either through an allied mission in Moscow or at the forthcoming conference at Yalta. The former question was in Sir Norman Bot-

¹ J.I.C. Report, 25th Jan. 1945.

² This is based on Sir Norman Bottomley's report of the conversation. See the following footnote.

tomley's mind when he reported his conversation with Sir Arthur Harris to Sir Charles Portal on 26th January, but he made no mention of the latter. The Deputy Chief of the Air Staff wanted to know whether the reports of the Joint Intelligence Committee should be sent immediately to General Spaatz or whether, in view of the important issues involved, the Chiefs of Staff should first be consulted.¹ At this moment Sir Charles Portal, who was about to leave for Malta on the way to Yalta, was under a particularly heavy pressure of work, but there was, nevertheless, an important reason for coming to an immediate decision.² The Prime Minister had intervened.

On the night of 25th January 1945 Mr. Churchill had a conversation with Sir Archibald Sinclair as a result of which the Secretary of State concluded that he had been asked what plans the Royal Air Force had for 'basting the Germans in their retreat from Breslau'. He wanted the Air Staff to advise him on how he should reply to the question.³ Thus, on 26th January, a critical issue of bombing policy required an urgent solution.

Sir Charles Portal did not, however, feel that it would be right 'to attempt attacks on Berlin on the "Thunderclap" scale in the near future'. He believed that the casualties to the bombers would be high and he did not think that the operation, even if 'done on the heaviest scale', would be decisive. Nor did he think it was worth while to undertake large-scale bombing of communications in the hope of delaying German reinforcement of the Eastern front. Tank factories could not be included in the directive without prior reference to the Combined Chiefs of Staff. 'Oil', the Chief of the Air Staff said, 'should continue to have absolute priority', but subject to that and to the need to deal with jet factories and submarine yards, 'we should', Sir Charles Portal said,

'use available effort in one big attack on Berlin and attacks on Dresden, Leipzig, Chemnitz, or any other cities where a severe blitz will not only cause confusion in the evacuation from the East but will also hamper the movement of troops from the West'.

It would be appropriate, Sir Charles Portal concluded, to get General Spaatz and Sir Arthur Tedder to approve these suggestions which would also have to be submitted to the Chiefs of Staff, for whom, in view of the imminence of the Yalta Conference, the Vice-Chiefs of Staff were already deputising.⁴

On the same day, that is 26th January, Sir Archibald Sinclair, after

¹ Min. Bottomley to Portal, 26th Jan. 1945.

² Min. initialled 'J. H.' to Sinclair, 26th Jan. 1945.

³ Min. Freeman (A.P.S. to S. of S.) to Williams (A.C.A.S.(Ops.)), 26th Jan. 1945.

⁴ Min. Portal to Bottomley, 26th Jan. 1945.

consulting the Air Staff, replied to Mr. Churchill's question in the following terms:

Secretary of State for Air to Prime Minister

'You asked me last night whether we had any plan for harrying the German retreat from Breslau.

The target which the enemy may offer in a large scale retreat Westward to Dresden and Berlin is best suited to Tactical Air Forces. This is particularly so now when cloud often makes it impossible to bomb from high level.

The Russians, as they swing round on lines parallel to the retreating Germans, should have excellent opportunities for ground strafing with their fighters.

It would be extremely difficult for our heavy bombers to interfere with these enemy movements by direct attack on their lines of retreat. The targets are at extreme range from U.K. and Mediterranean bases; precise Intelligence as to movements is not available; and it would be inadvisable to make attacks within the Russians' tactical area without prior consultation and co-ordination.

I feel strongly that the best use of our heavy bombers at the present time lies in maintaining the attack upon German oil plants whenever the weather permits. The benefits of these attacks are felt equally by the Russians and by ourselves and nothing should be allowed to interfere with them. There may, however, be occasions when the weather is unsuitable for attacks on the comparatively small targets presented by the oil plants but yet would permit area attacks on Eastern Germany. These opportunities might be used to exploit the present situation by the bombing of Berlin and other large cities in Eastern Germany such as Leipzig, Dresden and Chemnitz, which are not only the administrative centres controlling the military and civilian movements but are also the main communications centres through which the bulk of the traffic moves.

To achieve results of real value, a series of heavy attacks would probably be required, and weather conditions at this time of year would certainly prevent these being delivered in quick succession. The possibility of these attacks being delivered on the scale necessary to have a critical effect on the situation in Eastern Germany is now under examination.'¹

This minute, it will be noticed, was cautious. It showed that the question of the suggested area attacks on east German towns was still under consideration and it left a doubt as to whether these operations would actually be carried out. After all, neither General Spaatz nor Sir Arthur Tedder had yet been consulted and the matter had not yet been put before the Vice-Chiefs of Staff. Indeed, in the light of what

¹ Min. Sinclair to Churchill, 26th Jan. 1945.

Sir Charles Portal had told Sir Norman Bottomley on the same day, Sir Archibald Sinclair was hardly in a position to go further. Nevertheless, Mr. Churchill did not think this was far enough, for he immediately sent the following minute to Sir Archibald Sinclair:

26 January 1945: Prime Minister to Secretary of State for Air

'I did not ask you last night about plans for harrying the German retreat from Breslau. On the contrary, I asked whether Berlin, and no doubt other large cities in East Germany, should not now be considered especially attractive targets. I am glad that this is "under examination". Pray report to me to-morrow what is going to be done'.¹

The note of urgency and even of irony in this somewhat peremptory minute was abundantly clear. It was, perhaps, due to a desire on the part of the Prime Minister to be able to show the Russians at the forthcoming meeting at Yalta that the strategic air forces in the West were capable of contributing to the Russian campaign in the East. However that may have been, it resulted in precipitate action. Without further consultation, Sir Norman Bottomley despatched an official letter to Sir Arthur Harris. With it, he enclosed the two reports of the Joint Intelligence Committee dealing with the implications of the Russian advance.² In the letter he drew the Commander-in-Chief's attention to Sir Charles Portal's doubts about the full-scale *Thunderclap* plan, but he also told him that the Chief of the Air Staff was in favour of one big attack on Berlin and of related operations against Dresden, Leipzig, Chemnitz and 'any other cities where a severe blitz will not only cause confusion in the evacuation from the East but will also hamper the movement of troops from the West'. These targets, Sir Norman Bottomley explained, were to be attacked 'subject to the overriding claims of oil and the other approved target systems within the current directive'. There was nothing provisional about the suggestion. 'I am therefore to request', Sir Norman Bottomley concluded,

'that subject to the qualifications stated above, and as soon as moon and weather conditions allow, you will undertake such attacks with the particular object of exploiting the confused conditions which are likely to exist in the above mentioned cities during the successful Russian advance.'³

Thus, as a result of the Prime Minister's insistent intervention, Sir Arthur Harris was, on 27th January, formally instructed to carry out the policy which he himself had informally suggested on the previous

¹ Min. Churchill to Sinclair, 26th Jan. 1945.

² J.I.C. Reports, 25th Jan. 1945.

³ Letter Bottomley to Harris, 27th Jan. 1945, App. 28.
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day. The fact was at once made known to Mr. Churchill in the following minute:

27 January 1945. Secretary of State for Air to Prime Minister

'Your minute M.115/5. The Air Staff have now arranged that, subject to the overriding claims of attacks on enemy oil production and other approved target systems within the current directive, available effort should be directed against Berlin, Dresden, Chemnitz and Leipzig or against other cities where severe bombing would not only destroy communications vital to the evacuation from the East but would also hamper the movement of troops from the West.

The use of the night bomber force offers the best prospects of destroying these industrial cities without detracting from our offensive on oil targets, which is now in a critical phase. The Air Officer Commanding-in-Chief, Bomber Command, has undertaken to attempt this task as soon as the present moon has waned and favourable weather conditions allow. This is unlikely to be before about 4th February.'¹

Mr. Churchill acknowledged the receipt of this information without making any further comment.²

Before leaving for Malta, Sir Charles Portal, who was accompanied by Sir Norman Bottomley, discussed the plan with General Spaatz and subsequently Sir Norman Bottomley and General Spaatz conferred with Sir Arthur Tedder.³ As a result of these meetings Sir Norman Bottomley on 31st January informed Sir Charles Portal, who in the meantime had reached Malta, that he and General Spaatz had agreed upon new priorities 'to meet the present situation'. The principal German synthetic oil plants were to remain as the first priority. The second priority for strategic air forces operating from the United Kingdom was to be the bombing of Berlin, Leipzig, Dresden 'and associated cities where heavy attack will cause great confusion in civilian evacuation from the East and hamper movement of reinforcements from other fronts'. General Spaatz, it was added, had already given orders to the Eighth Air Force for the bombing of Berlin.⁴ Third priority was accorded to the destruction of communications feeding both the Eastern and Western fronts. The attack on jet aircraft plants was to continue at fourth priority. A 'marginal' effort was to be directed against tank-producing factories. The message ended with the suggestion that, in view of the speed of the Russian advance, especially towards Berlin, 'the Russians may wish to know our inten-

¹ Min. Sinclair to Churchill, 27th Jan. 1945.

² Min. by Churchill, 28th Jan. 1945.

³ General Spaatz flew to Bovington on 28th January to attend celebrations of the third anniversary of the creation of the Eighth Air Force. He had lunch with Sir Norman Bottomley on that day.

⁴ These orders were apparently given orally to General Doolittle.

tions and plans for attack of targets in Eastern Germany'. Sir Norman Bottomley and General Spaatz supposed that the Combined Chiefs of Staff would consider this point and they assumed that they would be told of any comments which the Russians might make. Sir Norman Bottomley, at General Spaatz's request, particularly asked that the message should be shown to General Kuter who, owing to the illness of his Chief, was deputising for General Arnold at the allied Conference.¹ Three days later the Vice-Chiefs of Staff in London informed the Chiefs of Staff in Malta that they approved these priorities to which, however, they added tank factories since Sir Archibald Nye, the Vice-Chief of the Imperial General Staff, had expressed the view that a 'marginal' effort would be inadequate.²

These priorities were apparently never discussed by the Combined Chiefs of Staff, nor it seems were they specifically mentioned to the Russians, but on 6th February 1945 Sir Charles Portal sent a message to Sir Norman Bottomley from Yalta in which he said that the recommendations of the Vice-Chiefs of Staff had been considered and approved by the British Chiefs of Staff. He suggested that they should now be considered by General Spaatz and that, if he accepted them, they should be embodied in a revised directive for the Combined Bomber Offensive.³

Meanwhile, at the Yalta Conference, discussions of what was described as the co-ordination of offensive operations were taking place with the Russians. At a plenary session held on 4th February 1945, General Antonov, Deputy Chief of Staff of the Red Army, tabled a memorandum on the operations of the Soviet forces in the recent and continuing offensive. The memorandum concluded with a number of suggestions as to how the Western allies might contribute to its ultimate success. One of these related to the employment of strategic bombers. It was asked that the Germans should be prevented from moving troops to the East from the Western front, Norway and Italy 'by air attacks against communications' and 'in particular' it was suggested that the bombers should 'paralyze the centres: Berlin and Leipzig'.⁴

Thus, by asking for attacks on east German cities the Russians had broadly confirmed the instructions which had already and independently been given to Bomber Command and the Eighth Air Force and, as far as the two targets of Berlin and Leipzig were concerned, they had done so specifically. Nevertheless, Sir Charles Portal

¹ Bottomley to Portal, 31st Jan. 1945. The message was also circulated as a C.O.S. memorandum, but it appears that General Kuter had no knowledge of it until 13th February.

² V.C.O.S. to C.O.S., 2nd Feb. 1945, and V.C.O.S. Mtg., 1st Feb. 1945.

³ Portal to Bottomley, 6th Feb. 1945.

⁴ Translation of Report by Antonov dated 3rd February 1945. Annex to Record of Yalta 2nd Military Meeting, 4th February 1945. *Argonaut* 2nd Military Meeting.

showed that his approval of the plan was qualified. He suggested that the oil offensive was the best contribution which the heavy bombers could make. Efforts would be made to disorganise German communications, but he thought that an attempt to cut railways in the middle of Germany to stop troop movements would produce only disappointing results. Marshal Khudyakov, Chief of the Soviet Air Staff, agreed that it would be impossible to cut all German railways; he confined his suggestions to an expression of the hope that Field-Marshal Alexander's operations could be aimed at hampering the movement of German troops from Italy to the Eastern front. Thus, if they were to fulfil any of the Russian requests, the Anglo-American strategic air forces were left with no real alternative to the policy of attacking east German cities near the fighting front such as Berlin and Leipzig.

Meanwhile, the angle of approach at the Yalta discussions had shifted, and apart from General Antonov's request that Berlin and Leipzig should be paralysed, the Russians showed little further interest in the strategic air offensive. As far as its application to targets in eastern Germany was concerned, they seem to have been anxious to restrict rather than to encourage its development. General Antonov suggested that a kind of air frontier or bomblines should be established in Germany and that it should run from Berlin to Dresden, Vienna and Zagreb.¹ Though the Russians made it clear that the towns through which it ran were to be allotted to the Western air forces for attack, General Kuter feared that it would exclude the bombing by the Anglo-American air forces of about twenty important strategic targets, including the oil plants at Pölitz and Ruhland. He also observed that it would prohibit operations against industrial and communications targets 'in the neighbourhood' of Berlin and Dresden. Though General Antonov's argument about the precise significance of the proposed bomblines was somewhat obscure, he insisted that it could not be moved farther to the east. He even suggested that if it was, there would be no targets left for the Soviet air force to bomb. Sir Charles Portal said that the British and United States Air Staffs would welcome strategic air attacks on suitable targets by the three air forces,² but General Antonov was evidently unwilling for the degree of co-operation which this suggestion required and no agreement was reached.³

¹ Mins. of 1st Tripartite Military Mtg., Yalta, 5th Feb. 1945, printed in *Foreign Relations of the United States Diplomatic Papers. The Conferences at Malta and Yalta*, (Washington, 1955), pp. 595-608.

² Mins. of 2nd Tripartite Military Mtg., Yalta, 6th Feb. 1945, printed in *The Conferences at Malta and Yalta*, pp. 640-655.

³ Letter Portal to Khudyakov, 9th Feb. 1945. A question which arose was whether the Anglo-American air forces should obtain Russian permission before attacking targets to the east of the proposed 'bomblines', or whether they should be able to do so after notifying the Russians of their intention and in the absence of any objection being raised.

Nevertheless, as was shown by his message of 6th February to Sir Norman Bottomley, Sir Charles Portal did not take the Russian attitude as a reason for changing the plans which had already been made for bringing the heavy bomber effort to bear in support of the Russian advance. Indeed, this plan had already sprung into action, for, on 3rd February, the United States Eighth Air Force carried out a massive daylight attack on Berlin. This operation and those which presently followed showed that General Doolittle had received from General Spaatz substantially similar instructions to those which had been conveyed by Sir Norman Bottomley to Sir Arthur Harris on 27th January.

These mass attacks on east German towns did not constitute any fundamental change in bombing policy. The February attack on Berlin was not the first which the United States Eighth Air Force had made on the German capital. Nor was it, or the operations which followed against such places as Dresden, Munich and Leipzig, the first occasion on which the Eighth Air Force had made general attacks on built-up areas in which many bombs were dropped blindly by *H2X* indications and in which the results corresponded with the British night area bombing assaults. As far as Bomber Command was concerned, the continuing area bombing offensive had never ceased to be an important part in the strategy of the air attack, and, though, as has been seen, there had been much disagreement about the priority which should be afforded to this particular aspect of the offensive, there had, as yet, been no authoritative suggestion to the effect that it should be abandoned.

Nevertheless, and in spite of the fact that the oil campaign was still clearly regarded as the primary aim of the combined bomber offensive, the new plan did impose important modifications upon the existing pattern of bombing policy. While for some time past severe area attacks upon the Ruhr had been demanded in the interests of causing chaos in the immediate rear of the German army on the Western front, the application of the same principle to the Eastern front presented a new situation for which there had been no previous opportunity. Thus, area bombing, which had been associated with many different aims in the past, now, for the first time, came to be connected with the desire of the Western allies to assist the Russian advance into German territory. This much was made clear by the whole development of the plan and especially by the prodding to which the Prime Minister had subjected the Air Staff at the end of January. The fact that the Russians themselves apparently expressed special interest in only two of the targets concerned, namely, Berlin and Leipzig, of course, had no bearing upon the motives which led to the inclusion in the list of other targets such as Chemnitz and Dresden. This modification, as Sir Charles Portal expected, might well

have led to a revision of the directive by Sir Norman Bottomley and General Spaatz, especially as the one they had issued on 15th January had fallen so far out of step with the realities of the situation. A new directive was not, however, issued.

This was curious, and particularly so since on 7th February 1945 Sir Norman Bottomley had suggested to General Spaatz that they should jointly issue a new directive allocating the first priority to oil, the second to communications including the destruction of Berlin, Leipzig, Dresden, Chemnitz and similar centres, the third to tank factories, the fourth to jet aircraft production and the fifth to submarine yards.¹ The failure of the agents for the direction of the combined bomber offensive to do this was unfortunate as it led to some confusion amongst their superiors, but the absence of a directive made little difference at the time either to Sir Arthur Harris or to General Doolittle. Their instructions, as has been seen, were quite clear, and it was obvious that the American attack on Berlin would shortly be followed by similar operations against Dresden, Leipzig, Chemnitz and, perhaps, other places as well. Even General Kuter, who was apparently unaware of the plan, showed at the Yalta Conference that he knew Dresden was a probable target for the strategic air forces.²

Dresden, with its pre-war population of more than 600,000 now swollen by an influx of refugees and its significance enhanced by military events on the Eastern front, had, even before these developments, been regarded as a desirable bombing target in its own right. So much had this been so, that towards the end of 1944 the British Air Staff had, with the approval of the Prime Minister, sought to persuade the Soviet Air Force to bomb it.³ Nothing had come of this but, as will be remembered, Dresden took its place alongside Leipzig and Chemnitz as among the towns which Sir Arthur Harris had for some time believed to be in urgent need of destruction. Though it was, in fact, first bombed by the Eighth Air Force on 7th October 1944,⁴ Sir Arthur Harris now had an opportunity for striking at what was still virtually an intact town, and for this action he had, as will already have become clear, a higher sanction than his own wish to complete the programme of the general area offensive.⁵ On the night of 13th

¹ Bottomley to Spaatz, 7th Feb. 1945.

² See his remarks in connection with the Berlin-Dresden bomblines, above, p. 106.

³ Mins., C.O.S. Mtgs., and communications to 30 Mission, Russia, October and November 1944.

⁴ And not, as Sir Arthur Harris states, on 13/14th February 1945 by Bomber Command. See *Bomber Offensive*, p. 242.

⁵ The Eighth Air Force made the following attacks upon Dresden:

		<i>Effective Sorties</i>	
Industrial Area	7th October 1944	30	
	17th April 1945	8	(Cont. p. 109)

February 1945 he despatched just over eight hundred aircraft of Bomber Command to Dresden, where one of the most devastating attacks of the war in Europe was carried out. In daylight on 14th February the action against Dresden was taken up by more than four hundred bombers of the Eighth Air Force. A third operation was mounted against the same target by over two hundred American bombers on 15th February, and on 2nd March the Eighth Air Force struck once more at Dresden, this time again with more than four hundred bombers. These blows, and particularly the Bomber Command night attack, proved utterly ruinous to the city where, on an even more fearful scale, scenes reminiscent of the Battle of Hamburg were re-enacted. Meanwhile, on the night of 14th February, Bomber Command carried out a major attack on Chemnitz and the Eighth Air Force extended the campaign by further massive operations including one on 26th February against Berlin by more than a thousand bombers.

The operations against Dresden were, therefore, only a part of a concerted action and the Bomber Command attack was only an element in a combined Anglo-American assault. Nevertheless, by far the heaviest damage was sustained by Dresden and by far the greatest proportion of it was inflicted by the Bomber Command night attack. This was, indeed, the climax of the night area offensive. It was the crowning achievement in the long, arduous and relentless development of a principle of bombing which the Royal Air Force had initially adopted, as a retaliatory measure, in the attack on Mannheim of December 1940, and to which the greater part of the Bomber Command effort had subsequently always been devoted. But as the area bombing of large cities was brought to a climax, so, at the same time, other more selective and more precise aspects of the strategic air offensive were also approaching theirs.

Throughout all the disputes and distractions which had beset it, the Air Staff had not lost confidence in the decisive character of the oil plan. In 1945, as in the later months of 1944, they had subjected all competing bombing policies to critical examination and they had refused to abandon oil as the primary objective of the offensive. Though they had failed to enlist Sir Arthur Harris' belief in the plan,

Marshalling Yards	16th January 1945	133
	14th February 1945	316
	15th February 1945	211
	2nd March 1945	406
	17th April 1945	572
	(Eighth Air Force Target Summary)	

The statement made in *The Army Air Forces in World War II*, Vol. III, p. 731, that 'the heavy bombers had left (Dresden) alone until 1945' is, therefore, not correct. The United States official history does not make any reference to the heavy Eighth Air Force attack against the marshalling yards at Dresden on 17th April 1945.

they did, in the opening months of 1945, succeed in securing his greater participation in it, and, between the beginning of January and the end of the war, more than a quarter of the total Bomber Command effort was devoted to this exacting and precise task.¹ The Air Staff's determination to persist with the oil offensive endured until the beginning of April 1945, when the Joint Intelligence Committee found themselves in a position to report that it had been brought to a triumphant conclusion. The German output of petrol had by that time, they estimated, been reduced to the level of 30,000 tons per month, which was about six per cent of the normal production. They considered that none of the remaining oil plants was capable of any substantial output and even the small resources which were still available could not, they reported, be properly distributed owing to the collapse of the German transport system.² Thus, it appeared, and as will be seen in Chapter XIV, it was actually the case, that the oil plan had achieved its ultimate aim. The Air Staff, therefore, and for the best of reasons, no longer had a case for persisting with the oil policy which had to so great an extent absorbed their attention since June 1944. But even before this they had been increasingly compelled to give ground to Sir Arthur Tedder's advocacy of the communications campaign.

While the Air Staff were within their rights in resisting the influence of the Deputy Supreme Commander in matters which touched the conduct of the strategic air offensive, they were bound by the arrangements made at the Quebec Conference to heed his suggestions about the air support of the land campaign, including those which embraced the operations of the strategic air forces. As has been seen, the arrival of allied troops on the Continent had created many difficulties of distinction between strategic and tactical or independent and auxiliary air operations, and the nearer the armies came to German territory the greater these difficulties became. They were, as has also been seen, especially acute when related to the particular question of communications bombing. By the end of 1944 communications in and out of the Ruhr, for example, were directly serving the German army in its defence of the Rhine frontier. They also continued to serve the industrial economy of Germany as a whole. Their destruction would, therefore, be at once, on the one hand, a tactical and auxiliary and, on the other hand, a strategic and independent operation. When, in March 1945, General Eisenhower's armies crossed the

¹ The proportions of Bomber Command effort devoted to the oil campaign were:

July-September 1944	11% (German cities 20%)
October-December 1944	14% (German cities 58%)
January-May 1945	26% (German cities 37%)

Bomber Command Quarterly Reviews, July-Sept. 1944, Oct.-Dec. 1944, and *Bomber Command Review 1945*.

² J.I.C. Report, 3rd April 1945.

Rhine most of the remaining meaning, which these distinctions had, disappeared. For these reasons the path of the advocates of communications bombing became easier and they were able to harness an increasing proportion of the heavy bomber effort to their purposes. Though these operations were an inseparable part of the military campaign which they so greatly facilitated, they were equally an inseparable part of the strategic air offensive, for, as will appear in Chapter XIV, these attacks, together with those on oil, made a decisive contribution to the paralysis of the heart of Germany which was wrought by that offensive in the closing months of the war.

The communications campaign had included two major plans. The first, known as *Clarion*, was mainly an American conception which had been strongly canvassed for some time and had been especially recommended by General Marshall. It involved widespread attacks on communications all over Germany by heavy, medium and light bombers as well as by fighters. Thus, while it provided for a functional concentration of air power, it necessitated an enormous geographical dispersal which by many, including the British Air Staff, was thought to be a severe disadvantage.¹ In practice the operation, which was initiated towards the end of February 1945, was largely indiscriminate and failed to produce any very satisfactory results.²

While the American air forces were concerned with this dispersed application of the communications campaign, Bomber Command devoted its main efforts to a more concentrated attack upon the Ruhr with the aim of isolating it from the rest of Germany. This was the object of the second main plan which had long been advocated by Sir Arthur Tedder and which was now given the code name of *Bugle*. It involved the use of the Anglo-American heavy bombers against the Ruhr area itself where, at the beginning of March 1945, it appeared that eight of the seventeen main railway centres were still in working order, and of the tactical air forces against specific communications to the north and the south of the Ruhr.³ Despite the fears which the British Air Staff expressed to the effect that this might interfere with the maintenance of the oil offensive, and despite a certain resentment, which they also expressed, at what they regarded as interference in the direction of the strategic air offensive by Sir Arthur Tedder,⁴ this plan was carried out in March immediately before the crossing of the Rhine by General Eisenhower's armies, to whose subsequent success it so greatly contributed.

¹ Bottomley to Tedder, 6th March 1945.

² *The Army Air Forces in World War II*, Vol. III, pp. 732-736.

³ S.H.A.E.F. Air Staff to Air Min. U.S.S.T.A.F., Bomber Command, etc., 3rd March 1945.

⁴ Bottomley to Tedder, 6th March 1945, and Bottomley to Harris, 6th March 1945. Sir Arthur Tedder observed to Sir Norman Bottomley on 16th March 1945 that he could no longer see much difference between strategic and tactical bombing.

Thus, by the beginning of April 1945, the principal parts of both the oil and the communications plans had been executed. The anticlimax of January had rapidly and dramatically been translated into a climax, for it was now apparent that the aim of the strategic air offensive had been accomplished. The military, industrial and economic system of Germany had been undermined to the point of utter collapse. The enemy was no longer capable of effective armed resistance. Nothing which could endure stood between the Russian armies moving westwards and the Anglo-American armies moving eastwards. In these circumstances, it became doubtful whether there was anything to be gained by further strategic air operations and particularly by heavy area bombing. On 28th March the Prime Minister drew attention to these considerations, but the manner in which he did so suggested that he was acting on the spur of the moment without due reflection.

28 March 1945. Prime Minister to General Ismay (for Chiefs of Staff Committee) and the Chief of the Air Staff

'It seems to me that the moment has come when the question of bombing of German cities simply for the sake of increasing the terror, though under other pretexts, should be reviewed. Otherwise we shall come into control of an utterly ruined land. We shall not, for instance, be able to get housing materials out of Germany for our own needs because some temporary provision would have to be made for the Germans themselves. The destruction of Dresden remains a serious query against the conduct of Allied bombing. I am of the opinion that military objectives must henceforward be more strictly studied in our own interests rather than that of the enemy.

The Foreign Secretary has spoken to me on this subject, and I feel the need for more precise concentration upon military objectives, such as oil and communications behind the immediate battle-zone, rather than on mere acts of terror and wanton destruction, however impressive'.¹

This was, perhaps, among the least felicitous of the Prime Minister's long series of war-time minutes. It appeared to overlook the fact that the Bomber Command attack on Dresden had taken place not at the end of March, when Germany was obviously facing imminent defeat, but in the middle of February, when the situation had been somewhat less promising and a great deal less clear. It also seemed to overlook the fact that, after encouraging the Air Staff, and more directly the Commander-in-Chief, Bomber Command, in the policy of area attack upon large German towns for the past four years, the Prime Minister had himself, as recently as 26th January 1945, suggested the application of this principle to the great eastern cities of Germany in

¹ A.H.B. File.

somewhat peremptory terms and that he had, at that time, been informed by Sir Archibald Sinclair that Dresden was among the targets which had, in consequence, been selected. No doubt these were some of the reasons which prompted Mr. Churchill presently to withdraw his minute and, as will be shown later, to substitute another and a more cautiously worded version of his views. Nevertheless, in this original minute the Prime Minister was reflecting a growing controversy about the objects of the strategic air offensive which persists to the present day and which has come to be particularly associated with the bombing of Dresden. This was due to the singular effectiveness of the attacks and to the widespread publicity which they immediately attracted.

On 17th February 1945 an Associated Press war correspondent issued a despatch from Supreme Headquarters, Allied Expeditionary Force, in which he stated that the 'Allied Air Chiefs' had made the 'long awaited decision to adopt deliberate terror bombing of German population centres as a ruthless expedient to hastening Hitler's doom'. The recent attacks on the 'residential sections' of Berlin, Dresden, Chemnitz and Kottbus were referred to as being for 'the avowed purpose of heaping more confusion on Nazi road and rail traffic, and to sap German morale'.¹

This despatch was widely publicised in the United States, it was broadcast from Paris; and in Britain, though it was suppressed after only a brief release, it did not go unnoticed, especially after it had been quoted, on 6th March 1945, in the House of Commons.² In the United States, where such a strong and public emphasis had been accorded to the selective and precise nature of American bombing, it produced an awkward situation which was only partly alleviated by the statement of General Marshall to the Secretary of War that the bombing of Dresden had taken place at Russian request.³ In Britain, too, the despatch caused serious embarrassment and undoubtedly contributed to the widespread misunderstanding of the conduct both of the British Air Staff and of the Commander-in-Chief, Bomber Command which has prevailed ever since.

The Associated Press message, though omitting to mention one of the major objects of the attacks, which was to assist the Russian advance, accurately, though, perhaps, injudiciously, described the aims of the attacks on Dresden and the other towns which it mentioned,

¹ A copy of this despatch appears on the Secretary of State for Air's file.

² Parliamentary Debates. Commons. Vol. 408, Col. 1901.

³ The statement was contained in a memorandum of 6th March 1945. The American official historian accepts it as correct. See *The Army Air Forces in World War II*, Vol. III, p. 731. It seems probable, however, that General Marshall read too much into the Russian request which, apart from the specific mention of Berlin and Leipzig, was in general terms. At any rate no evidence has come to light showing that the Russians asked specifically for the bombing of Dresden.

but the suggestion that a radically new kind of bombing policy had been adopted and that it had been adopted by the decision of the 'Allied Air Chiefs', by which service officers were presumably meant, was entirely misleading, and even indicated that the military forces were no longer within the proper control of the political direction. In view of this and in view of the fact that even the Prime Minister seems to have been temporarily influenced by the same delusion, it seems necessary to examine the foundations upon which this myth grew.

The conduct of the strategic air offensive had long been regarded with suspicion by sections of public opinion in Britain. It was generally regarded as morally legitimate to bomb strategic objectives such as factories, oil plants, dockyards and railway centres, even if this did incidentally cause severe destruction of residential areas and of civilian life and limb. On the other hand, the view that it was morally legitimate to bomb residential areas, even if the object was to reduce military or industrial activity, was frequently challenged, and the more apparent it became that in the majority of its major area attacks, Bomber Command was, in fact, aiming at the centres of the residential areas, the more pronounced the protests became. In dealing with these challenges and with the many anxious enquiries which he received, the Secretary of State for Air was naturally placed in a somewhat delicate and difficult position. It was unfortunate that he had to contend with such a widespread and deep-rooted ignorance of the operational problems involved. All the same, many of those who expressed anxiety about the objects of strategic bombing were highly responsible people whose motives could not be in doubt. Notable among them were the Bishop of Chichester, Dr. Bell, and the Marquess of Salisbury.¹

Now, of course, the responsibility for the fact that Bomber Command often, and at some stages of the war generally, aimed at the residential areas of German towns lay upon the Government, who had considered, endorsed and to a great extent encouraged Air Staff advice to that effect. These processes have been exhaustively examined in these volumes and should by now have become abundantly clear. There is no doubt, for example, that Sir Charles Portal's instructions of 15th February 1942 to the effect that Bomber Command was to aim at built-up areas and not at factories were in accord with Government policy, even though, on that particular occasion, none was formally expressed.² As further examples of the informally expressed views of the principal members of the Government it is, perhaps, worth mentioning that on 5th August 1941 Sir Charles Portal

¹ For Dr. Bell's attitude, see his speech in the House of Lords on 9th February 1944. Parliamentary Debates. Lords. Vol. CXXX, Cols. 737-755. Lord Salisbury corresponded privately with Sir Archibald Sinclair at the end of 1943.

² See above, Vol. I, p. 324.

reminded Sir Archibald Sinclair that 'the Prime Minister has repeatedly declared during recent weeks and even since Russia came into the war that our policy should be to attack centres of population', and that on 15th April 1942 the Foreign Secretary, Mr. Eden, wrote to Sir Archibald Sinclair expressing the view that

'the psychological effects of bombing have little connexion with the military or economic importance of the target. They are determined solely by the amount of destruction and dislocation caused. The bombing of Lübeck for example had a moral and dislocating effect out of all proportion to the direct military and economic importance of that city . . .'

Mr. Eden then suggested that the psychological effects of attacking a medium-sized town were greater than those of attacking, with equal force, a larger town, and he added:

'I wish to recommend therefore that in the selection of targets in Germany the claims of smaller towns of under 150,000 inhabitants which are not too heavily defended, should be considered, even though those towns contain only targets of secondary importance . . .'

¹

Moreover, there is no reason to suppose that Sir Archibald Sinclair found these views morally repugnant. At any rate he received a letter towards the end of May 1942 in which an M.P. stated that he was

'all for the bombing of working-class areas in German cities. I am Cromwellian—I believe in "slaying in the name of the Lord", because I do not believe you will ever bring home to the civil population of Germany the horrors of war until they have become tasted in this way'.

To this Sir Archibald Sinclair replied, on 26th May 1942, that he was

'delighted to find that you and I are in complete agreement about . . . bombing policy generally. . . .'

²

Naturally, climates of opinion varied with the changing circumstances of the war, and the aim of disrupting civil morale as an end in itself came, in fact, to occupy a less and less prominent position in the directives. Nevertheless, as will be recalled, the object of 'undermining the morale of the German people' was avowed in the Casablanca directive of January 1943, immediately after the object of achieving 'the progressive destruction and dislocation of the German military, industrial and economic system'. Sir Arthur Harris was never dissuaded from general area attacks upon residential areas for moral reasons, though, as has also been seen, he was from time to time

¹ Min. Portal to Sinclair, 5th Aug. 1941, and letter Eden to Sinclair, 15th April 1942.

² Correspondence with Sinclair, 21st May and 26th May 1942.

discouraged on strategic grounds. The events leading to the attack on Dresden have been fully described.

Nevertheless, the view that the Air Staff, and even Sir Arthur Harris himself, were ultimately responsible for the decision to carry out what was, perhaps, not inaccurately, described as 'terror bombing' had grown up more or less *pari passu* with the development of the bombing offensive. This was undoubtedly at least partly attributable to the nature of the frequent public and in some cases private pronouncements which Sir Archibald Sinclair found it his duty to make. In these he did not concede that one of the objects of area bombing was the reduction of civilian and especially industrial morale by the bombing of housing and public utilities and so, of course, of the populations themselves. He usually, and, on public occasions, invariably, suggested that Bomber Command was aiming at military or industrial installations as, of course, it sometimes was. He did not conceal that severe and sometimes vast damage was done to residential areas, but he either implied, or on some occasions said, that all this was incidental and even regrettable. Only in this way, he explained to Sir Charles Portal in October 1943, could he satisfy the enquiries of the Archbishop of Canterbury, the Moderator of the Church of Scotland and other significant religious leaders whose moral condemnation of the bombing offensive might, he observed, disturb the morale of Bomber Command crews. This latter consideration was, the Secretary of State thought, more important than another which Sir Arthur Harris had raised, namely, that the Bomber Command crews might form the impression that they were being asked to perform deeds which the Air Ministry was ashamed to admit.¹

Sir Arthur Harris himself, however, frequently made the objects of the bombing offensive clear, and there accordingly sometimes appeared to be a difference between his conception of legitimate warfare and that of the Government and Air Staff. As Lord Salisbury put it to Sir Archibald Sinclair in November 1943, the resolve of Sir Arthur Harris that the Battle of Berlin should continue until the 'heart of Nazi Germany ceases to beat' seemed to 'bring us short up against the repeated Government declarations that we are bombing only military or industrial targets'.²

These moral issues are likely to continue long to be debated, and the verdicts will doubtless to some extent be conditioned by the circumstances of the ages in which they are reached. It should now, nevertheless, be clear that neither the Air Staff nor Sir Arthur Harris

¹ Min. Sinclair to Portal, 28th Oct. 1943. For examples of Sir Archibald Sinclair's public pronouncements on bombing policy see his speeches and answers to questions in the House of Commons and especially those on 6th May 1942, 31st March 1943 and 1st December 1943. Parliamentary Debates. Commons. Vol. 379, Col. 1364; Vol. 388, Col. 155; Vol. 395, Cols. 337-338.

² Letter Salisbury to Sinclair, 26th Nov. 1943.

can justly be accused of waging war in a different moral sense from that approved by the Government. Moreover, it should equally be clear that at no stage of the war was the area bombing offensive wanton. On the contrary, it was a carefully designed strategic plan intended to contribute to the most rapid and the most economical defeat of Germany. Though the area offensive, even in the light of the various operational circumstances, is open to many strategic criticisms, it is difficult to see why it should bear unfavourable moral comparison with naval blockade or some other kinds of warfare.

Despite all these important considerations, Mr. Churchill had, nevertheless, raised a relevant and, indeed, an urgent question in his minute of 28th March 1945. This was the problem of determining the time at which it would be safe to discontinue or, perhaps, to restrict the massive destruction of the strategic air offensive. A premature decision was likely to prolong the war. A delayed decision could only produce needless damage.

The atmosphere in which this situation was appraised became calmer than would otherwise have been the case because, on the evening after he had written it, the Prime Minister agreed, at the suggestion of Sir Charles Portal, to withdraw his minute and to substitute for it a somewhat more discreetly and fairly worded document.¹ The new minute, which Mr. Churchill issued on 1st April 1945, was as follows:

Prime Minister to General Ismay (for Chiefs of Staff Committee) and the Chief of the Air Staff

'It seems to me that the moment has come when the question of the so called "area bombing" of German cities should be reviewed from the point of view of our own interests. If we come into control of an entirely ruined land, there will be a great shortage of accommodation for ourselves and our Allies: and we shall be unable to get housing materials out of Germany for our own needs because some temporary provision would have to be made for the Germans themselves. We must see to it that our attacks do not do more harm to ourselves in the long run than they do to the enemy's immediate war effort. Pray let me have your views'.²

The suggestion, in this form, was substantially acceptable to the Air Staff. In the reply, which was given the authority of the Chiefs of Staff Committee on 4th April 1945, the Air Staff agreed that 'at this advanced stage of the war no great or immediate additional advantage can be expected from the attack of the remaining industrial

¹ Mins. Portal to Bottomley, 28th March 1945, and to Sinclair, 29th March 1945. Sir Archibald Sinclair's comment was 'Excellent!'

² Circulated to C.O.S., 2nd April 1945. Sir Winston Churchill quotes two sentences of this minute in his *The Second World War*, Vol. VI, (1954), pp. 470-471. This is his only reference to the incident.

centres of Germany'. There were, nevertheless, the Air Staff pointed out, certain possible situations in which some further area bombing might be required as an element in the continuing battles on land and at sea. German resistance on the Eastern and Western fronts was apparently crumbling but, if it stiffened again, it might yet be necessary to bomb towns near the battle fronts. In any event, if, as was thought likely, Nazi leaders established headquarters from which to organise a final stand in Thuringian towns, then those too might become important area bombing targets. The transport campaign would have to be continued and its execution might involve the destruction of some towns, especially in central and southern Germany. Towns which were naval bases and notably Kiel, where some eighty commissioned U-boats appeared to have been concentrated, were also liable to further devastation. For these reasons, while accepting Mr. Churchill's main point, the Air Staff and the Chiefs of Staff were not yet prepared to prohibit area bombing under all circumstances.¹

When, on 6th April 1945, this decision was communicated to Sir Arthur Harris an important element in the strategic air offensive was withdrawn, but, in fact, the whole campaign was ending because the utter collapse of Germany was daily becoming more obvious and more imminent.² On 10th April General Eisenhower and Sir Arthur Tedder concluded that the primary object of bombing was now to give direct support to the armies, and they suggested that the greater part of the effort should be devoted to the destruction of communications, especially in the area of Leipzig and Halle.³ Nor did the Air Staff any longer wish to resist this conclusion, though they believed that a limited effort should still be devoted to the oil plan.⁴

The new situation was recognised by Sir Norman Bottomley and General Spaatz in the fourth and last of their directives which, on 19th April 1945, was recommended for the approval of the Combined Chiefs of Staff by the British Chiefs of Staff. It stated that the 'main mission of the Strategic Air Forces is now to give direct assistance to the land campaign' and, in effect, it signalled the ending of the strategic air offensive against Germany. This directive was dated 16th April 1945, but it was not officially promulgated until 5th May owing to differences of opinion in London and Washington as to whether it should be issued by Sir Charles Portal and General Arnold or by Sir Norman Bottomley and General Spaatz.⁵

¹ C.O.S. Memo., 4th April 1945.

² Air Min. to Bomber Cmd., 6th April 1945.

³ Tedder (signed Eisenhower) to Bottomley and Spaatz, 10th April 1945.

⁴ Bottomley to Tedder, 11th April 1945.

⁵ Directive No. 4 for Strategic Air Forces in Europe, 16th April 1945, and covering letter Bottomley to Harris, 5th May 1945. App. 8 (xlv(b)) and (a). C.O.S. to J.S.M. (Washington), 19th April 1945, J.S.M. (Washington) to C.O.S., 3rd May 1945, C.O.S. to J.S.M. (Washington), 4th May 1945.

This, however, was a matter of little importance and, in any case, on 16th April Sir Charles Portal adopted another means of signifying the same intention. In a message, which he suggested Sir Arthur Harris might promulgate as an order of the day to Bomber Command, he stated that:

‘The tasks given to the British and American strategic air forces in Europe were to disorganise and destroy the German military, industrial and economic systems and to afford direct support to our forces on land and sea.

In the first of these tasks we are now at the point of having achieved our object: the progress of the allied armies across Germany brings to light every day how fatally the German war machine has been weakened by the devastating blows of the strategic air forces against industrial and military targets. Bomber Command were the pioneers of the strategic bomber offensive and all formations and units are deserving of the highest praise for the part they have taken with our American allies in bringing it to a successful conclusion.

Henceforth the main tasks of the strategic air forces will be to afford direct support to the allied armies in the land battle and to continue their offensive against the sea power of the enemy which they have already done so much to destroy. I am confident that Bomber Command will maintain in these final phases of the war in the air over Europe the high standard of skill and devotion that has marked their work since the earliest days of the war.’¹

In these words the ending of the strategic air offensive against Germany was signalised.

¹ Order of the Day Portal to Harris, 16th April 1945.
S.A.O.—VOL. III, Pt. 5—1

CHAPTER XIII

THE CULMINATION OF
THE OFFENSIVE:
NEW OPERATIONAL SKILLS

Bombing techniques, 1944-45

1. New operational factors in the strategic air offensive, 1944-45
2. *Overlord* and the strategic air offensive. The development of precision bombing at night, April-June 1944
3. The development of day attack by Bomber Command and the establishment of new conditions in the night offensive, June-October 1944
4. The operational climax, October 1944-May 1945

'In the latter stages of a war after some years of lavish expenditure of money, material, and manpower in the equipment and manning of all arms of the fighting services, military problems have a way of becoming relatively easy of solution.'

LORD TEDDER, 1947

'It has now been reported that the attacks which take place so often at night now, are considerably more effective than daylight attacks, since heavier bombs are used and an extraordinary accuracy in attacking the target is reported.'

ALBERT SPEER, 19th January 1945

Bombing techniques 1944-45

OBOE SKY MARKING (Musical Wanganui)

Blind *Oboe* sky marking—main force normally approaches in the same direction as *Oboe* run in and bombs sky markers at 165 m.p.h. with zero wind velocity on bombsight.

OBOE GROUND MARKING (Musical Paramatta)

Blind *Oboe* ground marking backed up as necessary with Target Indicators of different colour. Main force aims preferably at *Oboe* Target Indicators.

CONTROLLED OBOE

Oboe Target Indicators are assessed by Master Bomber who instructs main force by Radio Telephone and sometimes backs up best *Oboe* markers with further Target Indicators of distinctive colour.

8 GROUP VISUAL

Similar to controlled *Oboe* (though may be used beyond *Oboe* range with *H2S* or eyesight). Master Bomber visually assesses *Oboe* markers and re-marks visually.

H2S GROUND MARKING (H2S Paramatta)

Similar to *Oboe* ground marking but, because *H2S* is less accurate, more initial markers are put down and backers up aim at mean point of impact. Main force aim at this backing up and not at the *H2S* marking.

H2S SKY MARKING (H2S Wanganui)

Similar to *Oboe* sky marking.

H2S NEWHAVEN

A form of 8 Group visual. Starts in same way as *H2S Paramatta* but flares are also dropped. Pathfinder Force visual markers then mark aiming point visually.

MUSICAL NEWHAVEN

Same as *H2S Newhaven* but with initial proximity marking by *Oboe*.

5 GROUP VISUAL

Flares and proximity marking followed by visual dive marking with the offset modification.

OBOE FORMATION (Daylight)

Aircraft fly in formation. Leading aircraft bombs on *Oboe* indication and remaining aircraft bomb on signal from leader. The only visibility requirement is for the pilots to be able to see each other's aircraft.

G-H FORMATION (Daylight)

Similar to *Oboe* formation but with *G-H*.

1. New operational factors in the strategic air offensive 1944-1945

IN the final period of the war between the end of the Battle of Berlin and the capitulation of Germany rather more than a year later, Bomber Command was confronted with a series of new operational factors which revolutionised the conditions and also the techniques of the strategic air offensive. In the spring of 1944 the German night fighter force, having apparently outwitted all the measures of deception and evasion which could be devised, seemed to be on the brink of winning a major victory against Bomber Command. But at the same time the German day fighter force was being outfought by the American co-ordinated long-range fighter and heavy bomber offensive in daylight. Day bombing, indeed, showed signs of becoming safer than night bombing, for no method could be found of engaging the German night fighters in the way that the day fighters were being engaged and overwhelmed. Nevertheless, day bombing was no longer necessarily more accurate than night attack. On the contrary, owing to the extraordinary advances of Bomber Command in the techniques of marking and aiming at night, the opposite was often the case. Then, in the late summer of 1944, the German night fighter force began to show a sudden and precipitate decline in effectiveness which presently left Bomber Command in possession of an air superiority at night as complete as that which had been gained earlier in daylight.

The revolution suggested by these abrupt and sweeping changes was one of great complexity which depended upon a number of radical factors, some of which were the product of natural and expected developments, such as the improvement in the techniques of Bomber Command, and some of which, like the changes in fortune of the German night fighter force, were more sudden and less expected. Whether expected or unexpected and whether evolutionary or revolutionary, these developments did, all the same, produce entirely new factors which, in turn, produced conditions for the bombing offensive which were not only different but often quite the reverse of those which had governed the earlier phases of the campaign. In the sections which follow the nature and effect of these new factors is analysed in detail, for it was upon them that the eventual decisiveness of the combined bomber offensive depended. Here, in this introductory section, an appraisal of their general significance and of the connection between them is made.

Among the most important of the new factors was one due entirely

to the logical and expected development of tendencies and decisions revealed much earlier. This was the enormously increased striking power of Bomber Command by comparison even with the height of what had been achieved in 1943. It was due to the continued expansion and improved quality of the front line which, both absolutely and in its Lancaster and Mosquito elements, became larger than ever before. These famous aircraft, the Lancaster and the Mosquito, not only did all they had done before but they did more. They yielded to modifications which enabled the former to lift a 22,000-lb. bomb and the latter to carry a 4,000-lb. bomb to Berlin. Even the Halifax showed an improvement, and the somewhat more efficient version of it came increasingly into service during 1944.¹

But the greater striking power of Bomber Command was not purely a question of aircraft quantities and qualities. It was also an expression of greater efficiency. New technical aids were introduced, old ones were improved and put both to wider and to different uses, remarkable developments occurred in the techniques of marking and bombing different kinds of target, and, in some cases, more powerful and more effective bombs were provided. Thus, Bomber Command became more powerful, more accurate and more versatile, with the result that two important and hitherto established conditions of the offensive were changed. Area bombing was no longer always an operational inevitability for the bulk of the force at night and many great objects, which could once only have been attempted by a maximum effort of the whole front line, could now be attained by a small proportion of the force. Not only could the force carry out precision attacks upon several different targets at the same time, but it was even to be shown that a single Group could effectively mount a major area attack upon a major German town.

The exploitation and development of these new capacities was made urgent and imperative by two other factors which also arose as the Battle of Berlin came to an end. The first was the nature and extraordinary variety of tasks which Bomber Command was called upon to undertake in direct preparation for *Overlord* and the short

¹ In April 1944 there was a daily average of 1,023 aircraft available with crews for operations in Bomber Command. The daily average of aircraft available for operations was:

Lancasters	614
Halifaxes	353
Stirlings	58
Mosquitoes	72

In April 1945 these averages had increased to 1,609 aircraft available with crews for operations and the average for individual aircraft at that time was:

Lancasters	1,088
Halifaxes	349
Mosquitoes	170

These figures include only bombers. Bomber Cmd. O.R.B.

time in which they had to be executed. The second was the alarming success of the German night fighter force which reached an unprecedented climax on the night of the Nuremberg operation at the end of March. These, of course, were entirely different kinds of factors and the connection between them was purely coincidental. It was, however, nonetheless strong for that reason. The requirements of *Overlord* and the success of the German night fighter force were mutually supporting in their effects. Strategically, the consequence was to impair the concentration of effort which, during the previous twelve months, had been devoted to targets within the German frontiers. Operationally the consequence was to disperse the concentrated tactics which Bomber Command had progressively developed during the previous four years.

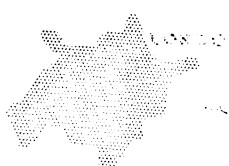
The preparations for *Overlord*, as will be remembered, involved Bomber Command in a plan for the destruction of a large number of relatively small targets within an extremely short time. Military considerations had dictated the choice of the targets, most of which were in France or other friendly but occupied territory, and the dates by which they had to be destroyed. Political considerations had dictated that, on account of their locations, the absolute minimum of incidental damage should be inflicted in the neighbourhood of these targets. Bomber Command methods, therefore, had to be radically adjusted. First, a major diversion from the offensive against Germany had to be accepted and, secondly, a completely different technique of bombing had to be devised. Obviously the tactics of massed area bombing were wholly inappropriate. A series of precision attacks was called for in which the scale of each operation was carefully related to the size and nature of each particular target. To meet the military and political requirements of the situation, the principle of economy of effort assumed a paramount importance. The greater the accuracy achieved the smaller would be the scale of attack required and the less the incidental damage inflicted. The smaller the scale of attack required the greater would be the number of targets destroyed in a given time and, therefore, the more quickly would the plan be completed.

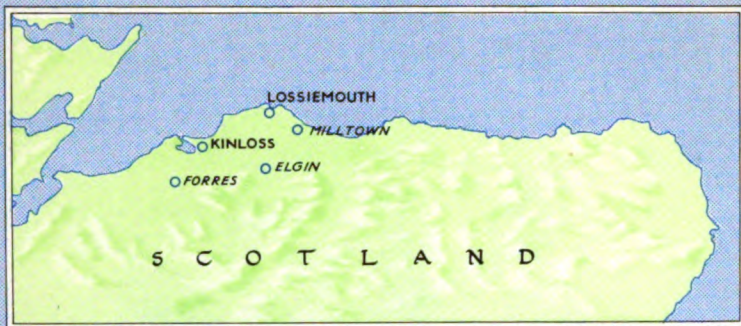
These requirements which, as has been seen, had such strong and authoritative backing, did, indeed, make heavy demands upon the relatively untested capacities of Bomber Command for a new kind of offensive. They placed an absolute premium upon the accuracy of bombing and they reversed the previous trend of increasing saturation tactics. It became necessary for Bomber Command to divide its force and to attack several different targets at the same time.

This latter necessity was not, however, due only to the strategic requirements of *Overlord*. It was equally due to the tactical situation produced by the success of the German night fighter force, which

made a dispersal of this kind inevitable. Saturation had long been the key to, and for longer the aim of, the area bombing offensive, though it was only after the beginning of 1943 that Bomber Command had gained sufficient strength and ability to achieve it on a sustained and convincing scale. The operational method of achieving saturation was, of course, concentration but, as saturation was used as a tactic of offence in overwhelming the whole target area with fire and explosion and as a tactic of defence in swamping the German gun, searchlight and night fighter forces as well as, with the help of *Window*, the radar devices upon which they partly depended, concentration in time and space had to be achieved not only at the target but also on the route in the bomber stream. This naturally meant that at least the great bulk of Bomber Command had to proceed by the same route to the same target and as far as possible at the same time. The Battle of the Ruhr, the Battle of Hamburg and, for much of its course, the Battle of Berlin had demonstrated an undoubted relationship between, on one hand, the effectiveness and cost in casualties of the operations and, on the other, the extent to which concentration was achieved at the target and on the route. Dispersed area bombing, even if on the heavy scale characteristic of the Battle of Berlin, seldom did really severe damage and never achieved anything comparable to what was done by successful concentration in the Battle of Hamburg. Stragglers from the bomber stream were denied the concentrated protection of *Window* and were often short-lived as they wandered alone over radar-directed guns or through Ground Controlled Interception (G.C.I.) fighter boxes. Efficiency as well as safety could be seen to depend upon the same tactics, namely, those of concentrated saturation, and this had inevitably meant that what had once been the individual and different methods of the Groups had to be adjusted to produce a standard operational technique for the whole of Bomber Command. In major attacks, the only important distinction which had remained was that between the Pathfinder Force, with its role of marking the target and often the route as well, and the main force, with its role of following the route and bombing the target markers.

These tactics were, of course, never wholly successful in neutralising the German air defences and Bomber Command always had to face a serious, though fluctuating, casualty rate which closely corresponded to the introduction of new measures and counter-measures by both sides favouring now the night bombers and now the night fighters. On the other hand, the German night fighters had never succeeded in stopping the night offensive and, though they had undoubtedly marred its effectiveness, they had not prevented that effectiveness from increasing. For as long as Bomber Command could increase its effectiveness and its immunity to fighter interception by





Map 2

BOMBER COMMAND

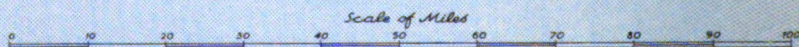
25th September 1944



Legend

1 GROUP	H Q	AIRFIELDS
3	⊙	○
4	▲	▲
5	●	●
6	■	■
8	●	●
91	○	○
92	▲	▲
93	■	■
100	⊙	○

OTU Satellite Airfields are shown in italic type



the same tactics, such as those of concentrated saturation, or at any rate by a series of tactics which were not mutually antagonistic, then the eventual advantage might well be expected to lie with the bombers. If, however, the German night fighters could drive a wedge between the tactics which Bomber Command had to pursue in order to protect itself and those necessary to make its attacks effective, then the outcome was likely to be quite different. The most disquieting element of the Battle of Berlin was that the latter situation seemed to be materialising. The tactics of concentrated saturation, so necessary to the destruction of the targets and especially of Berlin itself, instead, as had previously been the case, of offering the bombers their greatest security now appeared to be presenting the German fighters with their best opportunities. This was due to the way in which the German fighters were able to exploit the measures which Bomber Command had to take in order to achieve its concentration.

Concentration on the route, which may be described as a kind of formation flying by dead reckoning, was dependent upon accurate navigation and time keeping because, in the darkness, the bombers were only occasionally visible to one another. The best results could only be achieved by radar navigation, and since *Gee* was jammed over enemy territory, this meant the use of *H2S* by as much of the main force as possible and the provision of pyrotechnic route markers for the benefit of those not equipped with *H2S*. But these and other aids to concentration were also aids to interception. *H2S* transmissions could be picked up on German radar screens and used for homing. Route markers could be seen by the German pilots as well as by the British. The more that Bomber Command did to improve its concentration *en route* the easier it became for the Germans to find the concentration, and the greater the concentration achieved the more likely it became that German fighters flying in its neighbourhood would be able to sight and engage individual bombers in it.

Thus, while concentration had tended to conceal the individual bomber in the mass of the bomber stream and had, therefore, greatly reduced the efficiency of the German night air defences in their radar search for individual targets, it had also presented those air defences with an increasingly well-defined collective target. The development of route concentration had, therefore, produced its own nemesis, or rather the German night fighter force had created its own opportunity, for it was, after all, the German night fighter force which had, in the first place, been mainly responsible for the Bomber Command policy of route concentration.

This German opportunity depended upon their ability to locate the Bomber Command concentration and, in turn, to concentrate their own forces in the most favourable position. After *Window* had largely dislocated the earlier system of linear defence and individual

ground-controlled interception, the most favourable point for general concentration and visual interception had appeared to be at the target itself. Not only was there sure to be a heavy concentration of bombers there, but fires and flares were likely to silhouette the aircraft and, therefore, to offer the fighters a greater prospect of visual contact with them. Moreover, the target had to be marked and, therefore, disclosed before the attack began. When, therefore, the Germans introduced the 'running commentary' system of interception, which has already been described, the main task of the fighter controller was to detect the target in sufficient time to arrange for his fighters to meet Bomber Command at it.¹ These tactics were, however, vulnerable to the Bomber Command counter-measures of 'spoof' marking, diversionary attacks and deceptive routing, which were liable to mislead the German controller as to the real destination of the main force. On several occasions Bomber Command did, in fact, succeed in passing a concentrated bomber stream to the target while the German fighters were being assembled at some quite different point. Nevertheless, these German tactics did effect the first real breach in the Bomber Command policy of concentration for it was found that, if they were to be convincing, the diversionary operations had to be mounted on an increasingly heavy scale and that the radio counter-measures war had to be undertaken on a similarly larger scale and also by more and more complex methods.² A decreasing proportion of the effort was, therefore, left for the destruction of the main target. Moreover, when so much turned upon the deception of the German fighter controller as to what the main target was, it obviously became more dangerous for Bomber Command to concentrate its assault upon the same place in a series of successive attacks. In particular, it was virtually impossible to deceive the fighter controller about the main target at the height of the Battle of Berlin and, as will be remembered, Bomber Command was subsequently forced more and more to shift its concentration to other parts of Germany and notably to the south. Thus, to a greater extent than ever before, the German night fighter force was beginning to dictate tactics to Bomber Command which were necessary to its protection and yet seriously antagonistic to the effectiveness of its assault. But worse was to follow, for it soon appeared not only that Bomber Command casualties were failing to respond satisfactorily to these diversionary tactics but that they were actually increasing.

This was due to a yet more serious development in the tactics of the German night fighter force which made the controller less dependent upon prediction and enabled him to rely more upon observation. In

¹ See above, Vol. II, p. 153.

² This led to the decision to form 100 Group in November 1943.

the autumn of 1943 the method of concentrated interception at the target began to give way to the aim of somewhat more dispersed interception on the route to the target. This was made possible by the fact that the average bomber stream was growing larger and more concentrated and, therefore, also better defined. It meant that the fighter controller, instead of sending the bulk of his force to the target, and possibly the wrong target, could feed it piecemeal into the bomber stream whose course could easily be followed by the radio transmissions which it inevitably emitted. Thus, the German night fighter force was well prepared to intercept Bomber Command even when it adopted the most confusing diversionary tactics. This, as Sir Arthur Harris clearly realised, was a most grave development, for it seemed to be the ultimate counter to the bomber tactics of concentrated saturation, and this, indeed, it proved to be for as long as the German night fighter force lasted as an effective operational weapon. Yet between March and July 1944, during which time the German night fighters continued to operate with great efficiency, Bomber Command was able to carry out its directive and at the same time to avoid casualties which were more than could be sustained.

This was, as has already been explained, because the nature of the Bomber Command task in that period called for the division of the force into a number of virtually independent components. The single great bomber stream did not reappear after the Nuremberg action at the end of March 1944. Instead the German fighter force was confronted with a series of smaller bomber streams proceeding at the same time, in different directions to different targets and often not seeking deep penetrations. Thus, while the German fighter force still had the opportunity, which it often took, of inflicting very heavy casualties upon elements of Bomber Command, it was denied the chance of attacking the whole force. In consequence, the overall casualty rate in Bomber Command began to decline. Thus, the requirement of *Overlord* for the application of divided concentrations to many different targets saved Bomber Command from the full consequences of the new German night fighter tactics, while the success of the latter had, in any case, made the adoption of such a policy by Bomber Command virtually inevitable.

This reduction of casualties was, however, by no means the only important consequence for Bomber Command which flowed from the *Overlord* requirements. As has been mentioned, most of the targets were relatively small, were situated in friendly territory and, therefore, had to be attacked by the most precise methods. The Pathfinder Force had not developed such methods and its experience had been principally confined to the marking of area targets for the united main force concentration which followed. As will have been noticed, the Pathfinder Force technique of high-level radar-assisted target

marking had not solved, nor even assisted in the solution of the much more precise marking problems with which 617 Squadron had for some time been concerned. Moreover, the Pathfinder Force, owing to its limited size and, when *Oboe* was used, owing to the limited number of aircraft which could be operated at the same time, was seriously restricted in the number of simultaneous attacks which it could lead against different targets. Thus, the Pathfinder Force, which had measured its accuracy against the standards of area bombing and had related its scale of effort to the needs of the single concentration, was unsuited to the new requirements for really precise marking and the use of divided concentrations.

The result was that, for the first time since 1942, Bomber Command had to make a radical revision of its methods of target marking. The solution, as Sir Arthur Harris would have had it in the first place, was found in the so-called main force groups themselves. Each group was encouraged to develop its own marking and bombing technique for the particular task which confronted it and, in consequence, a great tactical diversification grew up in Bomber Command.¹ The predominance of the Pathfinder Force was much reduced and the standard operational technique of the main force groups developed into a series of specialised and often quite different techniques. This led not only to the solution of the problems raised by the requirements of *Overlord* but, by greatly increasing the operational ability and versatility of Bomber Command, it also changed the prospects of the strategic air offensive at night. The exacting demands of the *Overlord* air plan formed the school of experience in which Bomber Command developed its capacity for the wonderful feats of air power which characterised its performance in the final air offensive.

In this process the techniques of night bombing in some respects outstripped those which had been developed in daylight, and there were to be many occasions when the former was not only more destructive, but also more accurate, than the latter. Even so, the activities of the German night fighter force had seriously shaken confidence in the efficacy of the cover of darkness which more and more seemed to be a factor favouring the night fighter rather than, as hitherto, the night bomber. Moreover, this occurred at the very time when the efficacy of the cover of long-range fighters was being so convincingly demonstrated by American activities in daylight. Inevitably, the possibility

¹ 'It will be seen', Sir Arthur Harris writes, 'that at this stage of the war we were getting towards that state of affairs which I had recommended when the formation of the Pathfinder Force was first under discussion, for we now had the benefit of several different techniques, developed by different Groups, which were suitable for a variety of targets or conditions of weather.' Nevertheless, the Pathfinder Force was not, Sir Arthur Harris suggests, 'superseded' nor, he says, did it lose its 'commanding position'. *Bomber Offensive*, pp. 202-203.

of day attack again became a live issue in Bomber Command and avenues which, as far as heavy bombers were concerned, had been virtually closed since the Lancaster attack on the M.A.N. Works at Augsburg in April 1942 seemed once more to be open.

When in February 1944 the American bomber forces had resumed their deep penetration attacks upon German targets in a campaign which became famous under its code name of Operation *Argument*, it had been feared, not only by the British Air Staff, but also by the responsible American commanders themselves, that severe casualties would be suffered. In view of what had happened in the autumn of 1943 this was not surprising but, in the event, these expectations were never realised. In February 1944, from the heavy bombers of the Eighth Air Force which carried out attacks, only 3·5 per cent were lost in action and a further 3·1 per cent damaged by German fighters. In March 3·5 per cent were again lost in action, but only 2·7 per cent returned with the marks of fighter action upon them. In the period between July and December 1943 five per cent of these heavy bombers had been lost in action and nine per cent had been damaged by fighters.¹

The danger from flak, so far from diminishing, had actually tended to increase,² so that the decline in the effectiveness of the German day fighter force may have been even greater than is suggested by these figures. This decline was not due to a reduction in the strength of the German day fighter force which was still expanding and was about to be expanded still faster. It occurred before the somewhat limited strategic effects of the 'Big Week' operations could make themselves felt. Nor was it due to any sudden loss of fuel supplies, for it occurred before the allied offensive against oil production had begun. Its operative cause was the great American victory in actual air combat and it was this which made the 'Big Week' battle one of the most decisive of the war in the air.

This combat was provoked by the American heavy bombers which carried the threat of the bomb to the heart of Germany by reaching out to targets of deep penetration and leaving the German fighters with no alternative other than to defend them. But the combat was primarily fought and certainly won by long-range fighters of the Eighth Fighter Command under the determined leadership of General Kepner, who had long refused to believe that his fighters

¹ Report by Eighth Air Force O.R.S., 12th Feb. 1944. R.S.I. 524·0581.

² The percentages of Eighth Air Force heavy bombers which carried out attacks and returned with flak damage were:

July-December 1943	26·2
February 1944	26·8
March 1944	30·2

Further Report by Eighth Air Force O.R.S. R.S.I. 524·0581.

could not eventually engage the enemy even over Berlin.¹ This, indeed, was what now came to pass. By February 1944 the escort radius of action of the P.47 Thunderbolt had been increased to 475 miles. That of the P.38 Lightning, which had been introduced in November 1943, had been extended to 520 miles and, in March 1944, when it was provided with two 108-gallon drop tanks, the P.51 Mustang was given an operational radius of action of no less than 850 miles.² Thereafter, these fighters could operate from their British bases up to the eastern limits of Germany and the factor of range allied with that of performance in an aircraft which could fly in the manner of an interceptor fighter for as far as a heavy bomber became the key to the decisive American victory which followed.

Never again did the American bombers have to fly beyond the range of fighter cover as, for example, they had had to do on their Schweinfurt operations in 1943. No longer was there any point beyond which the German fighter force could rely upon finding an American bomber formation at a disadvantage. Moreover, as the number of long-range fighters was increased at a more than characteristically American rate and as the aggressiveness of their tactics was developed, there ceased to be any part of Germany in which flying for operational, transport or training purposes could be undertaken with safety. The *Luftwaffe* had lost the security of its base in the daylight hours and the heart of Germany was at last exposed to the day bombing offensive.

This, of course, did not lead to an absolute security for the American bombers, for there never was such a thing as absolute air supremacy. Considerable numbers of German fighters remained in the air until nearly the end of the war, and there were occasions when they could achieve a local and temporary superiority. There were also occasions when they could still find American bombers unaccompanied by friendly fighters. This was inevitable, if only because no air force can ever fill the whole sky, but it was also partly due to the tactics of the American fighters themselves.

It was soon realised in the Eighth Fighter Command that the full potential of a fighter could only be expressed in a tactically offensive role. Fighters tied to the bomber formation in a protective screen were at a serious disadvantage by comparison with those enjoying the whole air space in which to hunt, to manoeuvre and to attack. This

¹ Notes of an interview with General Kepner, C.G. 8th Fighter Cmd., by Dr. Bruce Hopper, 15th July 1944. R.S.I. 524-0581.

² *Eighth Air Force Tactical Development*, Ch. 5. R.S.I. 520-549B. The full range depended not only upon fuel capacity but also good pilotage. This, of course, was a question of experience. Nevertheless, Mustangs did operate over Berlin and even beyond it in March 1944. See *The Army Air Forces in World War II*, Vol. III, p. 12. In June 1944 Mustangs escorted bombers from British bases all the way to Poltava in the Ukraine where they landed. This was a distance of 1,700 miles. *Eighth Air Force Tactical Development*, pp. 50-52.

had been demonstrated by German experience in the Battle of Britain and by British experience in the subsequent *Circus* operations. It was again demonstrated by the initial American experience over Germany.¹ When, however, the Americans had gained the necessary confidence, they truly interpreted the meaning of these lessons. A higher and higher proportion of their fighters were then deployed in an offensive posture and proportionally fewer and fewer were harnessed to the bomber formations in a strictly escorting role. To an increasing extent, the role of the long-range fighters became that of seeking and destroying the enemy wherever he could be found. The immediate protection of individual bomber formations, though naturally always important, was of secondary importance. What was sought was the safeguarding of the bombers by general air supremacy and not merely by local air superiority.

The American bomber formations did, of course, have to pay in casualties for this policy from time to time, but a more important consequence was that wherever the German fighters rose they were generally engaged by superior forces. Despite their continuing occasional and local successes, the German fighters, therefore, failed to inflict decisive damage upon the American bomber formations, their own casualties increased sharply and, aided by the harsh criticisms of their superiors, the morale of their pilots and their commanders inevitably declined. In this way the command of the daylight air over Europe passed from the Germans to the Americans.

The effect of this upon the whole course of the war both in the air and on the surface was fundamental and far-reaching but, as far as the Bomber Command offensive was concerned, the favourable consequences were not all entirely direct, nor were they by any means immediately felt. The new conditions did mean that the American heavy bombers could now develop their daylight offensive at a cost in casualties which was far lower than that of 1943 and which was also lower than that which Bomber Command continued to sustain at night. This was remarkable, but it did not mean that Bomber Command could remedy its situation by an immediate switch from night to day operations. In most forms of war there is one law for the trained, the experienced and the properly equipped, and another for the untrained, the inexperienced and the ill-equipped. The art of high-level daylight formation flying was an advanced one in which the American crews were deeply versed both by special training and

¹ In the first two cases the fundamental restriction upon the offensive potential of the fighters was their limited range which afforded them a short time in which to fight and a limited space in which to pursue their enemies. Another important factor was the relatively poor performance and wholly inadequate armament of the bombers which were, therefore, far more dependent upon the immediate presence of escorting fighters than the later American formations which flew at much greater heights and carried much more formidable armament.

by considerable operational experience. The Bomber Command crews, on the other hand, were scarcely versed in it at all and few of them had ever undertaken an operational flight of any kind in daylight. Nor, on account of the constant pressure of operational duties, was there any prospect of their being trained to American standards. Moreover, the British Lancasters and Halifaxes could not climb to the great altitudes at which the American Fortresses and Liberators habitually operated. Nor did the British bombers possess anything like the fire power which had been built into the American formations. Therefore, if Bomber Command was to seize the undoubted opportunity to attempt daylight bombing, it had to do something more than merely to imitate American methods. It had to devise its own tactics and techniques.

During the summer of 1944 this process was begun, and, on the basis of cautious beginnings against relatively safe targets, Bomber Command eventually contributed a substantial daylight element to the Combined Bomber Offensive. Thereby the versatility of the force was yet further increased and another of the conditions which had governed the conduct of operations up to that time was changed.

The achievement of air superiority in daylight meant, as has already been indicated, that the American bomber forces were at last able to mount an offensive in daylight which, in vigour, penetration and duration, if not always in object, was comparable and in some respects even superior to that of Bomber Command at night. In March 1944 the Eighth Air Force intervened in the Battle of Berlin. In April, the Fifteenth Air Force struck the first blows in the oil campaign and, in May, the Eighth Air Force seized upon the same target system which, in the following month, was also to be attacked by Bomber Command. Thenceforth, the strategic air offensive became a Combined Bomber Offensive not, as hitherto, in name only, but in practice as well. The long period of frustration which had beset the American day bombers was ended by the achievement of daylight air superiority and the great contribution of Bomber Command to ultimate victory now became irretrievably entangled with that of the United States Strategic Air Forces. Had this Bomber Command contribution remained in isolation it would certainly have amounted to much less. Many of the tasks which were eventually successfully completed by the combined forces could not have been discharged by Bomber Command alone any more than they could have been performed by the Americans alone, and several of them would, perhaps, not even have been attempted. To this extent, the eventual effect of the strategic air offensive was controlled by the achievement of daylight air superiority.

Some of the great feats performed by Bomber Command in the later stages of the war, ranging from the destruction of the battleship

Tirpitz to the devastation of certain oil plants and communications targets, were the results of daylight actions. These, like practically the whole of the American offensive from Britain and Italy in the same period, were direct products of a fruitful exploitation of daylight air superiority, but the latter also had a bearing which was much less direct, though not less important, upon the issue of night air superiority. Two great factors in the collapse of the German night fighter force in the late summer of 1944 were the loss of territory in western Europe which contained forward bases and radar early warning installations, and the reduction of fuel supply which followed from the air attacks on oil production and particularly aviation petrol. This collapse, which was both abrupt and irretrievable, did not offer Bomber Command absolute security at night, but it did enable the force, at a very low cost in casualties, to translate the techniques which had been developed in France and to apply them to the destruction of Germany herself. Thus, the heart of Germany was exposed to a night offensive which was no less accurate and far more destructive than the contemporary daylight offensive. A fundamental condition of the night offensive was, therefore, changed primarily by the advance of the allied armies to the Rhine and by the initial effects of the strategic air attacks upon oil plants. But without daylight air superiority the allied armies would hardly have got ashore, or at any rate remained ashore, in Normandy in June 1944, and without daylight air superiority Bomber Command would have been virtually alone in the oil campaign. It is, indeed, difficult to see how night air superiority could ever have been gained if day air superiority had not first been achieved. To this extent, the ultimate success of the night offensive was controlled by the winning of daylight air superiority.¹

The realisation of the significance of air superiority should not, however, be allowed to obscure the fact that both in daylight and in darkness it was never anything more than a means to an end. The value of air superiority lay, not in itself, but in the way that it was exploited. The collapse of the German night fighter force would not have been an important event had it not been for the great and flexible striking power of Bomber Command which had been built up during the previous four years. Nor should the connection which has now been established between day and night air superiority be

¹ Professor L. Brandt, who was responsible for the development of German radar installations, states that during the war, 1,500 German night fighters were equipped with the *Naxos* radar device which enabled them to home upon *H2S* transmissions from a distance of fifty kilometres. He adds that never more than fifty *Naxos* night fighters were able to operate on a single occasion 'due to the decline in synthetic fuel production from 500,000 tons in January 1944 to 10,000 tons in October 1944. This in turn was due to a considerable extent to the fact that there were insufficient day fighters available . . .' Translated extract from Paper read at Radar Conference in Frankfurt, 1953, by Professor Brandt.

allowed to lead to a confusion of the two issues which were, in fact, quite different.

The defeat of the German day fighter force had little direct and no immediate effect upon the night fighter force other than, perhaps, to involve it to some indeterminate extent in the general decline of *Luftwaffe* morale. Nor did the method of victory in the daylight struggle even provide a useful precept for the solution of the problem at night. Indeed, the German night fighter force was never engaged in decisive combat by allied fighters, and the somewhat meagre efforts of the long-range night fighters of Fighter Command and 100 Group, the special counter-measures formation, were rewarded with an even more meagre result. Moreover, the collapse of the day and night arms of the German fighter force occurred not only in substantially different ways but also at substantially different times. Though it is difficult to date precisely the achievement of day air superiority, it can now be seen that the battle had swung decisively in favour of the Americans by the beginning of April 1944.¹ The coming of night air superiority was somewhat more abrupt and it is clear that the German night fighters ceased to operate as an efficient force in August 1944. Between these two events, it will be noticed, there was an interval of fully three months during which the day fighter force was contained more or less constantly in a condition of virtual neutralisation, but during which the night fighter force continued to operate with formidable and even increasing efficiency. This shows the extent to which the connection between the two events was non-immediate and indirect.

This fact was, however, to some extent obscured by the general and constant decline in Bomber Command casualties which occurred over the period between January, when the missing rate was about five and a half per cent of the despatched sorties, and June 1944, when it amounted to little more than two per cent. This apparently satisfactory trend was, however, primarily due not to a decline in the German night fighter force, but to the dispersal of the Bomber Command concentration and to the fact that, in the later months, the majority of the operations involved only shallow penetrations of French territory. To the perceptive mind, it tended only to conceal continuing and even growing dangers. The Bomber Command effort would not always be mainly confined to divided attacks upon French targets. In the attacks on Germany greater concentrations and greater penetrations would be required.

Moreover, even when Bomber Command's activities were mainly

¹ This was not nearly so evident at the time since air superiority by combat is something which can only be gauged by looking at the general conditions over an extended period. In rather the same way it was not entirely evident to Fighter Command that the Battle of Britain had been won in the middle of September 1940.

directed at what were sometimes thought to be easy targets and when the effort was divided between seven or eight different localities on the same night, the German night fighters secured some remarkable successes. In May 1944, for example, when the overall loss rate of Bomber Command was less than three per cent of the despatched sorties, the German night fighters were presented with singularly unpromising conditions. Apart from the independent Mosquito operations, there were only five attacks on German targets during the month and on none of these was the size of the concentration comparable with the normal standards of a few months earlier.^① In addition, on every night that it operated, Bomber Command dispersed its effort over several widely separated areas and there was never any massive concentration at one place at one time. Owing to its restricted size, it was, therefore, never possible for the German night fighter force to engage virtually the whole of Bomber Command as it had done, for example, on the Nuremberg operation at the end of March. Even so the night fighters exploited their limited and fleeting opportunities with effects which were disquieting for Bomber Command.

Thus, on the night of 3rd May 1944, Bomber Command attacked Mailly-Le-Camp, Montdidier, Chateaudun and Ludwigshafen. It also carried out minelaying near the Frisian Islands and off the French Atlantic ports. In addition, Wellingtons and Whitleys from Operational Training Units dropped leaflets over northern France. In the Mailly-Le-Camp operation 362 bombers were despatched and forty-two, or 11.3 per cent of them, failed to return. Despite the shallow penetration involved, the great majority of these missing aircraft undoubtedly fell to night fighters. On the night of 10th May operations were even more dispersed and they included attacks on Lens, Lille, Ghent, Dieppe, Courtrai and Ludwigshafen. One bomber failed to return from minelaying operations, but apart from this there were no losses except from the force sent to Lille. This amounted to eighty-nine bombers from which twelve, or 13.5 per cent, failed to return, again principally as a result of night fighter action.^② These were severe examples of the generally prevailing conditions, and when it was seen that crews who had returned from Nuremberg had been shot down on sorties to Mailly-Le-Camp and Lille, the term 'easy target' tended to drop out of the Bomber Command vocabulary.^③ The overall loss rate was low, not because the German fighters

① These attacks were on Duisburg (21/22 May: 532 bombers despatched), Brunswick and Dortmund (22/23 May: 235 and 375 bombers despatched), Aachen (24/25 May and 27/28 May: 432 and 170 bombers despatched). O.R.S.(B.C.) Nt. Raid Reports.

② O.R.S.(B.C.) Nt. Raid Reports. In both cases the attacks on Ludwigshafen were by Mosquitoes only.

③ So also did the system of counting these sorties as one-third of an operation from the point of view of a tour of duty.

were failing to react, but because their reaction inevitably affected only a small element of Bomber Command on each occasion.

In June 1944 the pattern was nearly the same, though attacks on German targets were even fewer. In fact, Bomber Command carried out major operations over German territory on only three nights during the month of invasion and, in addition to the Mosquito effort, these involved the despatch of only 832 Lancaster and Halifax sorties, all of which were directed against the oil plants at Gelsenkirchen, Sterkrade, Wesseling and the Scholven plant at Buer. But from these 832 heavy bomber sorties, no fewer than ninety-three Lancasters and Halifaxes failed to return, which amounted to eleven per cent of the force despatched. It was virtually certain that more than sixty-five of these aircraft owed their destruction to night fighter action.¹ This was not a happy augury for the oil plan which was now being pressed upon Bomber Command and which called for both concentration and penetration as well as precision attack which exposed the crews to additional risks.

There was certainly no question of the German night fighters being a spent force at this time. They were, in fact, achieving a higher kill rate, when given the opportunity, than had characterised their achievement in the Battle of Berlin. As Sir Charles Portal observed to the Prime Minister soon after these oil attacks in June, the casualties were 'another pointer to the increasing efficiency of the enemy's night defences . . .' and they showed the extent to which he was 'surmounting the difficulties presented by our radio counter-measures'. If the losses were to be kept down, Sir Charles Portal said, 'great flexibility of tactics and improved defences by our heavy bombers and by accompanying night fighters will be needed . . .', but, as though he was aware of the probable limitations of such measures, which in any case were already being vigorously prosecuted, Sir Charles Portal reminded Mr. Churchill that it was 'hoped to extend the scope of our daylight operations and to attack suitable targets in Germany as experience is gained.'²

This extension of daylight operations took place rapidly in Bomber Command, and by August they accounted for slightly more than half the total effort of the force. Moreover, under the cover of growing day air superiority, they were accomplished at a surprisingly low cost in casualties. The damage from flak was necessarily much greater, but Bomber Command aircraft were generally able to survive it.³ Never-

¹ O.R.S.(B.C.) Nt. Raid Reports.

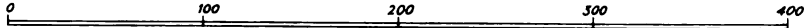
² Min. Portal to Churchill, 31st July 1944.

³ In August 1944, Bomber Command flew 10,345 sorties by day and 10,314 by night. The loss rate for the daylight sorties, which, however, included only one penetration of Germany, was 0.48 per cent. Ten per cent of these sorties were damaged by flak. In September, the day and night sorties amounted to 10,832 and 6,540 respectively. The daylight loss rate was 0.4 per cent and even from the 2,071 daylight sorties over Germany

Advance of the Allied Armies

August 1944 - April 1945

Scale of Miles



Legend

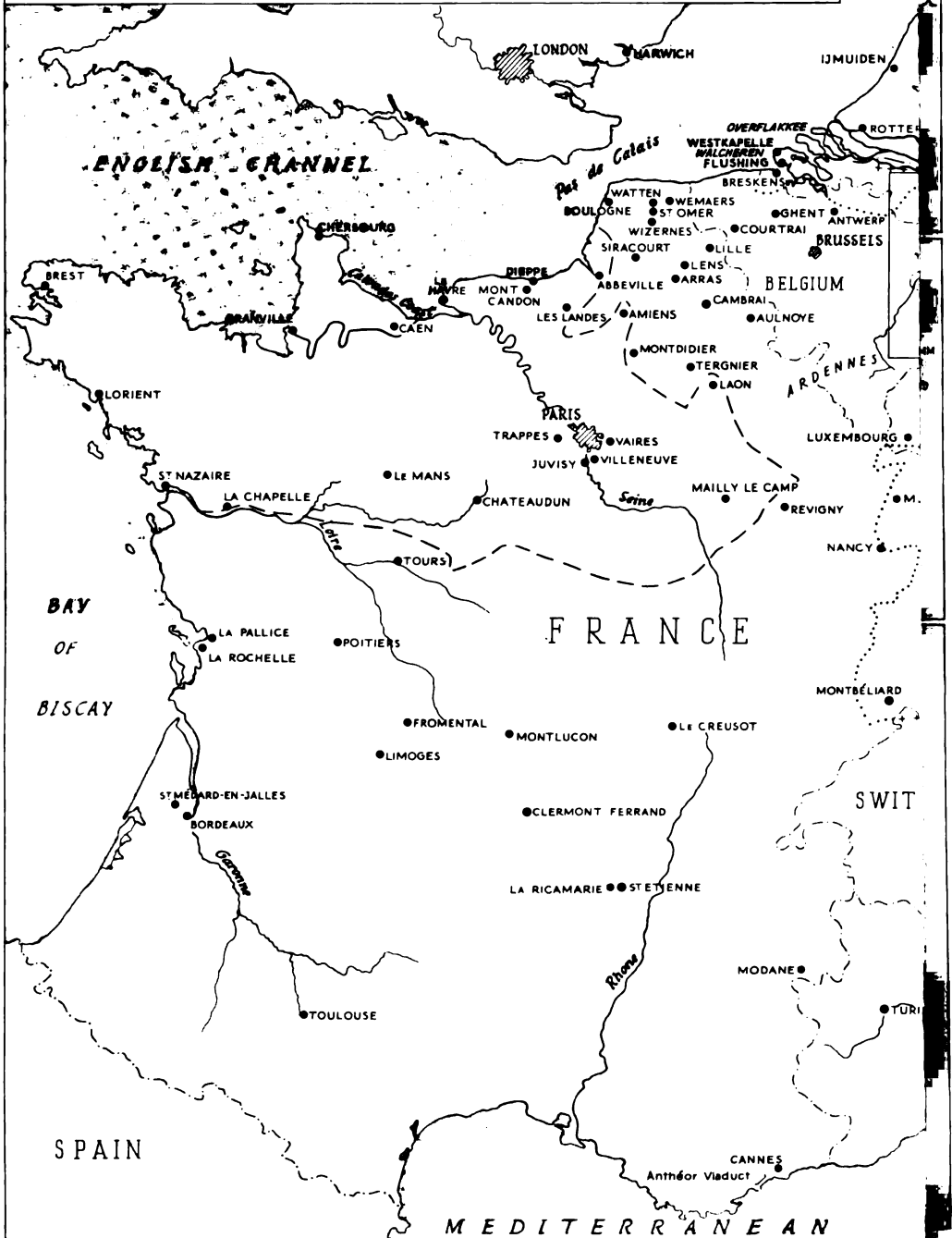
Anglo-American positions on

- 1st AUG 1944 (solid line)
- 1st SEP " (dashed line)
- 25th " (dotted line)
- 13th FEB 1945 (dash-dot line)
- 19th APR " (line with crosses)

Russian positions on

- 1st AUG 1944 (solid line)
- 1st SEP " (dashed line)
- 25th " (dotted line)
- 13th FEB 1945 (dash-dot line)
- 19th APR " (line with crosses)

The positions shown on the map are approximate



theless, and at the same time, the night offensive had suddenly emerged from the threatening situation which had so recently looked so grave. In August 1944, Bomber Command suffered an overall loss rate of only 1·2 per cent of its despatched sorties at night, and from 3,823 heavy bomber sorties at night against major German targets the missing rate was only 3·7 per cent, by comparison with that of eleven per cent for similar sorties against similar targets in June. In September 1944 the overall loss rate at night was 1·5 per cent, and from the 3,154 heavy bomber sorties sent to German targets, only sixty-nine Lancasters and Halifaxes representing 2·2 per cent of the despatched force did not return.¹ Thus, in September 1944, Bomber Command despatched more than three times as many aircraft on this kind of operation as it had done in June 1944 and lost only about two-thirds as many.

Though the intensive counter-measures and growing night fighter support of 100 Group as well as the constantly developing tactics of Bomber Command certainly contributed something to this change, the sudden and dramatic reduction of casualties even against what had previously been notoriously dangerous targets owed its cause to something more than simply another swing of the pendulum in the struggle between the night fighter and the night bomber. In fact, it marked the virtual collapse of the German night fighter force and the coming of night air superiority for Bomber Command. For years the German night fighters had operated in alternately favourable and unfavourable conditions. Now at last they were scarcely able to operate at all. In August 1944, the allied armies advanced across the areas of the German forward fighter bases and radar early warning installations in France and Belgium and behind them came the Bomber Command ground radar stations and emergency landing fields. Bomber Command could now approach Germany under a cloak of secrecy which extended almost to the Rhine, and the German fighters were driven back to the tactics of interception at the target. Even there they were inevitably and generally too late. At the same time the *Luftwaffe* was caught in the crippling consequences of an oil famine. From these fundamental disabilities the German night fighter force could never recover and for the first time since the very early nights of the war it ceased to be an important factor in the night bombing offensive.

it amounted to 1·1 per cent. A comparison between day and night sorties is provided by the following figures for attacks on Ruhr targets in September:

	<i>Sorties</i>	<i>Losses</i>	<i>Flak Damage</i>
Night . . .	872	11 (1·3%)	22 (2·5%)
Day . . .	1,464	19 (1·3%)	538 (36·7%)

O.R.S.(B.C.) Reports.

¹ O.R.S.(B.C.) Reports.

In these ways, as a result both of its own achievements and of those of other forces, Bomber Command was, in the autumn of 1944, afforded an unprecedented opportunity for bringing its great destructive power to bear against the heart of Germany by precision and area bombing in daylight and in darkness. Owing to the difficulties connected with the solution of the problems of bombing policy, which have already been considered, this opportunity was neither fully nor immediately exploited, but it certainly was not lost. By far the greater part of the damage done to the German war machine by Bomber Command in the entire war was done in the period between July 1944 and April 1945 and, in combination with the great achievements of the United States Strategic Air Forces, this ultimately proved to be one of the decisive elements in the allied victory of May 1945.

Such, in outline, were the principal processes and the connections between them which changed the conditions of the strategic air offensive and produced, from apparent defeat, its eventual triumph.

2. *Overlord* and the strategic air offensive.

The development of precision bombing at night April–June 1944

In March 1944, as will have been seen in an earlier chapter, Bomber Command continued, as it had been since March 1943, to be mainly committed to the strategic offensive against Germany. The bulk of its operations, sometimes for general and sometimes for selective purposes, were directed against city centres and most of them were area attacks focused by the high-level radar-assisted marking of the Pathfinder Force. But while the Battle of Berlin was thus drawing to a close the date for the launching of *Overlord* was also drawing near. Active discussion of the part which Bomber Command should play in the phase of immediate preparation for this great undertaking and of the system of command by which its effort should be directed had, as will be recalled, been proceeding for some time and, as will also be remembered, had resulted in a series of important decisions at the end of March. Bomber Command was to be placed under the 'direction' of the Supreme Allied Commander, General Eisenhower, and its principal though not, of course, its only object was to be the dislocation of railways in north-western Europe and especially in northern France.

These decisions were not formally put into effect until the middle of April, but before that and, indeed, before final agreement had been reached about them, Bomber Command began, on a limited and experimental scale, to carry them out. In March, attacks were made on the marshalling yards at Trappes, Le Mans, Amiens, Laon, Aulnoye, Courtrai and Vaires, and these marked the beginning of what may conveniently be called the *Overlord* air diversion. This railway campaign soon mounted to formidable proportions and in the three months between the beginning of April and the end of June 1944, Bomber Command carried out no fewer than one hundred separate operations, involving the despatch of twelve thousand nine hundred and forty-nine sorties in its pursuit.¹ A few of the targets were in Germany, but the vast majority lay in France and Belgium. Nor was this the only or even the greatest cause of diversion from German targets. An even greater effort was devoted to flying-bomb launching sites, coastal batteries, signals depots, ammunition dumps, military camps and similar targets outside Germany. At times the diversion became almost total and the proportion of bomb tonnage dropped by Bomber Command on German territory declined

¹ *Bomber Command Quarterly Review*, April–June 1944.

from forty per cent in April to eight per cent in June. Over the three months as a whole it amounted to little more than seventeen per cent.¹

In the eyes of the army commanders much of this diverted effort was strategic. The armies did not come into contact until 6th June and it was, therefore, not until then that any strictly tactical air operations could occur. The aim of the railway campaign up to that time was to damage the German lines of communication to such an extent that when the land battle was joined the German army would be denied its mobility and flexibility. This, in military terms, was clearly a strategic object, but, in air force terms, it equally clearly was not. The attacks were aimed at the periphery and not the heart of the enemy. They were designed to immobilise the manifestations of his military power and not to strike at its sources. Thus, while it may be incorrect to refer to these operations as tactical, except, as was often to be the case after 6th June, when they were directly connected with an actual battle on the ground, they were certainly not a part of the strategic air offensive and, of course, few of them were against targets in Germany. The most obvious and the most immediate effect of the *Overlord* air diversion upon the strategic air offensive was to emaciate, and, for a time, almost to eliminate it. This, however, was not the most important effect.

The targets associated with the *Overlord* and flying-bomb air diversion had two salient characteristics in common. By comparison with the usual targets in the Battle of Berlin, they were generally small in size and short in the penetrations which they demanded. Although their destruction afforded Germany a respite from the direct pressure of bombing which had so constantly fallen upon her since March 1943, Bomber Command was also given a relief from the dangerously high casualty rate which had been suffered. Many of the *Overlord* targets were, at least initially, scarcely defended at all and, being of short penetration, they were difficult to cover with the most effective of defences, namely, night fighters. Being so small, they did not individually require the great bomber concentrations which had proved so vulnerable in the later stages of the Battle of Berlin. On the contrary, they afforded Bomber Command an unprecedented opportunity for dividing its force and thereby confusing the defending night fighters and denying them a well-defined collective target.² Again, because they were so small, these targets stimulated a drama-

¹ *Bomber Command Quarterly Review*, April-June 1944.

² It will have been noticed that in the hundred operations against railway targets between 1st April and 30th June 1944, 12,949 sorties were despatched. This meant that the average strength of each despatched force was 129 bombers. In the nineteen major attacks on Berlin between the beginning of November 1943 and the end of March 1944, some 11,113 sorties were despatched, which meant that in this case the average strength of each despatched force was 585 bombers.

tic development in the technique of precision bombing at night not only by specialised elements of the force but by all Bomber Command. The consequences of this, as far as the strategic air offensive was concerned, began to emerge soon after the invasion in June when Bomber Command embarked upon the destruction by night of German synthetic oil plants. Thus, the participation of Bomber Command in the *Overlord* air diversion not only made an important and, perhaps, even an indispensable contribution to the success of the invasion, but it also tended to restrict the opportunities of the German night fighter force and to develop the precision techniques of Bomber Command.

Nevertheless, the difficulties imposed upon the German night fighter force by the nature of the Bomber Command contribution to this air diversion were not necessarily permanent. Indeed, as was mentioned in the previous section, the German fighters, as they had so often done before, soon began to adapt their tactics to the new situation and presently to score impressive successes even against small-scale attacks of shallow penetration. Still less was it likely that, when Bomber Command returned in force to Germany, the night fighters would be unable to regain the kind of superiority which they had enjoyed in the early months of 1944. Nor did the fact that Bomber Command had in April, May and June so successfully met the challenge of precision bombing against lightly defended targets of slight penetration in occupied territory necessarily or even probably mean that the same challenge could be met against much more heavily defended and more distant targets in Germany. Precision bombing after all, other things being equal, was more dangerous than area bombing, because it tended to involve longer periods over the target and because it often had to be carried out from lower altitudes and on clearer and lighter nights than were necessary for area bombing. It was also more difficult to achieve at long than at short range because of the cumulative effect of navigational errors, the opportunities for German radar jamming and the limited distance to which some kinds of radar such as *Oboe* and *G-H* could reach. Thus, while the strategic air offensive against Germany suffered a set-back as a result of the breathing space which was afforded to the German homeland by the preoccupation of Bomber Command in the *Overlord* air diversion, it was likely to gain from the tactical and operational developments which were produced or stimulated by that diversion only in so far as these developments could be applied to the conditions prevailing over Germany itself. As far as the neutralisation of the German night fighter force and the application of precision techniques were concerned, the prospects, as was shown by the relatively inaccurate and exceedingly expensive Bomber Command attacks on oil plants in the Ruhr during June, were by no means

promising. In only one of these four attacks did it appear that serious damage had been done to the target and even on that most of the bombs fell wide.¹ Moreover, the lowest missing rate was 5·8 per cent of the despatched force while the highest was no less than 27·8 per cent.²

As will, however, duly be shown, Bomber Command did eventually succeed both to a much greater extent and at a very much lower cost in casualties in translating the precision technique of the auxiliary offensive over France into terms of the strategic offensive over Germany. But one of the principal factors and, as far as night bombing was concerned, perhaps, the decisive factor, in this achievement was the conquest of territory in western Europe by the allied armies. When they lost France, the Germans also lost the fundamental basis of their night fighter defence organisation. Bomber Command was afforded a secret entrance to Germany simply by the process of approaching over France at a low level. By the loss of its early warning system, the German night fighter force suffered a crippling blow from which there was to be no recovery. But the advance of the allied armies towards the Rhine also enabled Bomber Command to advance the sites of its radar ground transmitters whose reach into Germany was, therefore, greatly extended. This was to be an important factor in the efficiency of precision attacks upon German targets. It also helped to increase the accuracy of area bombing. These beneficial consequences did not make their full impact until September, by which time the allied armies were well on the way to the Rhine, but, on account of their eventual effect, the techniques of the short-range auxiliary offensive over France were to have an important bearing upon the subsequent strategic attacks on Germany. If they had not been developed, then obviously the opportunity created by the military advance could not have been exploited. It is, therefore, not unreasonable, from the viewpoint of the strategic air offensive, to regard the *Overlord* air diversion as an important phase of operational training for Bomber Command.

Precision bombing over Germany, or anywhere else, did not, however, depend only upon the development of techniques. It depended as much upon the degree of opposition which the enemy was able to offer. Air defences have a marked effect on bombing accuracy even before they cause actual casualties. Important as the allied military advance was to be in this connection, the loss of territory was by no

¹ This was the first attack of the series on the night of 12th June 1944 when the target was the Nordstern plant near Gelsenkirchen. Actually, as can be seen in App. 32 (i), these attacks caused more damage than appeared.

² The Gelsenkirchen attack resulted in a missing rate of 5·8 per cent and that on Wesseling on the night of 21st June in one of 27·8 per cent. The other attacks were on Sterkrade (16/17th June) and Scholven-Buer (21/22nd June). They resulted respectively in missing rates of ten per cent and 6·1 per cent.

means the only loss which was to be suffered by the German night fighter force. The period between March and June 1944 was a phase of great significance in the development of active counter-measures to the German air defences. In the remainder of this section it is, therefore, intended to examine the progress which occurred in the period between March and June in the development of counter-measures to the German air defences and in that of precision bombing techniques at night. These developments and the loss of territory to Germany which followed them were, as has just been suggested, to become the operational foundation of the final offensive.

Counter-measures against the German air defences had a history which was as long as that of the bombing offensive. There was a strict limit to what could be achieved to minimise the hazards of flak and searchlights. Their radar direction could be tampered with, as indeed it was, by the use of *Window*, but, apart from that, the only profitable course was evasion by careful routing and high flying, and, when the barrage had to be faced, the use of concentration which, at any rate, made it difficult for the Germans to sight individual targets. The greater hazard caused by the night fighters was, however, more susceptible to interference of various kinds. The developing tactics of evasion and deception as well as the more active measures of radio jamming and, by the use of *Window*, radar swamping have been noticed in earlier chapters. An even more active measure, the introduction of long-range fighter support, provided by *Serrate* aircraft of Fighter Command, has also, in its initial stages, been examined.

By March 1944, however, it had become apparent that these measures had either exhausted themselves or were being applied on an inadequate scale. The high rate of Bomber Command casualties made that abundantly apparent. Towards the end of 1943 a special group, 100, had, it is true, been formed in Bomber Command for the specific purpose of 'combating the enemy night defence organisation by means of:

- (a) Countermeasures
- (b) Offensive Night Fighters.'¹

But for the first six months of its life, the activities of the new group were confined to the operation of ground-based jammers and of the long-range night fighters which were transferred to it from Fighter Command and elsewhere. Apart from one type of jamming, known as airborne *Cigar*, the first airborne radio counter-measures of 100 Group began on D-Day. Nor did the long-range night fighter effort amount to much either in terms of the effort devoted to it or of the results which it achieved. During the period between December 1943

¹ 100 Group Review of Operations from Nov. 1943 to May 1945. Cited below as 100 Group Review.

and April 1944 inclusive, the number of these fighter sorties which completed a patrol was only 220 and the number of German aircraft claimed to have been destroyed was a mere twenty-seven.¹

The reasons for this meagre effort and still more meagre achievement were numerous. Only three *Serrate*-equipped squadrons were available. One of these, number 141, was the original *Serrate* squadron, but the others, numbers 169 and 239, had previously been operating on Mustangs and, therefore, had to be re-equipped with Mosquitoes.² Their crews had no experience of the *Serrate* equipment, which, it will be remembered, was the radar device for detecting the position of the enemy aircraft, nor did they have any experience of long-range navigation. In addition, the picture of enemy night fighter tactics was far from complete and the 100 Group fighters could do little more than experiment with various methods of operation. Moreover, the Mosquito II aircraft with which they were equipped were mostly suffering badly from old age and their operations had to be drastically curtailed so that they could be re-engined with new Merlin 22s. Finally, the equipment carried by these fighters was in many respects unsuitable or inadequate.³

It is, therefore, hardly surprising to find that only the most experienced and determined crews got any worthwhile results. In fact, of the thirty-one German aircraft claimed in this initial period as

¹ *100 Group Review*. Another four were claimed as damaged. It is not possible to discover from German records how many night fighters were in fact destroyed by these *Serrate* operations, but it is interesting to note that in this period, i.e. from 1st December 1943 to 30th April 1944, the following casualties were sustained by night fighters in *Luftflotte Reich* and *Luftflotte 3* as a result of allied air action:

	<i>Luftflotte Reich</i>	<i>Luftflotte 3</i> (France and the Low Countries)
<i>Destroyed</i>		
In air combat	163	15
On the ground by bombing or strafing	62	17
	<hr/> 225	<hr/> 32
<i>Damaged</i>		
In air combat	53	2
On the ground by bombing or strafing	79	9
	<hr/> 132	<hr/> 11

Losses due to causes other than enemy action, even if sustained on operational flights, have been excluded from the above figures. In other words, these losses represent only the total due to direct allied air action.

² Another Squadron, 515, was equipped with Mosquito VI aircraft and began operations in March 1944. This was used for intruder operations and it was not equipped with *Serrate*.

³ The Mark IV A.I., for example, with which they had to make do, was swamped by the Bomber Command stream whenever close escort was attempted, while the number of 'blips' registered in the target area made it virtually impossible to marry the evidence of *Serrate* to that of A.I. The Mark X ten-centimetre A.I. would have given much better results, but 100 Group was not at this time permitted to use that equipment over enemy territory.

destroyed or damaged, six were credited to one crew, three to another, two each to five crews and one each to twelve crews. In other words, in a period of three months, the efforts of three squadrons resulted in claims by only seventeen crews.¹

This situation was justly regarded by Sir Arthur Harris as intolerable. In a strong letter of 7th April 1944 to the Vice-Chief of the Air Staff, he observed that Bomber Command had only two means of 'making any impression on the German night fighter force'. The first was provided by the armament carried in the bombers themselves, but the 303 guns were not sufficiently powerful to inflict 'serious losses on the enemy' and the vision from the turrets at night was 'so bad that our gunners have not a fighting chance'. Even if this armament could be improved by the introduction of automatic equipment,² Sir Arthur Harris believed that

'the chances against the bomber would still be too great to give a reasonable chance of success against the enemy fighter defences, which will, no doubt, under the tremendous pressure of events, continue steadily to improve in efficiency'.

The second means was the long-range fighter offensive, but, Sir Arthur Harris pointed out, 'the small effort by night fighter aircraft, which is all that 100 Group can at present provide for the support of the bombers, is not large enough to have even a serious nuisance value against the German night fighter force'.

Sir Arthur Harris said that he had long foreseen and pointed out that the strength of the German air defences would eventually 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', he said,

'yet reached that point, but tactical innovations which have so far postponed it are now practically exhausted. Remedial action is therefore an urgent operational matter which cannot be deferred without grave risk. Already the cost of attacking targets in the Berlin area under weather conditions which give good prospects of accurate and concentrated bombing is too high to be incurred with any frequency.'

One solution, which, as Sir Arthur Harris knew, had occurred to the Air Staff, was the adoption of daylight bombing in which the

¹ *100 Group Review*. The pilot of the Mosquito which claimed six German aircraft was Wing Commander Braham. He had also secured by far the best results in the period of *Serrale* operations in Fighter Command before the formation of 100 Group.

² A new and remarkable device, the Automatic Gun Laying (Turret) (A.G.L.(T)), known to Bomber Command as *Village Inn*, was under development. It automatically sighted and fired at enemy aircraft, but by the time of the German surrender it had been used on such a limited scale as to make no difference.

established protection of American air superiority could be gained. But Sir Arthur Harris did not believe in this solution. Even Lancasters could not fly in formation at altitudes greater than eighteen or nineteen thousand feet, and at these heights 'flak would be lethal and would more than compensate for the losses which the fighter escort might be expected to save.'

'The only remedy,' Sir Arthur Harris said, 'therefore, is the provision of night fighter support on a substantial scale, and it is considered that a total minimum of ten night fighter Mosquito squadrons should forthwith be placed at the disposal of 100 Group to satisfy this requirement.'

He did not regard it as essential that all these squadrons should be equipped with *Serrate*. Fighters equipped with only A.I. were, he said, 'quite effective', and he meant to use the aircraft not only for night fighter support to the bombers but also in attacks on German night fighter bases.

Sir Arthur Harris was, thus, insistent upon his minimum requirement, but he was also realistic about the objections which would be raised to it. 'It may be urged', he said, that the night defence of Great Britain would be dangerously weakened by such a reinforcement of 100 Group. This argument he rejected in advance, on the grounds of the dwindling strength of the German bomber force. There would, he claimed, still be sufficient night fighters left in Air Defence of Great Britain to provide, in conjunction with the ground defences, for an adequate protection from night attack of the *Overlord* concentrations and, in case of need, this force could be supported by 100 Group. Another objection foreseen by Sir Arthur Harris was that many of the available Mosquitoes were equipped with Mark VIII A.I.¹ and were, therefore, prohibited from operating over enemy territory in case the nature of the equipment was revealed to the Germans. 'This again', Sir Arthur Harris said, 'is surely an entirely inadequate ground for withholding protection from our bombers.' Finally, Sir Arthur Harris thought, it might be argued that a major decision of the kind which he was urging could not be made effective quickly enough to have a worthwhile effect. If this were so, he believed,

'we should compare very poorly with the American performance in providing their day bombers with long range fighter escort within a few weeks of the necessity for this step becoming apparent, though the difficulties which confronted them were far greater than those with which we are now faced.'²

Thus, believing that Bomber Command could not, on account of

¹ Presumably he meant Mark X A.I.

² Letter Harris to Evill, 7th April 1944.

its relatively low ceiling, exploit the day air superiority which had been gained by the Americans, Sir Arthur Harris now sought to gain the same kind of air superiority by the same kind of means at night. In this attempt, however, he was to be frustrated. A conference summoned at the Air Ministry by Sir Charles Portal on 20th April 1944 decided to transfer to 100 Group, not ten night fighter squadrons, but three.¹ All these had to undergo retraining and a considerable measure of re-equipment. Their efforts undoubtedly caused some disturbance to the German night fighter force and, perhaps, to some extent, deterred the German crews from using their own radar equipment which was liable to reveal their position to the 100 Group squadrons. But the total claims of all the 100 Group fighter squadrons over the whole period between December 1943 and April 1945, a period of seventeen months, amounted only to the destruction of 257 enemy aircraft and the probable destruction of a further twelve.²

This relative failure was not due purely or even mainly to lack of strength in the 100 Group long-range fighter arm. Indeed, in one respect, greater strength would have caused greater difficulties. As it was, much time and effort was wasted in the pursuit of what proved eventually to be friendly fighter aircraft. The main problem was that of interception. The always limited efficiency of *Serrate* declined even further as time went on. The average number of contacts obtained with this equipment per sortie completed declined from 1.1 in May 1944 to 0.005 in September and the number of A.I. contacts needed to result in one successful combat increased from an average of nine in May 1944 to sixty in September.³ The reasons for these set-backs were that the German pilots became more wary, that interference with the Mark IV A.I. increased and more and more German fighters were equipped with a new kind of A.I. which did not register on *Serrate*. Low-level offensive fighter patrols carried out by aircraft without radar interception devices were even less successful. In June 1944, for example, some 138 of these sorties resulted in the claim of only one enemy aircraft being destroyed.⁴ Nor did the increasing introduction of the Mark X and later the Mark XV A.I. make any substantial difference. No effective means was ever found of engaging the German night fighter force in direct combat and it was certainly not to direct combat that its ultimate collapse was due.

Though it must be remembered that Sir Arthur Harris' minimum requirement for long-range fighters in 100 Group was never met, it

¹ Air Min. Conf., 20th April 1944. Two of these Squadrons, 85 and 157, came from A.D.G.B. The third, 23, was brought home from the Mediterranean theatre.

² *100 Group Review*. Of these 257 aircraft, 236 were claimed as destroyed in the air and twenty-one on the ground.

³ *100 Group Review*.

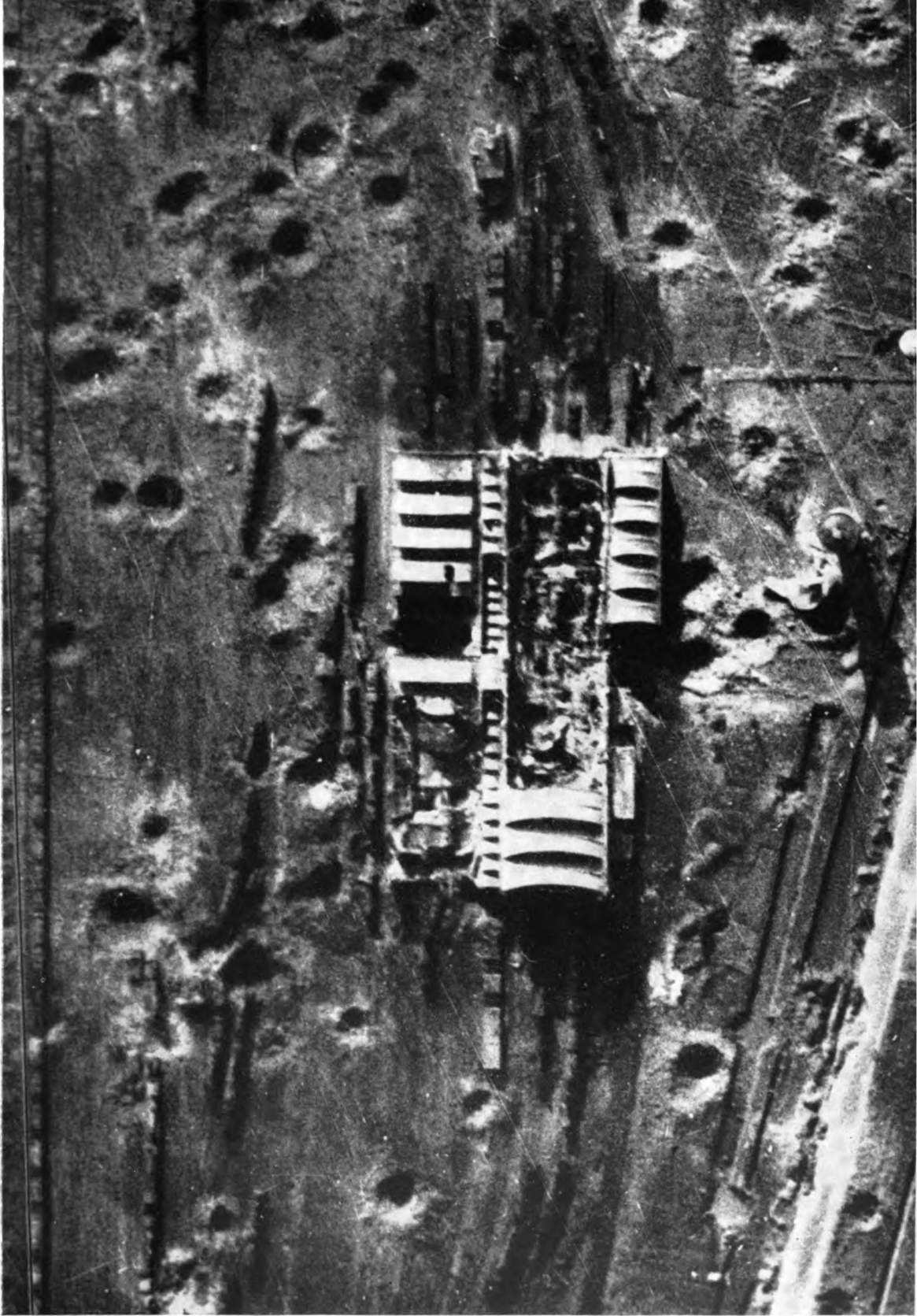
⁴ do.

would, all the same, appear that his expectation of this kind of attack on the German fighter force was not realistically related to the interception equipment and tactics which could be developed and that it was, therefore, somewhat over-optimistic. On the other hand, the belief, which he expressed at the beginning of April to the effect that Bomber Command could expect little protection from further 'tactical innovations', was, perhaps, especially if these were taken to include radio counter-measures, somewhat over-pessimistic.

Indeed, the recently formed Bomber Command Tactical Planning Committee had already proposed a number of innovations by which it was hoped to increase the problems of the German night fighters. These included the division of the bomber stream by splitting the force, the dispersing of the altitude at which it flew and the employment of a greater diversionary effort.¹ Such measures were in the nature of palliatives rather than solutions, but in combination with the developing campaign of radio counter-measures, they did eventually have some effect upon the efficiency of the German night fighter force.

Radio counter-measures, as has already been seen, were now principally the responsibility of 100 Group, and throughout this period 192 Squadron carried out airborne investigations to determine the radio tactics of the opposing air force. In addition, six Flying Fortresses of 214 Squadron operated with a device known as airborne *Cigar* which was designed to disrupt the radio-telephone communications between the German night fighter controllers and pilots. This, however, was merely the prelude to a much more intense and complex campaign of radio counter-measures which was necessarily delayed by the time required to equip and train squadrons in 100 Group and voluntarily by the desire to spring some puzzling surprises upon the Germans at the time of the Normandy invasion. Thus, the *Mandrel* screen, which was produced by 199 Squadron Stirlings and Flying Fortresses of the 803rd Squadron, United States Strategic Air Forces, did not make its initial appearance until the night of 5th June 1944 when it was used to mask the approach of the invasion force itself. *Mandrel* was a device for jamming the German early warning *Freyas* which were designed to plot the course of the approaching bomber stream, and in this capacity it was used after D-Day. It constituted a serious breach in the German early warning system and, therefore, initiated a process which was to be virtually completed by the allied occupation of France. This, however, was only the first of

¹ Bomber Command Tactical Planning Committee. First mtg. 18th Feb. 1944. At the second meeting on 9th April, it was even suggested that Bomber Command should revert to its original practice of having no bomber stream at all and of allowing each aircraft to follow its own route. This was rejected owing to the risk from Ground Controlled Interception fighters.



1. The marshalling yards at Trappes after attack on the night of 6th March 1944.



2. The marshalling yards at Juvisy before attack.

3. The marshalling yards at Juvisy after attack on the night of 18th April 1944.



many other kinds of jamming which were to come into service in 100 Group during July and the months which followed.¹

It may be doubted, nevertheless, whether such tactical innovations and radio counter-measures could, in the absence of other and even more important circumstances such as the loss of territory and the loss of fuel supplies, have had a really, or at any rate permanently, crippling effect upon the resourceful German night fighter force. Indeed, the resilience of the latter, as will be seen in the next section, made part of the case for the resumption by Bomber Command of daylight operations. Another part of the same case, namely the greater accuracy which might be expected, was, however, losing much of its force. This was due to the remarkable advances in the techniques of night precision bombing which took place between March and June 1944.

The Bomber Command railway campaign in preparation for *Overlord* began, as has already been mentioned, on the night of 6th March 1944 when the marshalling yards at Trappes were the target. This was the first of fourteen operations against eleven similar targets which were carried out between then and the night of 10th April.² They involved the despatch of some 2,513 heavy bomber sorties, nearly three-quarters of which were flown by Halifaxes of 4 and 6 Groups. On each occasion the target marking was laid down blindly by *Oboe* Mosquitoes of the Pathfinder Force.³ The only variation of these tactics was in the last attack on the night of 10th April when two master bombers visually assessed the green target indicators which had been dropped by the Pathfinders on the marshalling yards at Aulnoye and then dropped their own red target indicators as the aiming point for the main force. This somewhat more ambitious modification of blind *Oboe* marking, known as controlled *Oboe*, introduced the altogether more complex and also more accurate methods which followed in the second phase of the campaign.

Though Bomber Command had little previous experience of these types of operation, the plan had been scientifically prepared with the object of bringing the right amount of force to bear upon the right points. In consultation with railway experts and 'other interested parties' the various aiming points had been carefully selected in the marshalling yards and the necessary densities of attack in terms of hits by five-hundred-pound medium-charge bombs per acre had been calculated. To these factors Bomber Command then had to apply its expectation of the marking and bombing error and of the abortive sortie rate in order to determine the required scale of attack. An allowance also had to be made for the fact that in most cases the

¹ 100 Group Review.

² For the results of the attack on Trappes see the photograph facing p. 150.

³ A table of these operations is at App. 47.

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bomb load could not be made up entirely of five-hundred-pound bombs.¹

Allowing for the *Oboe* marking error and the main force aiming error, it was expected that there would be an overall average bombing error of 640 yards for the bombs which were effectively aimed and it was anticipated that seventy per cent of the bombs despatched would be effectively aimed and would detonate. In fact, the average bombing error for the effectively aimed bombs amounted for these fifteen attacks to 680 yards, but only fifty-five per cent of the despatched bombs were effectively aimed. The expectation that thirty per cent of the despatched bombs would not be effectively aimed had been based on the assumption that ten per cent of the sorties would be abortive, that ten per cent of the bombs dropped would fail to detonate and that a further ten per cent would, owing to gross errors, be dropped far outside the target area. Experience of the fifteen operations showed that almost exactly ten per cent of the sorties were, in fact, abortive and it revealed nothing to suggest that more than ten per cent of the bombs had been duds. It did appear, however, that twenty-five and not ten per cent of the bombs had been dropped with a gross error, and had fallen far away from the targets. This was due not to carelessness by the main force bomb-aimers but to a much higher proportion of gross errors by the *Oboe* Mosquito markers than had been expected.²

This, indeed, despite the considerable and remarkable success achieved,³ was the principal and the most obvious respect in which the tactics of the campaign were defective. It suggested the importance of developing yet more accurate and reliable target marking techniques and, at least, as was done in the Aulnoye operation, of imposing a visual correction to blind radar marking. Thus, though not, of course, to the same extent, the problem facing the main force of Bomber Command was substantially the same as that which for

¹ The actual bomb loads in the fifteen operations were composed as follows:

	1,000 lb.	500 lb.
M.C. . . .	38·9%	53·8%
G.P. . . .	6·0%	1·3%
Total . . .	44·9%	55·1%

In one attack twenty-three 2,000-lb. bombs had to be carried owing to a temporary supply difficulty. For the purpose of these attacks the value of a 1,000-lb. bomb was assessed at one and a half that of a 500-lb. bomb. The reason for the inclusion of 1,000-lb. bombs was that an all 500-lb. bomb load was uneconomic in Lancasters and Halifaxes. Unlike *Stirlings*, which could economically carry maximum loads of 500-lb. bombs, these aircraft were underloaded when armed exclusively with 500-lb. bombs. The normal load of a Halifax (without *H2S*) on these operations was nine 1,000-lb. and six 500-lb. bombs. If the 1,000-lb. bombs had been omitted, only fifteen 500-lb. bombs could have been lifted.

² O.R.S.(B.C.) Report, 15th June 1944. Individual reports on each of the fifteen operations had been produced earlier by the O.R.S.

³ Five of the marshalling yards, those at Trappes, Le Mans, Amiens, Vaires, and Lille, were, in fact, estimated to have been destroyed to the required extent.

some time had confronted 617 Squadron. Fundamentally it was a problem of target marking and not of bomb aiming, and the great advances of April and May in overcoming it were founded upon the experience and also on many occasions upon the operational effort of 617 Squadron. So striking were these advances that the average density of bombing around the aiming points in marshalling yards for operations in May increased by about a hundred and sixty-five per cent by comparison with the not unimpressive achievement in March.¹

After his reverse at the Anthéor viaduct in February 1944, it will be remembered, Wing Commander Cheshire had resolved to try the Mosquito as a vehicle of low-level visual marking, and with that end in view he had gone to Colby Grange to familiarise himself with one of these machines. He concluded that the most promising method of operation was to dive towards the aiming point at an angle of about thirty degrees and from a height of a thousand feet or less, which in many cases was to be much less, to release his red spot fire target markers by visual aim, using the gunsight. This initial marking could then be increased by further red spot fires dropped by Lancaster crews from higher altitudes and then bombed from still higher level by the striking force. Meanwhile, the whole operation could be controlled and directed by radio telephone from the Mosquito still flying low enough to see the aiming point clearly.

This daring and ambitious dive-marking technique was first tested in action on the night of 5th April 1944. Diving in their Mosquito over the aircraft factory at Toulouse, Wing Commander Cheshire and his navigator, Flying Officer P. Kelly, dropped red spot fires on the aiming point. These were backed up by two Lancasters, also from 617 Squadron, and the target was then attacked 'with tremendous effect' by a hundred and forty Lancasters of 5 Group. Daylight reconnaissance photographs later showed that nearly all the buildings in the target area had been demolished or heavily damaged.²

The next day, 6th April, 5 Group was informed by Bomber Command that it was to be employed as a separate force and that two Lancaster squadrons of the Pathfinder Force, 83 and 97, were to be attached to it for marking duties in co-operation with 617 Squadron. In addition, 627 Mosquito Squadron was similarly to be attached to 5 Group for low-level marking sorties. Further Mosquitoes were also procured for 617 Squadron itself and by the night of 20th April, when

¹ Bomber Cmd. O.R.B. Jan.-June 1944.

² O.R.B. (617 Sqdn.), 5th April 1944, and O.R.S.(B.C.) Nt. Raid Report. 147 Lancasters were despatched. Seven made abortive sorties and one was shot down, probably by flak, over the target. The two marking Lancasters were flown by Squadron Leaders McCarthy and Munro. They also dropped one 8,000-lb. bomb each.

the marshalling yards at La Chapelle were bombed, Wing Commander Cheshire could muster four of these aircraft over the target, from his own squadron.¹

From the night of 10th April, when it carried out an independent attack on the marshalling yards at Tours, 5 Group, in addition to many other activities, played an important part in pressing forward the railway campaign and a leading part in the further development of night precision bombing techniques.

The low-level visual ground marking technique of 5 Group, which was further developed in the course of these attacks, produced results which were materially better than those achieved in the high-level blind *Oboe* marking attacks which had preceded them. In the first fifteen of the latter type of operations, it will have been noticed, some forty-five per cent of the despatched effort was wasted owing to abortive sorties, gross bombing errors, and so on. An analysis of thirteen of the 5 Group precision attacks between 10th April and the end of May showed that seventeen per cent of the effort had been wasted for the same reasons. The average overall bombing error for the eighty-three per cent of the 5 Group bomb loads which were effectively aimed in these attacks amounted to 380 yards, which compared with the average error of 680 yards for the fifty-five per cent of effectively aimed bombs in the *Oboe* ground marking attacks. Even these impressive figures did not, however, fully reflect the brilliance of the 5 Group achievement. A modified marking technique was introduced in the middle of May, and in the first four operations analysed after this the 5 Group overall average bombing error was reduced to 285 yards.²

This modification was known as offset marking and in order to understand it some description of the 5 Group technique must be given. It will already have been seen that the initial marking was laid down on the aiming point by visual aim from a very low level and that after the beginning of April this was generally, though not invariably, done from a Mosquito. In many operations, 'proximity' markers were first dropped blindly by high-level *Oboe* Mosquitoes of the Pathfinder Force. These were followed by a number of flares which were intended to facilitate the visual identification of the target by the master bomber, who, at this time, was generally Wing

¹ Bomber Cmd. O.R.B. Jan.-June 1944 and O.R.B. (617 Sqdn.), 20th April 1944.

² O.R.S.(B.C.) Report, 30th June 1944. The thirteen attacks were selected for analysis because they were those for which the best photographic reconnaissance was available. They were thought to be typical of the twenty-nine precision operations of 5 Group in this period. Operations which had to be abandoned either because the target could not be visually marked or because the markers were obscured were disregarded in the calculation of results. They, in fact, account for about twenty per cent of the total despatched force. Thus, if they had been included, the abortive rate would have risen to thirty-seven per cent by comparison with the forty-five per cent for the blind *Oboe* attacks.

Commander Cheshire. Having laid his red spot fires on the aiming point and assessed their accuracy, the master bomber then called upon the backing-up force to aim further spot fires at them and also to cancel any inaccurate marking with spot fires of a distinctive colour, usually yellow.¹ Meanwhile, specially selected experienced crews were patrolling the target area at the bombing height to calculate the wind speed and direction. The average of their findings was broadcast to the bombing force and each bomb aimer set this same value on his bomb-sight before attacking the target. In this way a concentrated and accurate attack upon the markers was practically guaranteed for so long as the latter could be seen. But in practice it was found that the markers were often obscured or even extinguished in the early stages of the onslaught, with the result that the target had to be re-marked or that the later arrivals were left in doubt as to the true aiming point. Moreover, in the smoke, dust and dazzle of a progressing attack it was difficult accurately to re-mark a target. For that reason offset marking was introduced.

This technique involved the deliberate planting of the spot fire markers at some distance, usually between three and four hundred yards, from the actual aiming point. The precise extent of the offset was then observed in terms of distance and direction from the aiming point and what was known as the 'false vector' was arrived at. The average wind findings in the target area were adjusted in terms of this vector and a 'false wind' was broadcast to the bombing force. This meant that bombs aimed at the offset marking struck, not the marking, but the target.

The Operational Research Section at Bomber Command concluded that the three principal explanations of the superiority of the 5 Group technique were that the presence of a master bomber eliminated the influence of inaccurate markers,² that the bombing force normally had a single point of aim and aimed with a common wind value on the bomb-sight and that the Group was already experienced in precision attack upon small targets. These estimates certainly had some force, but it is a mistake to assume that the bulk of the 5 Group squadrons had much experience of precision bombing. Owing to the heavy casualties of the recent past many of the crews had little or no experience of any kind of operational bombing, and a high proportion of the older crews had never previously bombed anything other than area targets in Germany. The real key to the success of the operations lay in the brilliance of the crews who carried

¹ Spot fires, consisting essentially of impregnated cotton wool which burnt vividly on the ground, should not be confused with target indicators which cascaded on to the ground from the air. The Germans, of course, were busy simulating both kinds of markers, but experienced crews could generally detect the deception.

² Either by having them cancelled or by warning the bombing force verbally of their position.

out the marking, backing up and wind finding, as also upon those hard-pressed men who made the complicated mathematical calculations under somewhat inconvenient circumstances. Above all, or to be more accurate, under all, the presence of Wing Commander Cheshire over any target was rightly recognised by all 5 Group to be a factor of incalculable advantage. Not the least remarkable feature of this officer's service in the war was that he lived to see the end of it. Another consideration of undoubted importance was the relatively low level from which the 5 Group bombing attacks were delivered. The average bombing height in these operations was, in fact, 7,500 feet, which compared with an average of 12,300 feet for the *Oboe*-controlled attacks.¹

Nevertheless, the 5 Group technique which was responsible for such brilliant feats as the attacks on the marshalling yards at Tours, Juvisy,² La Chapelle, and elsewhere as well as upon the Kjeller airframe factory at Oslo, the explosives works at St. Médard-en-Jalles near Bordeaux and many other targets suffered from the defects of its own qualities. Apart from the use of *Oboe* Mosquitoes of the Pathfinder Force for proximity marking, the whole of each operation turned first upon the visual identification and marking of the target, and, secondly, upon a clear view of the markers from the bombing aircraft. This meant that the operations were at the mercy of the weather. They could not be carried out in poor visibility or when there was much low or medium cloud. Moreover, by its very nature, the technique involved rather lengthy periods in the target area for some aircraft and, when difficulties arose, sometimes for the whole force. This was liable to be more than usually dangerous, especially as the German fighter defences over France grew stronger and more efficient. The very heavy casualties suffered at Mailly-Le-Camp on the night of 3rd May and at Lille on that of 10th May, which have already been mentioned, were primarily due to hitches in the marking procedure which delayed the attack and kept the bombing force in the target area for much longer than had been planned. On each occasion, this enabled the German fighters to get to the target while the main concentrations were still over it.³ Thus, even against lightly defended targets of shallow penetration the 5 Group technique was liable to expose the bombing force to more than the usual hazards of

¹ In these attacks the average *Oboe* marking altitude was 28,600 feet. Altitude, of course, had an adversely cumulative effect upon any inherent aiming errors.

² For the results of the attack on Juvisy see the photographs facing p. 151.

³ O.R.S.(B.C.) Report, 14th July 1944, Nt. Raid Reports. In the Mailly-Le-Camp operation there were two aiming points, one of which was allotted to 5 Group and the other to 1 Group. Fifteen of the 173 Lancasters despatched by 5 Group and twenty-seven of the 173 despatched by 1 Group did not return. Two more of the 1 Group Lancasters were damaged beyond repair by German fighters. The delay at Mailly-Le-Camp was due to confusion between the two aiming points. That at Lille was occasioned by the necessity of re-marking the target, after the initial markers had been blown out.

night operations. Against more formidable targets of deeper penetration it necessarily had to be pruned of some of its refinements.

Towards the end of April there were three 5 Group attacks against major German targets, and though Lancasters from 1 Group contributed on each occasion to the bombing forces, these were real and severe tests of the extent to which the 5 Group precision technique might be translated into the sphere of the strategic air offensive against Germany.

The three attacks took place on the nights of 22nd, 24th and 26th April and the targets were the centres of Brunswick, Munich and Schweinfurt. On each occasion the plan was for Mosquito crews from 5 Group to dive-mark the aiming point with red spot fires after a visual identification of the target in the light of flares. If this proved to be impracticable, 5 Group Lancasters were to lay down sky marking on the indication of *H2S*. The bombing was to be controlled by the master bomber by means of radio telephone. In the Brunswick operation the dive-marking, some of which was delivered from as low as one thousand feet, appears to have been successful and it was well backed up by Lancasters from higher levels. Unfortunately, however, in addition to these ground markers, a number of sky markers were dropped wide and to the south of the target. These were, no doubt, thought necessary as there was a good deal of haze and thin cloud over Brunswick, but they attracted about forty per cent of the bombing effort. Owing to bad radio conditions many crews failed to receive Wing Commander Cheshire's instructions to ignore these sky markers. Nevertheless, heavy damage was done in Brunswick.

The Munich operation two nights later was much more successful. The four 617 Squadron Mosquitoes flown by Wing Commander Cheshire, Squadron Leader D. J. Shannon, Flight Lieutenant G. E. Fawke and Flight Lieutenant R. S. D. Kearns dived through intense flak and searchlight dazzle to lay their red spot fires. Wing Commander Cheshire estimated that these were within a hundred yards of the aiming point, and they set in motion what appeared at the time, and was later confirmed by photographic reconnaissance, to be a devastating attack of great accuracy. All the low-level Mosquitoes returned safely, though not without difficulty from their extraordinary adventure and thereby demonstrated that a really well-defended target could be visually dive-marked from between two and four thousand feet under reasonable weather conditions.¹

The third operation, against Schweinfurt on the night of 26th April, did not achieve the same degree of success, though the ball-bearing plants and marshalling yards in this difficult and controversial target were hit. The arrival of the flare force and the bombing

¹ Wing Commander Cheshire's feat over Munich on this occasion was prominently mentioned in his subsequent citation for the award of the Victoria Cross.

force was delayed by an unexpectedly strong headwind which sprang up on the outward journey. The initial red spot fires, not on this occasion dropped by 617 Squadron, were somewhat wide of the mark and the backing up crept even farther from the aiming point. The valiant efforts of the master bomber to concentrate the attack somewhat beyond the markers were only partly successful and the bombing force, which by that time was being severely harassed by German night fighters, found itself in considerable difficulties. Twenty-one of the aircraft, representing 9.3 per cent of the despatched force, did not return.¹

These three operations, and especially that against Munich, were certainly remarkable, and in many respects they provided a convincing vindication of the 5 Group technique which by some had been regarded as wholly unsuitable for major German targets. All the same, they represented a refinement of area bombing rather than an introduction of precision attack. In their accuracy they scarcely compared with what was being achieved in France and the Low Countries. Nor, as will presently be seen, had these difficulties by any means been overcome when the Bomber Command oil offensive began in June with attacks on Gelsenkirchen, Sterkrade, Wesseling and the Scholven plant.

Meanwhile, in the course of the railway campaign and of other operations against small targets, various different precision bombing techniques were being developed and tested in the light of the established success of the master bomber principle. The method of controlled *Oboe*, which has already been mentioned, and another, known as *Musical Newhaven*, were both crosses between the blind *Oboe* method and the visual 5 Group technique. Also, like controlled *Oboe*, they were refinements of techniques which, as will have been noticed, had been developed over the course of the area bombing offensive since the beginning of 1942. Controlled *Oboe* and *Musical Newhaven* both introduced a visual check upon and, if necessary, a correction of the blind *Oboe* marking of high-level Mosquitoes. They also both provided for the presence of a master bomber to direct the attack. The results achieved by their use were better than those following the purely blind *Oboe* attacks, but they were not as good as those produced by the 5 Group technique. In operations between 6th March and the end of April hits achieved expressed as a proportion of hits expected amounted for blind *Oboe* marking attacks to fifty-seven per cent, for *Musical Newhaven* to sixty-four per cent, for controlled *Oboe* to seventy-nine per cent and for the 5 Group technique to ninety-three per cent.²

¹ O.R.S.(B.C.) Nt. Raid Reports and O.R.B. (617 Sqdn.) 22nd and 24th April 1944.

² O.R.S.(B.C.) Report, 9th May 1944. These statistics were derived from the analysis of twenty-nine operations, fifteen of which were by blind *Oboe*, five by *Musical Newhaven*, six by controlled *Oboe* and three by the 5 Group technique.

Thus, the gloomy forecasts made by the Commander-in-Chief before the campaign began about the inability of Bomber Command to hit small targets at night as well as the fears, so vigorously shared by the Prime Minister, that large numbers of French civilians would be killed in the attempt by misplaced bombs, were now shown to have been largely without foundation. Operationally, the *Overlord* air plan and the determination of the Air Staff that Bomber Command should take part in it, had been vindicated, and now, as will have been seen in the previous chapter, powerful opinions in the Air Staff believed that the same kind, if not quite the same degree, of night precision bombing should be applied to the strategic offensive against Germany and particularly to the attack upon oil production which had already been initiated by the United States Eighth and Fifteenth Air Forces in daylight. The wisdom, or otherwise, of this view depended upon whether something like the standard of bombing accuracy which had been achieved over France could be maintained over Germany and whether this could be done without a prohibitive rise in Bomber Command casualties. The experience of 5 and 1 Groups over Brunswick, Munich and Schweinfurt in April, though by no means discouraging, was limited and inconclusive. In the four oil attacks of June 1944, Bomber Command was, therefore, venturing upon yet another of the great experiments which had recently filled its history.

As far as casualties were concerned, these four oil attacks were, as will already have been seen, little short of disastrous. From the 832 heavy bomber sorties despatched to Gelsenkirchen, Sterkrade, Wesseling and the Scholven plant on the nights of 12th, 16th and 21st June, no fewer than ninety-three failed to return. The least expensive and also the most successful of these operations was the first against the Nordstern plant at Gelsenkirchen. The bombing force was composed of 271 Lancasters of 1 and 3 Groups and the marking was to be done by seventeen Mosquitoes and six Lancasters of the Pathfinder Force. The plan adopted the technique of *Oboe* blind ground marking which was to be laid down throughout the attack in the form of red target indicators by the Mosquitoes. This marking was to be backed up by the Pathfinder Force Lancasters with green target indicators and the bombing force was to attack in two waves aiming at the centre of the red, or, if that was not apparent, at the centre of the green concentration.

Thus, the tactics were broadly similar to those used from March 1943 onwards in area attacks on targets within range of *Oboe*, but more accurate results were looked for from the improvement in the quality and quantity of *Oboe*-equipped Mosquitoes which had occurred since then. Nor, as the operation showed, was this an idle hope. For the most part, the marking was accurate and at least eight

groups of target indicators were plotted within the immediate vicinity of the aiming point. Nevertheless, one red marker was dropped with a gross error and fell nearly ten miles from the target. It attracted about thirty-five of the bombing Lancasters. For the first three minutes of the attack, the bombing appeared to be accurate and concentrated, but after that smoke began to drift across the target, obscuring the marking, and the usual pronounced creep back of bombing began to assert itself.

Night photographs suggested that, though two hundred Lancasters had got their bombs within three miles of the aiming point, only fifteen of them had actually hit the oil plant, but subsequent daylight photographic reconnaissance showed that a much better result than this had been achieved. It clearly showed that, in fact, the whole plant had been heavily damaged. Nearly all its vital elements were seen to be affected, especially the injection houses, the generating plants, the turbine house, the hydrogenation stalls, a gas generating plant and a paste preparation plant. In addition, many oil storage tanks appeared to have been destroyed, all the thirteen cooling towers were damaged and railway lines and wagons within the plant were widely dislocated.¹ The Pathfinder Force *Oboe* ground marking technique had, in fact, resulted in a remarkably precise attack upon a target which, though not as heavily defended as expected, was covered by a formidable flak barrage.

On the same night Bomber Command was over Amiens, Caen, Poitiers, Arras, Cambrai and a second target at Amiens, and confusion caused by all these operations somewhat delayed the German fighter reaction to that against Gelsenkirchen. For that reason bombers taking part in it were not intercepted until they had almost reached the Zuider Zee on their return journey. Nevertheless, at least eleven Lancasters were shot down by fighters at and after that point and altogether seventeen of them failed to return.²

The same tactics were used for the second attack on the night of 16th June. This time the target was the oil plant at Sterkrade. Sixteen Mosquitoes and six Lancasters of the Pathfinder Force were despatched to do the marking and backing up and they were followed by 162 Halifaxes of 4 and 6 Groups and 137 Lancasters of 1 and 6 Groups.³ The weather on this night was somewhat worse than the bad conditions which had in any case been forecast. Thick cloud covered the whole of the route and the target, where it rose to a height

¹ The 276 aircraft which claimed to have attacked the target carried 1,440.8 tons of H.E. and 3.5 tons of incendiary bombs. Included in this were two hundred and seventy-three 4,000-lb. bombs.

² O.R.S. Nt. Raid Report.

³ The Halifaxes were all the new improved Mark III version, but twenty-two of them failed to return all the same. Nine of the Lancasters failed to return.

of fourteen thousand feet. This rapidly converted the Pathfinder Force marking into little more than a faint glow which, nevertheless, served to some extent as an aiming point in a rather scattered attack. It was, perhaps, remarkable that the daylight reconnaissance showed that nine units of the Sterkrade plant had been damaged.

The attacking force had approached the target in two waves, one passing to the north and the other to the south of Rotterdam. This ruse confused the enemy for a time, but as the bombers converged upon Sterkrade they also drew near to the German fighter beacon at Bocholt over which the German controller had unfortunately assembled his force. In the resulting encounter the bombers and particularly the Halifaxes suffered heavily. Thirty-one of the total force failed to return, of which ten were probably destroyed by flak.¹

Five nights later on 21st June the oil plants at Wesseling and Scholven-Buer were attacked by somewhat different methods. In the first case the attack was to be directed by the 5 Group visual marking technique, but if the red spot fires could not be seen from the bombing height of seventeen to twenty-two thousand feet the attacking force was warned not to wait in the target area but to attack blindly on *H2S* indications. The Scholven oil plant was also to be visually marked with red spot fires by 5 Group Mosquitoes, but in this case *Oboe* Mosquitoes of the Pathfinder Force were to drop yellow target indicators as proximity markers. The force despatched to Wesseling consisted of six Mosquitoes and a hundred and twenty Lancasters of 5 Group and seven Lancasters of 1 Group. That sent to Scholven consisted of four Mosquitoes and a hundred and twenty Lancasters of 5 Group, five Mosquitoes of the Pathfinder Force and three Lancasters of 1 Group.

Neither operation achieved the accuracy which was hoped for and the only apparent result was some blast damage to an oil storage tank in the north-west corner of the Wesseling plant. Complete cloud coverage prevented the bombing force from seeing the marking and only a very small proportion of the aircraft engaged brought back photographs showing anything other than cloud. Above the cloud this midsummer's night was, however, objectionably clear despite the absence of a moon. The brunt of a most effective German fighter attack fell upon the Wesseling force, from which thirty-seven Lancasters failed to return. Eight more Lancasters from the Scholven force were also reported missing. At both targets there was intense and, up to eighteen or twenty thousand feet, accurately predicted flak. At least thirty-five of the forty-five missing Lancasters were, nevertheless, probably shot down by fighters and, in addition, two more

¹ O.R.S. Nt. Raid Report. On this operation the airborne *Mandrel* screen was used in support of Bomber Command for the first time.

returned after combats with fighters so badly damaged that they had to be scrapped. The missing rate in the Wesseling operation was 27·8 per cent of the despatched sorties.¹

On the evidence of these four operations against oil plants the prospects of precision bombing in Germany at night seemed bleak. Only one of the attacks had apparently achieved significant damage and very heavy casualties, which in the last case had become prohibitive, had been the result. Moreover, if the weather, which had had such a bad effect upon the accuracy of the attacks, had been better, there was little reason to believe that the casualties might not have been even more severe. On the other hand, there was equally little reason to suppose that the casualties would have been lighter in these cases if the operations had been area and not precision attacks. All the losses had been borne by the bombing forces. None had been suffered by the markers either of the Pathfinder Force or of 5 Group. But the bombing forces had operated at normal area attack altitudes of about twenty thousand feet and there had been no undue delays in the target areas. Moreover, on the two last and most expensive operations, though the visibility above the cloud had been dangerously good, there was no moonlight. The high casualties suffered were, therefore, a commentary, not particularly upon the hazards of this kind of precision bombing, but upon the general hazards of any kind of night attack over any territory which was well covered by the German night fighter force. This, as Sir Charles Portal was soon to suggest to the Prime Minister, made a strong case for the adoption by Bomber Command of daylight tactics.²

¹ O.R.S. Nt. Raid Report. The weather forecast for this operation was wrong. It had been predicted that the Ruhr area would be clear of cloud all night. Actually there was ten-tenths cloud well below the bombing height at Wesseling and Scholven.

² Min. Portal to Churchill, 31st July 1944.

3. The development of day attack by Bomber Command and the establishment of new conditions in the night offensive June–October 1944

The launching of operation *Overlord* on the morning of 6th June 1944 by no means brought the *Overlord* air diversion to an end. Bomber Command was now called upon to act in the manner of a tactical air force and to provide direct support to the armies of the field. Like the preparatory attacks carried out between March and June, these operations were not a part of the strategic offensive against Germany and as far as those carried out at night were concerned, they had little bearing upon it. The pre-*Overlord* diversionary operations, as has just been seen, stimulated great advances in the techniques of night precision bombing and provided a kind of operational training in the practical application of the various methods. The fruits of this stimulation and of this training were now, however, as has also been seen, beginning to be applied to the destruction of strategic objectives in Germany and it was from these operations, themselves a part of the strategic air offensive, that the future of the precision element of the campaign at night was to stem. It is, therefore, not intended to dwell upon the night operations of Bomber Command which were carried out in support of the armies against targets in occupied territory. The development of precision bombing at night can henceforth be seen in the history of Bomber Command's strategic operations against German targets.

Nevertheless, the *Overlord* requirements as also those for the destruction of flying bomb sites and other similar small targets in occupied territory did still have an important ultimate bearing upon another aspect of the final strategic air offensive against Germany, and this was the development of daylight bombing. Rather as the preparatory phase of the *Overlord* air plan had, after March 1944, provided the occasion and the opportunity for the development of night precision bombing, so now, after June 1944, a somewhat similar occasion and opportunity was provided for the development of daylight bombing. In this section it is, therefore, intended to examine the way in which day bombing was resumed by Bomber Command and developed to such a point that towards the end of the period here reviewed, it had become a fundamental aspect of the Bomber Command contribution to the Combined Bomber Offensive. But at the same time new conditions in the night offensive were also being established and these, too, must be examined in this

section, for it was due to them that Bomber Command succeeded in developing, on the basis of its somewhat adverse experience of the four oil attacks in June, a really formidable and diminishingly expensive precise element in the continuing night offensive as well as a vastly increased destructive potential in its area attacks.

Daylight bombing had a bad reputation in Bomber Command especially when the employment of heavy aircraft was involved. The efforts of the past, which had been largely abandoned by the end of 1942, had resulted in little else than exceptionally heavy casualties and the grounds on which Sir Arthur Harris had in 1942 resisted Air Staff pressure to persevere with the development of the Lancaster as a day bomber still seemed to him to be firm and valid in the spring of 1944. 'Even the Lancaster', he wrote to the Vice-Chief of the Air Staff on 7th April, 'would be incapable of operating in formation above 18,000 or 19,000 feet', and at this height, the Commander-in-Chief thought, the effect of flak would be 'lethal'.¹ The Air Staff, on the other hand, was inclined to believe that the 'general situation' might at any time make day bombing by heavy aircraft of Bomber Command 'both practicable and profitable. It is appreciated', Sir Arthur Harris was told on 18th April 1944, 'that under present conditions, by reason of their armament and limited ceiling, our existing types of heavy bombers, when flying in formation are unsuitable for a full scale offensive against Germany. Nevertheless,' the Air Staff letter continued,

'it should be possible for them, under cover of an adequate fighter escort, to penetrate to targets in the occupied countries and even into Western Germany. In the clear conditions required for visual bombing the flak risk would be appreciably higher than at night, but provided the targets selected are not too heavily defended by flak and the forces are carefully routed, losses due to this cause should not be unduly heavy.'²

There were, as was explained in this letter, a number of important reasons to account for the Air Staff desire to resume daylight operations. Bomber Command would be enabled to exploit any sudden deterioration of the German day fighter force and achieve successful attacks upon 'vital precise objectives'. The reinforcement of the American day offensive would, it was thought, do much 'to confuse and further reduce the efficiency of the enemy fighter defences.' Greater accuracy, it seemed, could be expected in daylight attacks upon small targets, 'particularly those of a tactical nature.' The potentialities of 617 Squadron and of the new *Tallboy* earthquake bomb might be more fully exploited in daylight than in darkness.

¹ Letter Harris to Evill, 7th April 1944.

² Letter Bottomley to Harris, 18th April 1944.

If there was an emergency in the course of the invasion, the ability to bomb by day would make it possible to increase the scale of effort for a short time against certain critical targets. Finally, the increasing success of the German night fighter force might eventually make a change over to daylight bombing necessary in order to reduce casualties.

Sir Arthur Harris was far from convinced by these arguments. Daylight operations by Bomber Command would, he thought, be uneconomical unless carried out in clear weather because in cloudy weather they would be no more accurate than night attacks and they would be pointless unless mounted on a scale to produce a material reinforcement of the American effort. If the first condition was fulfilled, he considered that the casualties would be prohibitive owing, in addition to the increased flak risk, to the vulnerability to enemy fighters of heavy aircraft equipped only with .303 guns. No fighter escort, Sir Arthur Harris observed, could ever provide continuous cover. If the second condition was fulfilled the night offensive would be gravely weakened and the effects of 'round the clock' bombing greatly diminished. The argument that German night fighter successes might develop to such an extent that day bombing would become inevitable was, in Sir Arthur Harris' view, more important. All the same, he did not regard it as valid. Improved turrets and radar warning devices would, he believed, quickly redress the disadvantageous position of the night bombers and he thought it would be better to concentrate on the production of such equipment and devices rather than to embark upon day bombing. The only tangible gain which Sir Arthur Harris expected from day bombing was an increased ability to deal with 'small but important tactical objectives. This, however,' he said, 'would be of real moment only if the U.S. Bomber Force available were inadequate in size to deal with such objectives. This, however,' it appeared to him, was 'not the case. Furthermore,' Sir Arthur Harris wrote, 'it is very doubtful whether our heavy bombers could in fact achieve greater accuracy in daylight than we have already achieved at night on fairly lightly defended targets by means of Oboe.' In addition, owing to the rarity of clear days, they would, he pointed out, have many fewer opportunities.¹

In the light of further developments, however, Sir Arthur Harris' views underwent a complete change and in June he decided to undertake the experiment which had been urged upon him by the Air Staff in April. The 234 Lancasters and Mosquitoes despatched in daylight to the docks at Le Havre on the evening of 14th June were the first of a total 2,716 daylight sorties sent out to targets in occupied territory during the rest of the month. By that time, it had

¹ Letter Harris to Air Min., 25th April 1944.

become evident that the German day fighter force had lost the will or the ability to offer a sustained challenge to allied air operations in daylight provided that the latter were protected by fighter cover. In particular, the almost complete lack of reaction by the *Luftwaffe* in daylight over the Normandy beach-heads at what was obviously one of the decisive hours of the war, had been singular and encouraging. Moreover, the feebleness of the German day fighter force bore interesting comparison with the still severe and effective reaction of the night fighter force. These factors had led Sir Arthur Harris to expect that, at any rate against targets in occupied territory, operations might be more cheaply executed in daylight than at night.

Nor was the Commander-in-Chief disappointed in this expectation. From the 2,716 daylight sorties, the bulk of which were flown by Lancasters and Halifaxes, despatched in June, only 0.4 per cent failed to return. From the 6,847 similar sorties despatched in July the missing rate again was only 0.4 per cent. Being of very short range, all these operations were covered by Fighter Command Spitfires of 11 Group and being for the most part directed against relatively ill-defended targets no undue flak risks were encountered.¹

These operations, to which many different squadrons in all the bomber groups contributed, did not involve the elaborate formation tactics which had been developed in the United States Eighth and Fifteenth Air Forces. Most of them were undertaken, often at short notice, by ordinary squadrons whose crews had little training in and no operational experience of daylight bombing. Indeed, because of the vast training effort which would otherwise have been required, it was initially decided that no attempt should be made to carry out the operations in formation. Squadrons were merely instructed to keep reasonably close to each other so that the escorting Spitfires could provide cover for at least the bulk of the force.

This naturally meant that, unlike the American crews, who dropped their bombs in the pattern of the formation on a signal from the leader, the Bomber Command crews each had to sight and aim individually at the target. For that reason, the aiming points were marked in much the same way as at night and the attacks were usually controlled, also as at night, by a master bomber.² The results in practice were far from ideal. The loose, and sometimes even chaotic gaggle of bombers was by no means perfect from the point of view of mutual defence or from that of the escorting Spitfires.³ In addition, there was usually almost a cohort of stragglers whose

¹ Bomber Cmd. O.R.B. Jan.-June 1944 and O.R.S.(B.C.) Reports.

² Mtg. Bomber Command Tactical Planning Committee, 24th June 1944 and Dir. Bomber Cmd. to 1, 3, 4, 5, 6, 8 and 100 Groups, 9th July 1944.

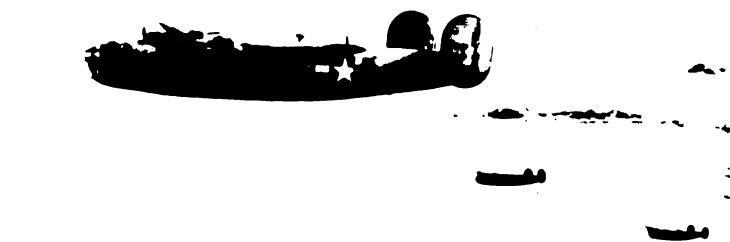
³ The word 'gaggle' was used to describe a group of bombers flying in close company but not in formation.



4. A P-51-B Mustang of the United States 8th Air Force being prepared for operations against Brunswick on 8th April 1944. The drop tanks can be seen under the wings.



5. A B-17 Flying Fortress of the United States Army Air Forces.



6. Liberators of the United States 15th Air Force crossing the Alps to bomb targets in Germany on 29th December 1944.



7. A Lancaster releasing incendiary bombs on Duisburg on 14th October 1944.

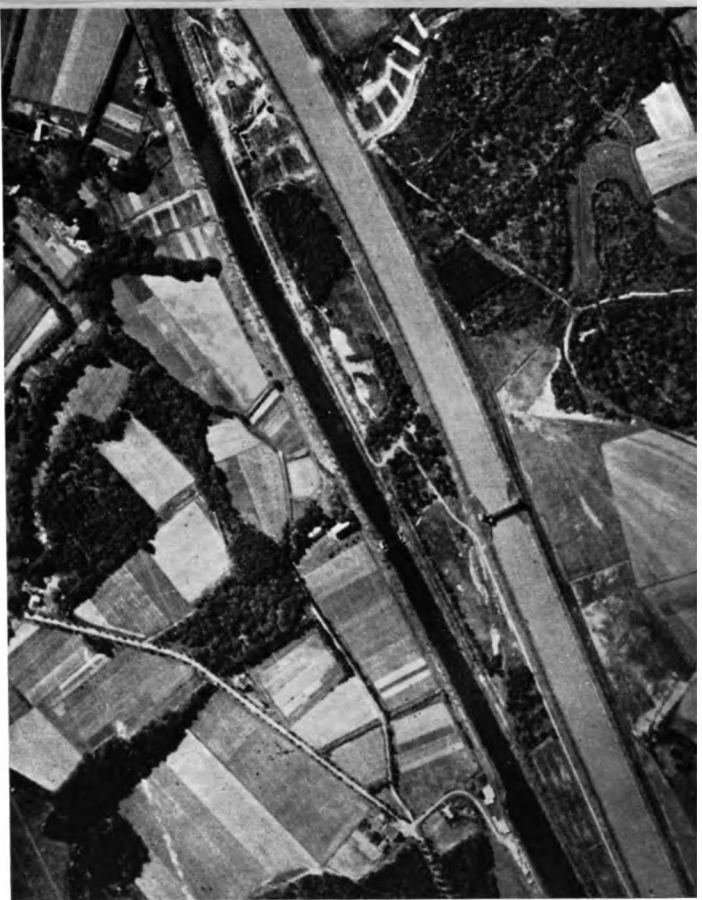


8. A Mosquito, Mk. XVI.



9. The improved Mk. III Halifax.

10. The Ladbergen section of the Dortmund-Ems Canal before attack.



11. The Ladbergen section of the Dortmund-Ems Canal after the attack on the night of 23rd September 1944. This photograph was taken on 2nd October. Two direct hits by 12,000-lb bombs are marked **a**. Four points where the water has flooded over the broken embankments are marked **b**. The camouflaged River Glane is marked **c**.





12. The oil plant at Bottrop/Welheim on 18th November 1944 after attacks by Bomber Command and the United States 8th Air Force.

crews doubted the wisdom of joining the gaggle or lacked the ability to do so. In the target areas there was often much congestion and an inevitable jockeying for position on the bombing run. Nevertheless, as a Bomber Command directive of 9th July 1944 observed, the experiment did show that it was possible

‘to carry out bombing attacks necessitating small penetrations into enemy occupied territory in daylight with almost negligible losses provided adequate fighter cover is given . . .’ and ‘that accurate bombing can be achieved in daylight using the same marker technique as used at night’.

The real value of the experiment, however, turned upon the extent to which these initial and somewhat haphazard methods could be developed into more scientific and precise techniques and upon whether, in the light of its growing experience, Bomber Command would be able to execute effective day attacks upon German targets at reasonable cost. Both propositions were tackled with vigour and, as in March, April and May, there had been spectacular developments in night bombing techniques against small targets in occupied territory, so now in July, August and September, there were equally important developments in day bombing techniques against the same kinds of objective. Moreover, as in April and again in June, Bomber Command had begun to translate its night precision techniques into terms of the strategic offensive against Germany, so now in August and September it began to do the same thing with its day bombing techniques.

These techniques, like those at night, were of various different kinds. Two of them, *Oboe* ground marking and controlled *Oboe*, were identical with night techniques which have already been discussed. The other methods of day attack developed by Bomber Command over occupied territory were firstly, visual bombing in which each crew had to sight and aim at the target individually either with or without the help of proximity markers. Secondly, there was an emergency method, known as *Gee*—Dead Reckoning, by which bombs were dropped either on a *Gee* fix or after a timed run from the last obtainable fix. Thirdly, there was the much more ambitious and complicated *Oboe* or *G-H* formation technique.¹

This system was developed in July and August by relatively small formations of bombers led in each case by one equipped with *Oboe* or *G-H*. The technique was for the leader, or if he was in difficulties for the reserve leader, to drop his bombs blindly on the indication of *Oboe* or *G-H*, and for this action to be taken by the rest of the formation as a signal to drop their bombs. Thus, the accuracy of the attack depended firstly upon the accuracy of the leader’s radar

¹ O.R.S.(B.C.) Report.
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aim and secondly upon the station-keeping of the bombers in the formation. The great advantage was that, as far as the weather was concerned, all that was required was reasonable visibility between the aircraft in formation. It made no difference if the target was completely covered by cloud, as indeed it was during most of the attacks on flying bomb sites by the *Oboe* formation method in the course of July.

The *Oboe* technique was developed by the Pathfinder Force and at first it was usual for an *Oboe*-equipped Mosquito to lead a formation of six Lancasters, and each attack was carried out by from one to three formations. Later the Pathfinder Force began to lead somewhat larger formations of between sixteen and eighteen aircraft each provided by 3 and 4 Groups, but in these cases not all the bombers could be close enough to the leader to hit a small target by releasing their bombs simultaneously with his. If they had done so, the resulting pattern of bombs on the ground would have been too large. A variation of the tactics was, therefore, introduced. The aircraft in immediate company with the leader still bombed simultaneously with him. Aircraft more than a hundred yards behind the leader bombed when their crews saw the aircraft immediately in front drop their loads. Aircraft still further behind bombed when they drew level with a smoke puff fired by the leader at the time of his attack. This smoke puff was the only kind of marking involved in the operation.¹

The *G-H* technique, which was fundamentally similar, was developed in 3 Group by 218 Squadron. *G-H*, it will be remembered, had been in limited service with Bomber Command for some time, but in February 1944, when a number of aircraft in 3 Group had been equipped with it, a conservation policy was adopted, training ceased and the equipment was withdrawn. On 30th March, however, it was decided to equip one flight of Stirlings in 218 Squadron with *G-H* and to proceed with training, though at that time the object was to use the device as an aid to target marking. In the meantime, 218 Squadron was not withdrawn from the line and it continued to carry out normal operations.² But at the end of July, *G-H* aircraft were used for the first time as leaders in formation bombing. In the first attack, which took place on 27th July against Les Landes, much the same tactics as had been devised for the *Oboe* method were adopted, but the results were not successful and in further experiments against Fromental and Wemaers on 28th July and Mont Candon on 2nd August, somewhat tighter formations were attempted.

These operations showed that *G-H* was a remarkable device for

¹ Bomber Cmd. O.R.B. July-Dec. 1944.

² do. Jan.-June 1944.

blind bombing. The average bombing error produced by it in the Fromental, Wemaers and Mont Candon attacks was only 275 yards and in the first attack it was actually 150 yards. The average bombing error of the other aircraft in the formations amounted, however, to some 760 yards. This was a less accurate result than was being obtained from similar methods by Marauder crews of the United States Ninth Air Force, but the 3 Group crews were still lacking practice in daylight formation flying, and the Stirlings, flying near the limit of their altitude, were by no means easy to handle.¹

Thus, on the evidence of the first few experiments, even though they were carried out by comparatively inexperienced crews in relatively inefficient aircraft, the *G-H* formation bombing technique was shown to be a most promising development in the tactics of daylight precision attack. Even so, it was less accurate, not only than some other methods of day bombing, but also than some night techniques. Indeed, on the evidence of an analysis of some 108 daylight and ninety-nine night precision attacks by various methods against targets in occupied territory carried out between March and September 1944, it appeared that the *Oboe* formation bombing technique was the best of any method tried by day or night. Its closest rivals were, firstly, the 5 Group visual night technique, especially after the introduction of offset marking and, secondly, the daylight visual method.²

Visual bombing, or bombing which depended upon visual marking, whether by day or by night, was, however, dependent upon the weather, and if the target was covered by more than a very moderate thickness of cloud, it could not be carried out.³ For that reason, the 5 Group visual technique at night was not so much comparable as complementary to *Oboe* and *G-H* formation bombing, but if the former suffered from the serious disadvantage of the weather consideration, the latter also had its limitations. Both *G-H* and *Oboe*, being dependent upon ground transmitters, had a limited range and, therefore, in any major plan of attack upon German targets, a limited value.⁴ Moreover, as will be realised, *Oboe* aircraft could only

¹ O.R.S.(B.C.) Report, 19th Sept. 1944. Increased experience was, however, producing better results. The average bombing error of the following aircraft in the Fromental operation was 1,200 yards. In the first wave of the Mont Candon attack it was three hundred yards.

² O.R.S.(B.C.) Report. A table showing the bases of these conclusions which appears in this report is printed at App. 48.

³ Even very thin cloud, through which markers could be seen at night, was enough to obscure them in daylight.

⁴ The range of *Oboe* and *G-H* was increased by the altitude of the aircraft carrying the equipment, but in the case of formation bombing this altitude was restricted by the ceiling of the bombing aircraft flying in formation. Thus, at the Lancaster ceiling *Oboe* had a shorter range than at the Mosquito ceiling, but when leading a Lancaster formation the *Oboe* Mosquito had to fly at the Lancaster altitude.

be operated in limited numbers at the same time and there was, therefore, a strict limit to the scale on which *Oboe* formation bombing could be undertaken. This latter disadvantage did not, however, apply to *G-H*. Despite the fact that it was initially less accurate than *Oboe* formation or visual bombing by day and the 5 Group technique by night, the *G-H* formation technique was, therefore, in some respects a more important and at least a complementary development. When precision attack on German targets in winter weather was contemplated this became fully apparent.

The idea that daylight operations over occupied territory might eventually develop into daylight attacks on German targets had been in the mind of the Air Staff in April 1944. It had been mentioned in the Bomber Command directive on day operations on 9th July and at the end of August it began to come to fruition. On 27th August a force of 216 Halifaxes from 4 Group and twenty-seven Mosquitoes and Lancasters from the Pathfinder Force was despatched to attack the oil plant at Homberg in the Ruhr. The bombers were accompanied by an almost equal number of Spitfires from 10, 11 and 12 Groups of Fighter Command. The first nine of the fighter squadrons made a *rendezvous* with the bombers near Overflakkee at 17,000 feet. The remaining seven fighter squadrons met the bombers at the target and augmented the escort on the return flight. The only German fighter sighted by the Bomber Command crews was an Me.110 which was driven off by the Spitfires before it had done any damage.

Homberg lay in the most heavily defended area of the Ruhr and intense anti-aircraft fire was encountered in the target area, but its main characteristic was its inaccuracy and none of the bombers in the Pathfinder marking force, or in the large 4 Group gaggle of Halifaxes, was brought down. All the aircraft subsequently returned safely to base. There was five to eight-tenths cloud up to seven thousand feet at the target which could, nevertheless, be seen through gaps from the bombing height. The damage to the plant was somewhat scattered, but in places quite severe.¹

Such, at least from the point of view of the absence of casualties, was the happy outcome of the first major daylight operation by Bomber Command against a German target in 1944 and the first also in which Bomber Command had ever penetrated beyond the Rhine with fighter cover. Naturally, this was the prelude to further operations of the same nature. On 6th September, a force of 181 Lancasters and Halifaxes from 6 Group and the Pathfinder Force,

¹ Bomber Cmd. Interception/Tactics Report, 31st Aug. 1944, and Photographic Interpretation Report, 2nd Sept. 1944. It is impossible to say exactly what damage was done by the operation of 27th August because no photographic interpretation was made between 21st July and 1st Sept. 1944.

covered by six squadrons of Spitfires and four of Mustangs, was despatched to Emden where a successful attack began just before half past six in the evening. One of the Pathfinder Lancasters crashed near the target but all the other aircraft returned to base. Photographic reconnaissance showed that the bombing had been accurate and well concentrated. Five days later, on 11th September, three separate and almost simultaneous daylight attacks were launched against oil targets in the Ruhr. 129 Lancasters, Halifaxes and Mosquitoes from 4 Group and the Pathfinder Force were sent to the Nordstern plant at Gelsenkirchen, 116 Lancasters from 3 and 5 Groups and the Pathfinder Force to Kamen, and 134 Halifaxes, Lancasters and Mosquitoes from 6 Group and the Pathfinder Force to Castrop Rauxel. No fewer than twenty squadrons of Spitfires, three of Mustangs and three of Tempests provided the fighter cover. The German fighter force offered no resistance and the nine aircraft of Bomber Command which failed to return were shot down by flak or in some cases, perhaps, brought down by bombs from friendly bombers. All three attacks, and especially those on Kamen and Castrop Rauxel, achieved considerable accuracy.¹ The way, at least to the Ruhr, was now clearly open to Bomber Command in daylight.

Sir Arthur Harris' wish to have the escorting fighters under his own command was not gratified, but despite this and despite the fact that the Spitfires and Tempests were, on these occasions, operating at the very limit of their range, the substantial fighter cover provided was more than adequate to hold off the practically non-existent reactions of the German fighter force, which, of course, though with scarcely more success, was at the same time contending with the deeper penetrations of American fighters and bombers. In these circumstances, the poor armament, limited ceiling and somewhat loose formation tactics of the Lancasters and Halifaxes were of no ill-consequence and a most convincing demonstration of the meaning of daylight air superiority was given. From the 803 sorties despatched by Bomber Command in these five daylight operations, only ten bombers failed to return and none of these was shot down by an enemy fighter.

The attacks had also achieved a considerable degree of success. Particularly heavy damage had been done to the centre of Emden and to the oil plants at Kamen and Castrop Rauxel. Moreover, the operations against the oil plants at Homberg and Gelsenkirchen had by no means been failures. But all these attacks had been carried out by visual bombing upon target indicators laid by the Pathfinder

¹ Bomber Cmd. Interception/Tactics Reports, 10th and 16th Sept. 1944, Photographic Interpretation Reports, 22nd, 13th and 14th Sept. 1944.

Force. They had, therefore, depended upon the reasonably clear weather which had, in fact, been encountered on each occasion. Such weather was, however, likely to become increasingly uncommon in the immediate future as autumn drew on. For that reason the development of 3 Group as a specialised blind day bombing force was of the utmost importance.

As a result of the demonstrated effectiveness of *G-H* as a mechanism of blind bombing, it had been decided by the end of July 1944 to equip the whole of 3 Group with the device as quickly as possible.¹ But the plan took a long time to execute and by 2nd October, when 3 Group, now an all Lancaster force, had some 234 aircraft in its squadrons, there were only sixty-one which had been equipped with *G-H*. This, however, together with the prospect of a faster rate of fitting in the immediate future, was considered sufficient to justify the view of the Air Officer Commanding, Air Vice-Marshal R. Harrison, that the Group should assume a specialised role within Bomber Command and that, as 5 Group had for some time been doing, it should be permitted to carry out independent operations. On 6th October, Bomber Command authorised 3 Group to carry out independent *G-H* blind bombing operations when the weather was unsuitable for ground marking and visual bombing, and when there was no other over-riding commitment. The targets allotted to the Group for this purpose were all, rather surprisingly, area objectives in the centres of large German towns. Among them was Bonn in which the Air Officer Commanding 3 Group had expressed a special interest.²

On 18th October 1944, Air Vice-Marshal Harrison despatched 128 of his Lancasters to this town. Substantial fighter cover was provided by Mustangs and Spitfires and the only German aircraft seen was an Me.109 which did not get into contact with the Lancasters, only one of which failed to return. The 3 Group bombers flew in formations of three, each 'vic' being led by a *G-H* aircraft. Along the route the attacking force flew over almost unbroken cloud which did, however, tend to break up in the target area, though this, owing to the technique of the bombing, was not necessary for the success of the operation. It was an exaggeration on the part of the Narrative Officer at Bomber Command to record that this attack 'practically wiped out [the] town', but it certainly did cause heavy and concentrated damage to it.³

¹ Bomber Cmd. O.R.B. July-Dec. 1944.

² Note of Conf. at 3 Group, 2nd Oct. 1944, Letter Bomber Cmd. to 3 Group, 6th Oct. 1944, and consolidated Form G, 2nd Oct. 1944.

³ Bomber Cmd. Interceptions/Tactics Report, 23rd Oct. 1944, Immediate Interpretation and Interpretation Reports, 30th Oct., 7th and 8th Nov. 1944, and Summary of Operations, 18th Oct. 1944.

At the first attempt, a substantial daylight operation against a German target by the 3 Group *G-H* technique had resulted in a striking success. Moreover, as was the case with Bomber Command's other daylight operations, this had been achieved at a negligible cost in casualties. It was clear that Bomber Command had developed a formidable daylight bombing potential of considerable precision which threatened German targets not only in fair but also in foul weather. This was to be an important aspect of the Bomber Command contribution to the final phase of the combined air offensive which was yet to come. In addition, it was an extending threat, because, as the allied armies advanced towards the Rhine, they were closely followed by mobile *G-H* transmitters, with the result that the area of Germany covered by them was greatly increased.

In other ways, too, this land advance simplified the problems of the daylight offensive. Refuelling facilities in France became available for the escorting fighters and the period of early warning for the German air defences was reduced, and, in the case of operations against the Ruhr, reduced virtually to nothing. The flying bomb sites, which had absorbed so much daylight effort, were captured and the German air force, already desperately short of petrol in consequence of the strategic attacks on oil plants, was thrown into some confusion by the need to withdraw to new bases. Thus, by these processes, the prospects of day bombing, which for some months had been favourable, were made more favourable. At the same time the prospects of the night offensive which so recently had looked so bleak, were, for much the same reasons, rendered equally favourable.

In June, it will be remembered, Bomber Command had carried out only four major night attacks on German targets. All of them had been directed against oil plants in the Ruhr and very heavy casualties, amounting, as far as the heavy bombers were concerned, to eleven per cent of the despatched sorties, had been suffered, mostly as a result of the prompt and effective reaction of the German night fighter force, which had scored its successes in the face of the growing radio counter-measures campaign and the Bomber Command tactics of diversions, feints and divided concentrations. In the first half of July there were no major operations by Bomber Command against German targets, but in its second part a considerable effort was devoted to night attacks on the Ruhr oil plants at Wesseling, Scholven-Buer, Homberg, Bottrop and Wanne-Eickel as well as to massive area attacks on Kiel, Hamburg and Stuttgart, the last of which was bombed three times.

These ten operations involved the despatch of 3,419 sorties seventy-seven of which were by Mosquitoes of the Pathfinder force. 132 bombers, all of which were Lancasters and Halifaxes, failed to

return and this missing rate of 3.9 per cent of the despatched force was mainly attributable to night fighter action. It was a much lower casualty rate than had been suffered against German targets in June, or, for that matter, in the Battle of Berlin in the previous winter. There were signs that the German night fighter effort had been somewhat confused or obstructed by the Bomber Command tactics and by the use of the *Mandrel* screen as well as by that of a new kind of *Window* designed to swamp the latest version of German A.I. equipment. On the night of 25th July, for example, a force of 135 aircraft despatched to Wanne-Eickel suffered no losses at all. The German night fighters were concentrating upon the much larger force going to Stuttgart, but owing to somewhat poor visibility and *Window* interference, they failed to inflict serious losses upon it. From the 550 bombers despatched to Stuttgart, only twelve failed to come back. Earlier, on the night of 18th July, Bomber Command attacked the oil plants at Wessling and Scholven-Buer with devastating effects and negligible losses. From the 194 bombers sent to Wessling and the 170 sent to Scholven only five failed to return. The German fighters were almost wholly engaged in Belgium and eastern France and the bombers going to the oil plants emerged from behind the *Mandrel* screen to find the approach to the Ruhr virtually undefended except by flak. To some extent, these were encouraging results, but there were still some extremely disagreeable aspects of the situation.

While the effective and inexpensive operations against Wessling and Scholven were taking place, another Bomber Command force, consisting of 110 Lancasters and five Mosquitoes from 5 Group, was being heavily and almost continuously engaged by German fighters all the way from Dieppe to the railway junction at Revigny in Belgium and back again. Twenty-four of these Lancasters, accounting for 21.8 per cent of the heavy bombers despatched, did not return. Many of the interceptions were made by single-engined fighters whose pilots were using free-lance 'cat's eye' tactics which, of course, were not subject to interference by *Window*. At this period, indeed, Bomber Command, owing to the activity of these 'cat's eye' fighters, suffered heavier losses over the general area of north-eastern France than over Germany itself. Nevertheless, few operations were as inexpensive as those against Wessling and Scholven on the night of 18th July. Nor, as the month came to an end, did the situation seem to be improving. On the night of 28th July, 803 bombers were despatched to make area attacks on Hamburg and Stuttgart. Sixty-two of them did not return.¹

The five oil attacks of July compared favourably with those of

¹ O.R.S.(B.C.) Report and Nt. Raid Reports. The ten major operations against

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June not only in the lower casualties incurred but also in the better and more uniform results achieved. In the Wesseling operation the plan was to open the attack with sticks of illuminating flares dropped blindly on *Gee* or *H2S*. These were to be followed by proximity markers from *Oboe* Mosquitoes and, in turn, the aiming point was to be marked visually with mixed green and red target indicators. In each of these processes, the Pathfinder Force achieved an outstanding success despite the fact that the master bomber was only partially effective owing to a smoke screen which the Germans put up to the south of the plant. Both the marking and later the backing up was accurate and a well-concentrated attack was the result. Photographic reconnaissance duly showed that severe devastation had been caused throughout the plant. The Scholven plant, which was marked by substantially similar means, was also badly damaged.¹

In the attacks on Homberg and Bottrop the oil plants were blindly marked by *Oboe* Mosquitoes, but the attacks were, nevertheless, accurate and well concentrated, causing, as was shown by photographic reconnaissance, severe damage to both installations. At Wanne-Eickel a considerable ground haze made visual identification of the target impossible, but the *Oboe* ground markers, though initially somewhat scattered, could be seen through the gloom. Once again photographic reconnaissance showed that heavy though, by comparison with the other attacks, rather less extensive damage had been done to the plant.²

German targets in July 1944 were as follows. The figures in brackets refer to Mosquitoes and are included in the totals.

July	Target	Despatched	Missing
18/19	Wesseling	194 (6)	1 (0)
"	Scholven	170 (13)	4 (0)
20/21	Homberg	158 (11)	20 (0)
"	Bottrop	166 (13)	8 (0)
23/24	Kiel	629 (10)	4 (0)
24/25	Stuttgart	614 (0)	21 (0)
25/26	Stuttgart	550 (0)	12 (0)
"	Wanne-Eickel	135 (10)	0 (0)
28/29	Stuttgart	496 (2)	39 (0)
"	Hamburg	307 (14)	23 (0)

In these calculations, as also in those for August and September, given below, a major attack is taken to mean an operation on which not fewer than a hundred heavy bombers were despatched. The tables, therefore, omit all independent Mosquito attacks.

¹ O.R.S.(B.C.) Nt. Raid Report. In the Wesseling attack nearly seven hundred tons of H.E. bombs, including fifty-two 4,000-lb. bombs, were dropped. In that on Scholven about 785 tons of H.E. bombs, including one hundred and fifty-one 4,000-lb. bombs were dropped.

² O.R.S.(B.C.) Nt. Raid Reports. The plant at Homberg was attacked with nearly 750 tons of H.E. bombs, including one hundred and forty 4,000-lb. bombs, that at Bottrop (only four Lancasters took part) with 530 tons, including four 4,000-lb. bombs,

The extent to which these heavy and accurate Bomber Command attacks contributed to the downfall of the German synthetic oil industry will be seen in a later chapter, but here it is, perhaps, appropriate to mention that in the destruction of these formidable installations, the weight of attack was almost as important as its accuracy. Moreover, in causing irreparable damage, the four-thousand-pound high explosive bombs were greatly superior to the smaller weapons. In this respect, the Lancaster, which, in these operations, was habitually armed with a four-thousand-pound bomb in addition to others of smaller size, was at a great advantage by comparison with the Halifax and the American Fortress and Liberator which could carry only the smaller bombs. Thus, with its high proportion of Lancasters and greatly improved accuracy of aim, Bomber Command had the capacity to become a more powerful force in the oil campaign than either the United States Eighth or Fifteenth Air Forces.¹

In August 1944, however, the Bomber Command effort in the oil campaign slackened appreciably. Nevertheless, in that month the prospects of the Bomber Command contribution to the oil and, indeed, the whole air offensive were radically improved. This was partly due, as has already been seen, to the successful break through to the Ruhr in daylight by Halifaxes at the end of the month and the new possibilities which that promised. But it was also due to the beginning of a sudden and dramatic decline in the effectiveness of the German night fighter force which, within a few weeks, entirely changed the conditions of the night offensive.

Bomber Command carried out twelve major night attacks on German targets in August 1944. They involved the despatch of 3,764 sorties among which were fifty-seven flown by Mosquitoes. 141 bombers, all of them Lancasters and Halifaxes, failed to return. Thus, the missing rate of 3·7 per cent was only slightly lower than that sustained in the same kind of attacks during July. But the August operations were more ambitious than those of July and they included four very long-range attacks on two occasions each, against Königsberg and Stettin. Moreover, owing to the rapid advance of the allied armies during the month, the German night fighter force had a smaller area of territory to defend than previously. One result was that the free-lance single-engined 'cat's eye' fighters, which in the months before had operated with such great effect in the neighbourhood of the Pas de Calais, were now frequently encountered over western Germany. The fact that, in these circumstances, the Ger-

and that at Wanne-Eickel with rather under 420 tons, including eleven 4,000-lb. bombs. In all five operations small numbers of incendiary bombs were also dropped.

¹ It should not be forgotten that some versions of the Mosquito could now carry a 4,000-lb. bomb and carry it to Berlin, nor that modified Lancasters could lift 8,000-lb., 12,000-lb. and eventually 22,000-lb. bombs.

mans were getting even slightly less good results than before was highly significant.¹

In itself, it indicated that the rising efficiency of the German night fighter force had been checked, but in view of what happened in September, it showed clearly that an actual and severe decline had set in. Operations in September were admittedly mostly of short penetration, but there were twelve major night attacks on German targets which involved the despatch of 3,188 sorties, including 132 by Mosquitoes, and one by a Lightning. From these operations, sixty-nine Lancasters and Halifaxes and three Mosquitoes, amounting to only 2.4 per cent of the despatched force, failed to return.²

The reasons for the decline of the German night fighter force were complex and manifold and not all of them were due to the events of the spring and summer of 1944. To some extent they must remain obscure until a definitive study of the *Luftwaffe* is undertaken. There were, nevertheless, in the summer of 1944, certain salient developments which undoubtedly had a most important effect. These were

¹ O.R.S.(B.C.) Report and Nt. Raid Reports. The twelve operations were as follows. The figures in brackets refer to Mosquitoes.

Aug.	Target	Despatched	Missing
12/13	Brunswick	379 (0)	27 (0)
"	Rüsselsheim	297 (10)	20 (0)
16/17	Kiel	348 (9)	5 (0)
"	Stettin	461 (0)	5 (0)
18/19	Bremen	289 (7)	1 (0)
"	Sterkrade	234 (14)	2 (0)
25/26	Rüsselsheim	412 (0)	15 (0)
"	Darmstadt	196 (6)	7 (0)
26/27	Kiel	382 (10)	17 (0)
"	Königsberg	174 (0)	4 (0)
29/30	Königsberg	189 (0)	15 (0)
"	Stettin	403 (1)	23 (0)

² O.R.S.(B.C.) Report and Nt. Raid Reports. The operations were as follows. Mosquito figures are in brackets.

Sept.	Target	Despatched	Missing
9/10	München-Gladbach	137 (24)	0
11/12	Darmstadt	240 (14)	12 (0)
12/13	Frankfurt	387 (9)	17 (0)
"	Stuttgart	217 (13)	4 (0)
15/16	Kiel	490 (7)	6 (0)
18/19	Bremerhaven	213 (7)	2 (1)
19/20	München-Gladbach	237 (10)	5 (1)
23/24	Neuss	549 (17)	7 (0)
"	Münster (Canal)	141 (5)	14 (0)
"	Münster (A/F)	113 (5+1)*	1 (0)
26/27	Karlsruhe	237 (11)	2 (0)
27/28	Kaiserslautern	227 (10)	2 (1)

* One Lightning.

the loss of territory, the loss of fuel supplies and the development of radio counter-measures.

The allied break out from the Normandy beach-head and subsequent advance had, by the middle of August, engulfed the most westerly of the German night fighter bases in France. By the end of the month the *Luftwaffe* retained control of only a fraction of its aerodromes and assembly points there. Already the position of those in Belgium and Holland was precarious. Precipitately, the German night fighter bases had to be withdrawn eastwards. At the same time the night fighter controllers lost their early warning installations on the Brest peninsula and along the Calvados coast. Bomber Command was presented with the opportunity of approaching a wide range of German targets at a low level over a great width of friendly territory. Its penetrations of enemy-held territory, therefore, became shorter and less heralded.

These advantageous consequences of the allied advance towards the German frontier were further enhanced, especially in so far as the approach to north German targets across the neck of Denmark was concerned, by ingenious developments in the use of the airborne *Mandrel* screen, which, it will be recollected, was a means of jamming the German radar early warning reception. Behind the screen, the approach of a bomber concentration could be masked, but, on account of its limited size, the area in which the bombers were concentrating could hardly be concealed. Bomber Command, however, devised a means of exploiting this apparent weakness. On nights when no operations of consequence were despatched the *Mandrel* screen was flown and other symptoms of Bomber Command getting airborne were simulated. A special *Window*-dropping force then emerged from behind the screen and, for the benefit of German radar, faked the approach of a bomber concentration. Thus, on several occasions, German night fighters were drawn into the air to oppose attacks which did not exist and, incidentally, to consume petrol which could be ill afforded. Naturally, the German fighter controllers became suspicious, but their suspicion tended to delay their reaction to actual Bomber Command attacks, often until it was too late. Route interception, which had once been so effective, therefore, owing both to the loss of territory and to the *Mandrel-Window* deceptions, became rarer and rarer. The alternative of target interception, as had been the case for a long time, was a poor one, owing to the difficulty of identifying the real objective among the simulated ones. In addition to all this, there was, as has already been mentioned, the acute and growing shortage of petrol and especially aviation petrol.¹

Night air superiority, which was heralded in these ways, not only

¹ O.R.S.(B.C.) Reports.

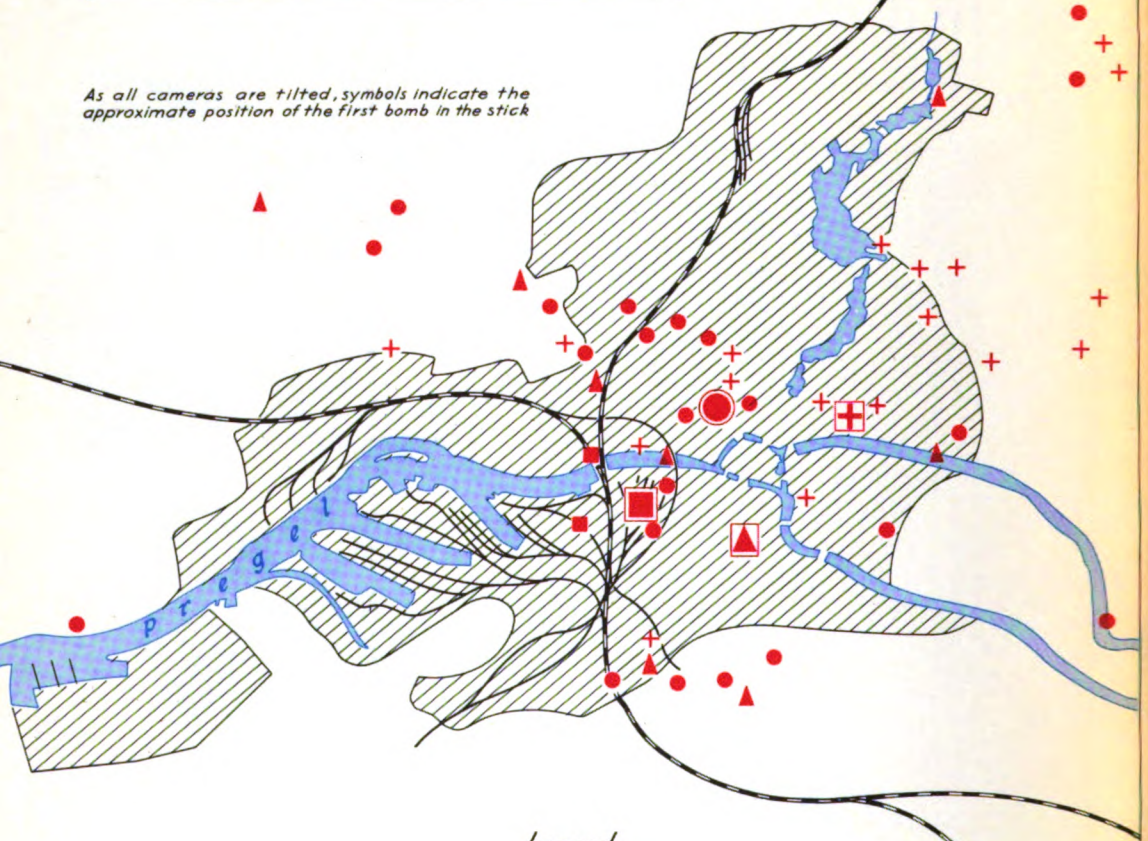
Night Photographs KÖNIGSBERG

29th-30th August 1944

5 GROUP ATTACK



As all cameras are tilted, symbols indicate the approximate position of the first bomb in the stick



Legend

- NORTH WESTERN AIMING POINT ●
- EASTERN " " ⊕
- SOUTHERN " " ▲
- MARKING POINT ■
- TOWN AREA ▨
- ATTACKING AIRCRAFT ●
- " " ⊕
- " " ▲
- MARKER " ■

Nº OF A/C REPORTING ATTACK	PHOTOGRAPHS RECEIVED	Not taken with BOMBING and FAILURES	SMOKE and CLOUD	FIRE PHOTOS	PHOTOGRAPHS PLOTTED BY GROUND DETAIL				% IF FIRE PHOTOS ADDED	
					TOTAL	SHOWING TARGET AREA	NOT SHOWING TARGET AREA	UNPLOTTABLE		
161	132	16	4	59	53	41	10	2	79%	89%

made the bombing offensive much cheaper but it also made it much more efficient. Fewer of the crews were shot down and, therefore, more of them lived to acquire a high degree of operational experience for which, in training, there could be no adequate substitute. Fewer aircraft were harassed *en route* to their targets and, therefore, more of them got there. Fewer bombing runs were marred by fighter interception and, therefore, more bombs were accurately aimed. Lighter casualties also, of course, led to greater confidence both in the commanders who directed the attacks and in the crews who carried them out. Air superiority thus added new powers to Bomber Command and, perhaps, above all, it released the whole latent strength of the force which had been maturing over the years. For Bomber Command this was a triumph. For Germany it was an irretrievable disaster.

Air superiority was, of course, the absolute and constant guarantee of nothing and night bombing still suffered its set-backs and produced its disappointments. The 5 Group attack on Darmstadt on the night of 25th August, for example, was an almost total failure. The target was to have been marked by the low-level visual technique, but the plan was vitiated by a series of misfortunes. The master bomber was forced to return early by an electrical defect in his aircraft and both the deputy master bombers were shot down before they reached the target. The initial flares fell somewhat to the west of the target and in the absence of any directions it was impossible for the low-level Mosquitoes to drop their markers. The bombing force, therefore, had to aim visually or by radar. Thirteen crews preferred to join the simultaneous and much more successful attack on Rüsselsheim. Nineteen others bombed alternative targets. Only four or five crews got their bombs on to the target at Darmstadt and about twenty-five more got them within three miles of it. The original force had consisted of 190 Lancasters and six Mosquitoes.¹

This sort of experience, which had once been so common, was now, however, extremely rare. Four nights later, on 29th August, the 5 Group attack on Königsberg provided an impressive demonstration of the more general rule. In this operation considerable difficulties were encountered. The target lay at very long range and, therefore, called for a particularly high standard of navigation.² A low approach across the North Sea behind the *Mandrel* screen concealed Bomber Command's intentions until the 5 Group Lancasters had crossed the Danish coast, but there was still a great distance to run before Königsberg was reached. All the way from near the Danish

¹ O.R.S.(B.C.) Nt. Raid Report.

² See Map 4.

coast the Lancasters were accurately plotted by German radar and considerable numbers of night fighters were brought into action. The burden of their attacks fell upon a second force of Lancasters from the Pathfinder Force and 1, 3 and 6 Groups which, curiously enough, was following the 5 Group force an hour later and heading by a similar route for Stettin. Nevertheless, the 5 Group Lancasters ran into stiff fighter opposition over Königsberg itself. Moreover, large amounts of cloud at the target complicated the visual marking and, in fact, delayed the attack for twenty minutes. Eventually, however, all these difficulties were overcome and a brilliant attack was carried out.

From the despatched force of 189 Lancasters, it is certain that not more than 175 attacked the target. Yet this relatively small number of bombers wrought tremendous havoc in Königsberg. Forty-one per cent of all the buildings and twenty per cent of the industrial buildings in the town were seen to be seriously damaged. On the basis of photographic reconnaissance it appeared that 134,000 people had been made homeless and that another 61,000 had had their homes damaged.¹ Results of this kind against so distant a target would hardly have been achieved a year earlier by 1,000 bombers. Such was the developing power of area attack produced by greater marking and bombing accuracy. Major results could now be achieved by minor forces, but at the same time the crumbling German air defences made it possible once more to contemplate the use of major forces. When that was done, as will be seen in due course, the results were to be catastrophic.

The success of area attacks, like the one against Königsberg which has just been mentioned, did not depend upon the introduction of new weapons. In the Königsberg operation the attacking force dropped about 135 tons of high explosive and about 345 tons of incendiary bombs. The fire-raising technique, introduced in 1941, was still the standard procedure of Bomber Command in area attacks and the principal means of achieving it was still the four-pound incendiary bomb. This weapon, though now dropped in ingeniously designed clusters with a reasonable ballistic performance, was essentially the same as that with which Bomber Command had begun the campaign against German cities.² The greatly increased area

¹ O.R.S.(B.C.) Nt. Raid Report. For the night photographic plot see Map 5. The damage at Stettin was not so severe, but it seemed that 34,000 people had been made homeless. In addition, three merchant vessels were sunk in the port. These targets were selected with a view to the disruption of German communications with the Russian front. This was the second attack on Königsberg within a week. Stettin had also been bombed on the night of 16th August.

² A.H.B. Monograph. A thirty-pound liquid-filled incendiary weapon known as the 'J' bomb was operationally introduced in the 5 Group attack on Brunswick on the night of 22nd April 1944. It was not a success and Sir Arthur Harris later heard after its further use that the Germans were picking up large numbers of duds and using the fuel in their M.T. vehicles.

bombing efficiency was produced by the high standards of accuracy which had been achieved as a result of the new techniques, such as 5 Group visual marking and the introduction or more widespread use of equipment, such as the Very High Frequency Radio Telephone, which made those techniques possible. The result was that the distinction between area and precision bombing was no longer so much one between the accuracy of attack, as the object of attack.

Nevertheless, this development of bombing accuracy, which made Bomber Command so much more efficient in the use of its accustomed weapons against its accustomed targets, had also, in conjunction with the introduction of new bombs, brought a whole range of new targets within the scope of its destructive power. The 12,000-lb. earthquake bomb, known as the *Tallboy*, which, like the extraordinary rotating bomb of the Dams raid, was a product of the genius of Mr. B. N. Wallis, had been operationally introduced by 617 Squadron in June 1944. Its first use was in the brilliant attack on the Saumur railway tunnel on the night of 8th June when nineteen of these formidable weapons were aimed with the stabilised automatic bomb-sight at marking laid down by Wing Commander Cheshire. At least one direct hit was secured on the roof of the tunnel which fell in. Hits were also achieved on the cutting by which the tunnel was approached and the Germans never succeeded in clearing the line afterwards.

This success was followed by a series of brilliant feats of destruction by 617 Squadron with *Tallboys* against a number of singularly robust targets including the concrete protected submarine pens at Brest, Lorient, St. Nazaire and La Pallice, the E-boat bases at Le Havre and Boulogne and the V-weapon constructional sites at Watten, Wizernes and Siracourt. On the night of 23rd September 1944 eleven Lancasters of 617 Squadron, led by Wing Commander J. B. Tait, who, on 12th July, had succeeded Wing Commander Cheshire, took off for the Dortmund-Ems Canal aqueduct near Münster with *Tallboy* bombs. They were accompanied by another 125 Lancasters of 5 Group carrying smaller bombs and by five Mosquitoes to do the marking. The object was to breach the banks of the canal, which at this point was raised above the level of the surrounding country, and to drain it.¹

In order to achieve the penetration, upon which their earthquake action depended, *Tallboys* had to be dropped from at least and preferably more than eight thousand feet. The conditions of the attack

¹ W. J. Lawrence: *No. 5 Bomber Group R.A.F.*, pp. 191-198, and O.R.B. (617 Sqdn.). The *Tallboy* is generally described as a 12,000-lb. bomb, but in the 617 Squadron O.R.B. for 8th June 1944, which is presumably the source referred to by Mr. Lawrence on pp. 191-192, it is entered as a 14,000-lb. bomb. Actually the *Tallboy* was a scaled-down version of the much bigger bomb weighing 22,000 lb. which eventually came into service in very small numbers as the *Grand Slam*.

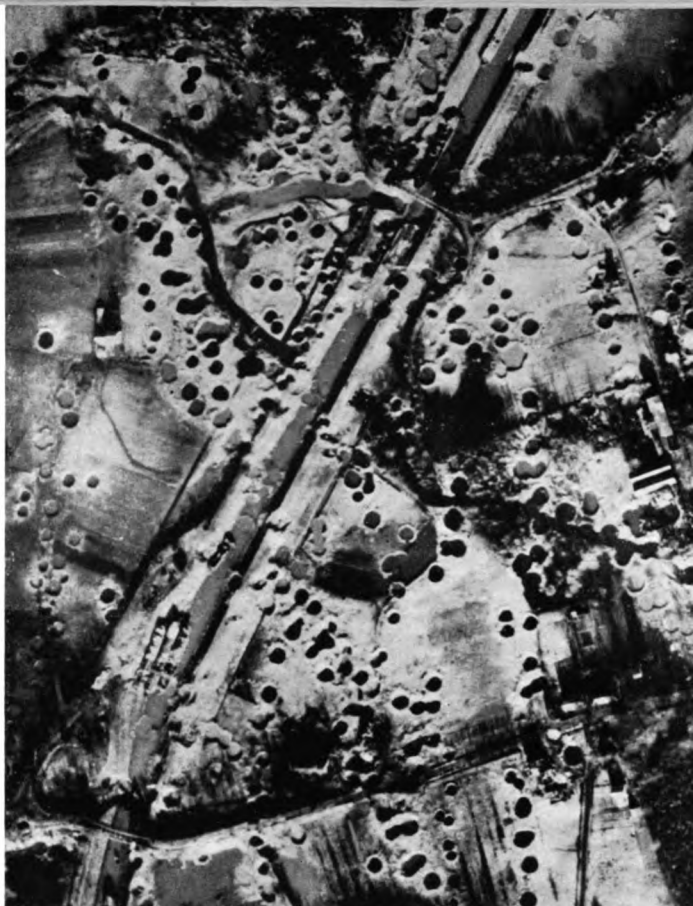
were, therefore, made very difficult by the fact that the target was covered by seven-tenths strato-cumulus cloud at eight to nine thousand feet. Some crews aimed their *Tallboys* at the glow of the markers which could be seen through the cloud and others came down below the cloud level and bombed from about eight thousand feet. Wing Commander Tait's bomb aimer released his *Tallboy* from seven thousand five hundred feet. The result of the attack, nevertheless, was a complete success. Both the east and the west branches of the canal at the Glane by-pass were breached. A section of the canal amounting to six and a half miles in length was drained and daylight photographs showed that twenty-one barges were stranded in it.¹ A further twelve stranded barges were photographed in a stretch of two thousand yards of the canal to the north of the by-pass. Outstanding as this achievement was, it cannot really be compared to the feats which had more than a year earlier resulted in the breaching of the Möhne and Eder dams. There was, however, one notable respect in which the Dortmund-Ems Canal attack was more effective. When it was over, Bomber Command stood ready to destroy the banks again when the Germans had repaired them and this, in fact, was to be done, not once but several times.²

Thus, by the autumn of 1944, Bomber Command had developed a paralysing power of attack which, in all but the most exceptional circumstances, could accurately be brought to bear by day and by night against targets large and small and near and far. Nor was there much that the German air defences could any longer do to disrupt or disperse the operations of Bomber Command. Strategic bombing, of course, still had its limitations. Some kinds of weather could defeat the most ingenious plans and the most advanced equipment and some targets proved to be substantially invulnerable even to the most powerful bombs. Nevertheless, Bomber Command in conjunction with the United States Strategic Air Forces now, for the first time in the war, had the operational capacity for decisive action and, in the remaining months of the strategic air offensive, that undoubtedly is what was achieved.

¹ For the canal before and after this attack see the photograph following p. 166.

² *No. 5 Bomber Group*, pp. 235-240, O.R.S.(B.C.) Nt. Raid Report and O.R.B. (617 Sqn.) 23rd September 1944.

13. The Gravenhorst section of the Mittelland Canal after attack on the night of 21st November 1944.

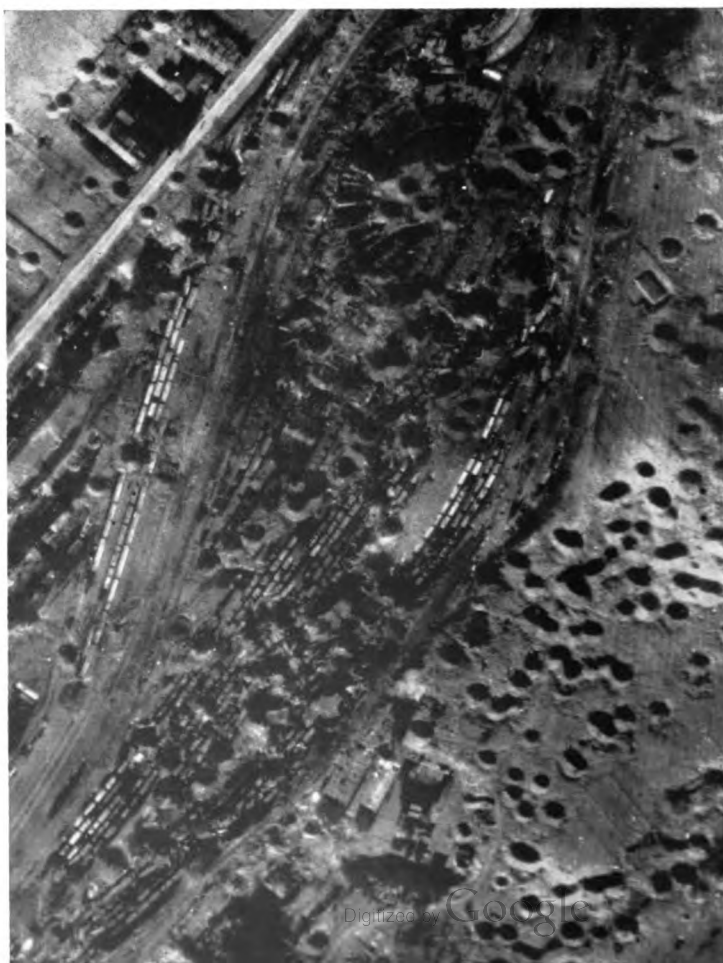


14. The Gravenhorst section of the Mittelland Canal two weeks after the attack on the night of 1st January 1945.





15. The Ladbergen section of the Dortmund-Ems Canal after the Bomber Command attack on 1st January 1945. This shows the western portion of the canal.



16. Marshalling yards at Giessen after attacks in December 1944 by Bomber Command and the United States 8th Air Force.

4. The operational climax October 1944–May 1945

Operations between October 1944 and May 1945 were the climax of the strategic air offensive. The Bomber Command part in them represented the realisation of most of the hopes and ambitions which had inspired the British Air Staff for a quarter of a century. This, from the point of view of what was achieved, was by far the most spectacular period in the history of Bomber Command, but, from the point of view of the operations themselves, it was, perhaps, the least interesting. The success of these final operations was the logical and almost inevitable crowning of an edifice whose foundations had by the painful processes of trial and error and of courage and endurance been laid in the past and to a not inconsiderable extent in the recent past. The new foundations laid in this final phase of the offensive were, perhaps, of less significance than appeared at the time because Bomber Command was carrying out its last war-like operations before the revolution of air power produced by the releasing of atomic energy and the application of jet propulsion. Thus, the doctrines of air power, and, indeed, of war altogether, based upon the operational experience of the strategic air offensive against Germany, had a less certain relevance to future possibilities than would otherwise have been the case.

The greatest significance of the final operations of Bomber Command, therefore, lies in the contribution which they made to the unconditional surrender of Germany in May 1945, and this is analysed in the chapter which follows. Here in this section it is intended only to chronicle the operational achievement itself. Among the great victories achieved will be found most of the highlights of the whole offensive including the complete obliteration of a number of oil plants, the widespread destruction of communications, including the constant breaching of the Dortmund-Ems Canal, and the felling of the Bielefeld viaduct, the ultimate despatch keel upwards of the German battleship *Tirpitz* and the vast havoc of the continuing area offensive culminating in the devastation of Dresden. Bomber Command operated in darkness and in daylight, in foul weather and in fair and in strengths varying from that of the whole Command to that of single squadrons. Throughout this variety the tide of success was virtually unchecked. Occasional failures and casualties there inevitably were, but the frustrations and even to a considerable extent the hardships of the past were things of the past.

This virtual operational omnipotence of Bomber Command had, no doubt, in some respects, been delayed by faulty decisions and

deductions in the past, but the limitations of operations in earlier months and years should not be judged in the perspective of the ultimate triumphs. Lord Tedder's observation which is recorded as the first motto for this chapter was afforded a particularly clear reinforcement in advance by Sir Arthur Harris. 'In the last three months of 1944,' he records, 'a greater weight of bombs was dropped than in the whole of 1943.'¹

In these last three months of 1944 Bomber Command, in fact, discharged more than 163,000 tons of bombs by comparison with the 40,000 tons it had dropped in the corresponding period of 1943 and the slightly more than eight thousand tons of the last three months in 1942.² Fifty-three per cent of this enormous effort was devoted to area attacks upon large industrial cities. Fourteen per cent of it was aimed at oil targets, fifteen per cent at railways and canals and thirteen per cent at targets such as enemy troops and fortifications which were directly associated with the land battle. The remaining five per cent was devoted to naval and other objectives.³

The area offensive was spread far and wide over Germany. In the Ruhr area sixteen towns were bombed, many of them several times. In south and south-west Germany eleven towns were bombed and in north and central Germany five more were attacked. The greatest effort was made against Duisburg, Essen, Cologne and Düsseldorf. In the case of Duisburg there were four major operations involving the despatch of some 3,119 sorties and the dropping of nearly thirteen thousand tons of bombs. Within a period of twenty-four hours on 14th October over two thousand sorties were despatched in day and night attacks of roughly equal strength and nearly nine thousand tons of bombs were aimed at Duisburg. Essen was also bombed four times and over 11,500 tons of bombs were aimed at it. Cologne was bombed three times and nearly 9,500 tons of bombs were dropped. In a single attack on Düsseldorf involving the despatch of 992 sorties more than 4,400 tons of bombs were dropped. In smaller attacks on Bochum, Gelsenkirchen, Dortmund, Hagen, Witten, Oberhausen, Neuss, Solingen, Münster, Hamm, Duisburg and Leverkusen about another twenty-two thousand tons of bombs were dropped. Thus, in the last and utterly crushing Battle of the Ruhr between the beginning of October and the end of December 1944, some 14,254 sorties were despatched, 60,830 tons of bombs were dropped and only 136 bombers failed to return. This was a missing rate of less than one per cent of the despatched sorties.⁴

¹ Marshal of the Royal Air Force The Lord Tedder: *Air Power in War*, p. 12, The Lees Knowles Lectures, Air Ministry Pamphlet 235 (1947). *Bomber Offensive*, p. 263.

² See App. 44.

³ These figures should be viewed with reserve, but they do have a comparative value.

⁴ *Bomber Command Quarterly Review*, Oct.-Dec. 1944.

In addition to the remarkable accuracy of these attacks on what were now virtually fringe targets, there was one particular respect in which these operations by day and by night differed from those of the earlier area bombing campaign. A very high proportion of the bombs dropped were of the high-explosive and not as had previously been the case of the incendiary varieties. In the great attacks on Duisburg, Essen, Cologne and Düsseldorf, for example, about eighty-five per cent of the total tonnage dropped consisted of high-explosive bombs. This, as Sir Arthur Harris has explained, was because much of the inflammable elements in these Ruhr towns had already been burnt in earlier incendiary attacks and with their devastated wildernesses they had become decreasingly profitable objectives for fire-raising attacks.¹ It was this high proportion of high-explosive bombs which accounted for the scenes of almost incredible destruction in these towns. They, however, are more easily judged from photographs than from descriptions.

Elsewhere in Germany the weight of the area offensive was brought to bear in the south and south-west on Ulm, Stuttgart, Karlsruhe, Heilbronn, Freiburg, Ludwigshafen, Saarbrücken, Nuremberg, Munich, Bonn and Coblenz. In north and central Germany attacks were made on Bremen, Wilhelmshaven, Brunswick, Osnabrück and Giessen. These operations were, however, on an altogether smaller scale than those against the Ruhr towns. The largest individual attack was against Stuttgart on the night of 19th October when a force of 583 aircraft was despatched and nearly 2,500 tons of bombs were dropped. On this occasion the incendiaries accounted for rather more than a third of the total weight of bombs, but in many of the other attacks on less severely damaged targets much higher proportions were represented by incendiaries. In the attack on Ulm, for example, on the night of 17th December, 704 tons of incendiaries and 590 tons of high explosives were dropped.²

In these area attacks a great variety of techniques was used by Bomber Command. For example, on the night of 14th October 1944, 1,005 Lancasters, Halifaxes and Mosquitoes from 1, 3, 4 and 6 Groups and the Pathfinder Force were despatched to Duisburg. The force was divided into two waves and between each attack there was an interval of about two hours. In both cases the aiming point was indicated by controlled *Oboe* ground marking. While this was going on another force of 233 Lancasters and seven Mosquitoes from 5 Group was despatched to Brunswick where the aiming point was indicated by the 5 Group visual marking technique. Only a few hours earlier a force of over a thousand Lancasters, Halifaxes and

¹ *Bomber Offensive*, p. 238.

² *Bomber Command Quarterly Review*, Oct.-Dec. 1944.

Mosquitoes had been despatched in daylight to Duisburg. Four days later, as has been mentioned, 3 Group carried out its daylight formation *G-H* attack on Bonn. These examples are characteristic of the area bombing offensive at this time. The casualties sustained on them were also characteristic. From the attacks on the night of 14th October against Duisburg and Brunswick, which involved the despatch of 1,245 sorties, seven bombers failed to return. From the daylight attack on Duisburg, involving the despatch of 1,063 bombers, fourteen failed to return. From the *G-H* operation against Bonn, on which 128 Lancasters were despatched, one failed to return. In all cases highly accurate and concentrated attacks were delivered.¹

The controversial oil plan was largely neglected by Bomber Command in October, but a much increased effort was devoted to it in November and over the whole period of the last quarter of 1944, Bomber Command carried out twenty-seven heavy bomber attacks upon fifteen oil plants. Some 5,194 sorties were despatched on these operations, fifty-seven bombers failed to return and about 23,000 tons of bombs were aimed at the targets.²

Nineteen of the operations were carried out in daylight with fighter cover and, though the flak damage was often considerable, the German fighter force offered little or no resistance. The weather, however, as was to be expected at the end of the year, was often bad, and, when, as in the attack on 9th November against Wanne-Eickel, a ground marking technique was used, the bombing tended to be scattered because cloud obscured the aiming point. Sky marking was not accurate enough for the precise bombing which was needed to hit an oil plant, and it was in these circumstances that the real value of the 3 Group *G-H* formation was demonstrated. 3 Group Lancasters, forming in 'vics' of three and bombing on *G-H*, did, indeed,

¹ O.R.S.(B.C.) Nt. Raid Report and Bomber Cmd. O.R.B. Oct. 1944.

² *Bomber Command Quarterly Review*, Oct.-Dec. 1944, and Bomber Command Interception/Tactics Reports Oct.-Dec. 1944. The twenty-seven operations with the numbers of aircraft despatched and missing were as follows:

DAY

6th Oct. Scholven-Buer (161—6), Sterkrade-Holten (159—3), 12th Oct. Wanne-Eickel (147—1), 25th Oct. Homberg-Meerbeck (243—0), 30th Oct. Wesseling (102—0), 31st Oct. Bottrop-Welheim (Bergius) (101—1), 1st Nov. Homberg-Meerbeck (242—1), 2nd Nov. Ditto (184—4), 8th Nov. Ditto (134—1), 9th Nov. Wanne-Eickel (277—2), 11th Nov. Castrop Rauxel (122—0), 15th Nov. Dortmund (177—2), 20th Nov. Homberg-Meerbeck (183—5), 21st Nov. Ditto (160—2), 23rd Nov. Nordstern (168—1), 30th Nov. Osterfeld (60—2), 30th Nov. Bottrop-Welheim (Benzol) (60—0), 2nd Dec. Dortmund (Benzol) (93—0), 11th Dec. Osterfeld (52—1).

NIGHT

11/12th Nov. Dortmund (228—0), 11/12th Nov. Harburg (245—7), 18/19th Nov. Wanne-Eickel (309—1), 21/22nd Nov. Castrop Rauxel (273—4), 21/22nd Nov. Sterkrade-Holten (270—2), 6/7th Dec. Leuna (497—4), 21/22nd Dec. Pölitz (207—3), 29/30th Dec. Scholven-Buer (337—4). In addition, as had been the case in earlier months, an independent Mosquito offensive against oil plants was maintained.

execute a number of highly accurate attacks and often, to the dismay of the Germans, the bombs found their mark after falling through ten-tenths cloud. A spectacular example of this was provided by the 3 Group attack on 31st October when the target was the hydrogenation oil plant at Bottrop-Welheim. Though the target was completely covered by thick cloud, the 3 Group Lancasters executed an accurate and concentrated attack from between 15,000 and 19,500 feet.¹ Thus, Bomber Command was able to maintain an accurate and effective attack upon oil targets of short penetration even when the weather was quite unsuitable for visual bombing or ground marking.²

The eight heavy bomber attacks on oil plants at night, like all the day attacks, were mostly against targets in the Ruhr area. Also like the day attacks, they generally achieved a high degree of success at the cost of only a very low missing rate. There were, however, two operations which called for the tactics of deep penetration bombing. These were against the oil plants at Leuna on the night of 6th December and Pölitz on that of 21st December. On the first occasion the Pathfinder Force led an attack by Lancasters and Halifaxes from 1, 4 and 6 Groups. The *Newhaven* marking was well placed, but nine- to ten-tenths cloud extending up to 10,000 and in places to 14,000 feet caused the bombing force considerable difficulties. Nevertheless, on the evidence of photographic reconnaissance, it appeared that considerable damage had been done to this important installation. The operation against Pölitz was carried out by a smaller force from 5 Group. Though the weather was clear at the target the marking did not fall quite as intended. The plant was hit but it seemed unlikely on the evidence available at the time that it had suffered serious damage on this occasion. Shorter range bombing was still more consistently accurate than that at long range. A month earlier, for example, on the night of 21st November, the Pathfinder Force led a controlled *Oboe* ground marking attack on the oil plant at Castrop Rauxel by Lancasters from 1 and 6 Groups. Both marking and bombing must have been accurate and concentrated for 'extremely severe damage' was seen to have been caused throughout the plant. Almost every individual building was

¹ For the result of this attack see the photograph facing p. 167.

² Bomber Command Interception/Tactics Reports and Photographic Interpretation Reports for Oct., Nov. and Dec. 1944. The bombing of oil plants by Bomber Command and the Eighth Air Force was more frequent than the photographic reconnaissance of them. It was, therefore, not possible to make reliable and detailed estimates of the results of individual attacks. This difficulty, at the time, caused some doubts about the priorities for attack and re-attack. It has to be remembered that though 3 Group could now bomb accurately through the overcast, the Photographic Reconnaissance Unit could not take pictures through it. Incidentally, 3 Group was at times the only element of allied air power which could operate in support of the armies during the bad weather at the time of the Ardennes counter-offensive.

shown to have been hit when the photographic reconnaissance picture was developed.¹

In the chapter which follows, it will be seen how the Anglo-American bombing offensive against oil plants contributed to the ultimate downfall of Germany. In this joint offensive, the very heavy, and generally accurate, Bomber Command contribution was a vital and, perhaps, even a decisive element. But even these attacks, though they may have been the most important, were by no means the most spectacular which Bomber Command carried out in the last three months of 1944.

The Dortmund–Ems Canal, it will be remembered, had been successfully breached by Bomber Command on the night of 23rd September 1944. But the Germans reacted to the disaster with something like the same vigour which had characterised their repair work on the Möhne Dam after the 617 Squadron attack in May 1943. Their efforts in the autumn of 1944 were, however, to be less rewarding, though not less necessary. The Dortmund–Ems Canal is a somewhat misleading name, for the channel was more than merely a link between Dortmund and Emden. Through a junction with the Mittelland Canal near Rheine, it in fact carried a great part of the inland water traffic between the Ruhr and many other industrial towns. Thus, after the breach of 23rd September 1944, radical repair action was put in hand. But through the eyes of air power these activities were carefully watched and noted at High Wycombe. On the night of 4th November 5 Group revisited the Ladbergen stretch of the canal and aimed more than 930 tons of bombs at it. The canal was once again breached and some of its important installations were devastated. Another watching period followed and an even more devastating attack was made by a somewhat smaller force, again from 5 Group, on the night of 21st November, while, on the same night, another 5 Group force gave the same treatment to the Mittelland Canal at Gravenhorst.² Throughout December the Germans worked vigorously to make good the damage, but on 1st January 1945 their endeavours were once more utterly wrecked. Flying in daylight to the Dortmund–Ems Canal and at night to the Mittelland Canal 5 Group drained both for the fourth and second time respectively.³ It may be doubted whether the accuracy, regularity and effectiveness of these brilliant operations had ever, in combination,

¹ O.R.S.(B.C.) Nt. Raid Reports and Immediate Interpretation Report, 8th Dec. 1944 (covering also the Bomber Command attack on 11th Nov.). In the attack on Castrop Rauxel some 960 tons of bombs were dropped. Eight tons of incendiaries and nine 4,000-lb. H.E. bombs were included in the load. In many attacks a higher proportion of 4,000-lb. bombs was dropped. In the Leuna operation, for example, when the total tonnage dropped was 1,847, there were three hundred and sixty 4,000-lb. bombs in it.

² For the results of this Gravenhorst attack see the photograph facing p. 182.

³ For the results of these attacks see the photographs facing pp. 182 and 183.

been approached by any air force in the previous history of bombing. Moreover, in spite of their repetitive nature and the often low level from which the attacks were delivered, the casualties were comparatively light. Finally, the results showed that, even if it was still supreme, 617 Squadron had now to acknowledge its rivals. The Dam Busters, after their contribution to the September attack, took no part in these canal operations.¹

In addition to these operations against canals, which formed an important part of the transport system of Germany, Bomber Command made many attacks in the last three months of 1944 which were specifically aimed at another aspect of the same target system, namely railway centres. These railway operations, in which, as was the case with the oil plan, the United States Strategic Air Forces played an important part, were partly designed to hamper German military movement in the battle area, but they also inevitably produced far-reaching effects upon the whole of the German economy and especially upon the import and export of raw materials and finished products from and to the Ruhr industries. They were, therefore, again like the oil campaign, a fundamental part of the strategic air offensive.

There is always a difficulty in making functional distinctions about the Bomber Command effort. Apart from the fact, which has been noticed before, that so-called strategic bombing often became confused with so-called tactical bombing especially at this stage of the war, there was also great difficulty in distinguishing between the efforts devoted to various different target systems. For example, in area attacks upon towns in the Ruhr, which were recorded under the heading of industrial areas, substantial damage was sometimes done to benzol plants which, of course, belonged to the oil plan. In addition much other important industrial damage was done. Even more so was this the case with the communications plan. It was impossible to make an effective attack on any town area without doing damage to communications and very probably to railways. Similarly it was very difficult to attack a large railway centre without

¹ *Bomber Command Quarterly Review*, Oct.-Dec. 1944, O.R.S.(B.C.) Nt. Raid Reports and Bomber Cmd. O.R.B. 1945.

The forces involved were as follows:

Target	Date	Despatched	Missing	Tonnage of bombs aimed at target
Dortmund-Ems	4/5 Nov.	176	3	930
"	21/22 Nov.	128	0	629
"	1st Jan.	104	2	593
Mittelland	6/7 Nov.	235	10	Abortive
"	21/22 Nov.	143	2	613
"	1/2 Jan.	157	0	716

doing damage to a town. This, indeed, as will be remembered, had been one of the objections to the French railway plan. But in France it had been intended to damage only the railways and not the towns. In Germany it was intended to devastate both, and, in fact, the forces carrying out the German communications campaign were generally given two aiming points when bombing railways. One was the railway centre and the other was the town centre. The devastation of the town contributed to the difficulty of repairing the railways. It was only when the target was relatively isolated, as had been the case in the canal operations and was presently to be in that of the Bielefeld Viaduct, that 'pure' communications bombing could be recognised. The same considerations applied to most other target systems, but in no case more so than in that of communications bombing. It would, therefore, be entirely misleading to judge the Bomber Command effort against communications by the statistics recorded under that heading. Naturally, however, a railway centre tended to suffer more heavily when it was an aiming point than when it was not.

An impressive example of this was provided by the 5 Group attack on Giessen on the night of 6th December 1944. 255 Lancasters and ten Mosquitoes made a joint attack upon the railway centre and the town itself. In both cases the *Newhaven* marking was extremely accurate and the bombing was highly concentrated around the two aiming points.¹ The railway centre, as can be seen in the photograph opposite page 183, was left in a parlous condition though not all the damage was due to this particular attack.² Though this attack on Giessen was an outstanding success it was by no means an unusual one, either for 5 Group or for Pathfinder Force led operations. The results of two attacks against the railway centres at Bingen and Cologne-Nippes on the nights of 22nd and 24th December are typical examples of the extremely high degree of accuracy and concentration which was now normally achieved by Bomber Command at night in the course of routine operations. On the first occasion a force of ninety Halifaxes from 4 Group was led into action by two Mosquitoes and fourteen Lancasters from the Pathfinder Force. In the Nippes operation eighty-one Lancasters from 1 Group were led by five Mosquitoes and sixteen Lancasters from the Pathfinder Force. In both cases the controlled *Oboe* marking accurately focused the

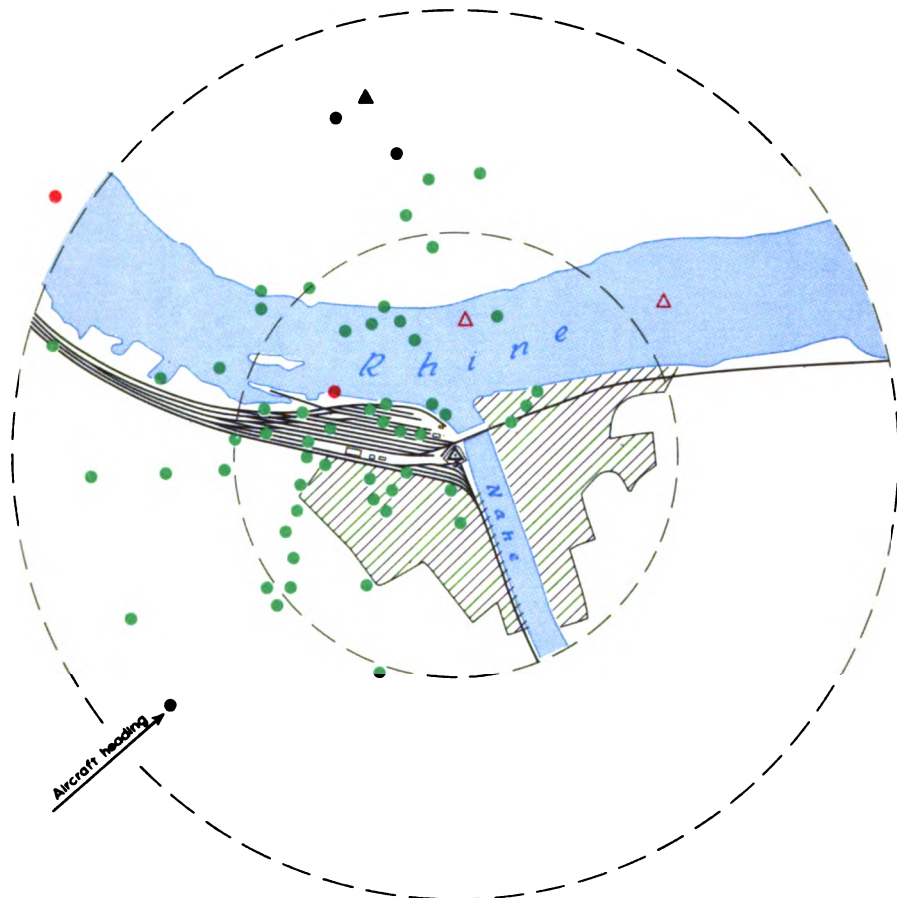
¹ 5 Group now seldom used the technique of offset marking which, owing to the time which had to be spent in the target area, was evidently judged to involve more danger than could generally be justified by the standard of bombing accuracy required against most German targets.

² Of the Lancasters in the attack, eighty-seven were detailed for the town centre and 168 for the railway centre. The photograph opposite p. 183 was taken on 24th December 1944 and showed damage caused by three separate attacks to which the Eighth Air Force contributed.

Night Photographs

BINGEN(BINGERBRÜCK) RAILWAY CENTRE

22nd-23rd December 1944



Legend

- BLIND SKY MARKER ▲
- VISUAL CENTRE △
- SUPPORTER ●
- 4 GROUP ●
- AIMING POINT ▲
- TOWN AREA ▨

Circles in broken lines show distance in 1000 Yards from Aiming Point

	NO OF A/C REPORTING ATTACK	PHOTOGRAPHS RECEIVED	Not taken with BOMBING and FAILURES	SMOKE and CLOUD	FIRE PHOTOS	PHOTOGRAPHS PLOTTED BY GROUND DETAIL			% IF FIRE PHOTOS ADDED	
						TOTAL	SHOWING TARGET AREA	NOT SHOWING TARGET AREA		% SHOWING TARGET AREA
PATH FINDER FORCE	13	11	1	—	4	6	5	1	82%	90%
4 GROUP	87	75	1	—	6	66	59	7	89%	90%
TOTAL	100	86	2		12	72	64	8	89%	90%

bombing which, in these cases, consisted almost exclusively of high explosives. Though both attacks were highly successful, the superiority of the Lancaster over the Halifax was graphically demonstrated by the fact that the seventy-eight 1 Group Lancasters which bombed Nippes railway centre dropped 483 tons of bombs whereas the eighty 4 Group Halifaxes which bombed Bingen dropped 272 tons of bombs.¹

These operations against railway targets were not, however, confined to night action. 3 Group Lancasters, using the *G-H* formation technique, often from above continuous cloud, also made an important and effective contribution. Among the many marshalling yards attacked in this way were those at Fulda, Duisburg, Osterfeld and Siegen.² Undoubtedly, however, the most famous and in some respects the most remarkable daylight operation in this period was that which resulted in the destruction of the German battleship *Tirpitz* by a small force of Lancasters.

Between three and half past three in the morning on 12th November 1944, thirty-one Lancasters of 617 and 9 Squadrons, armed with *Tallboy* bombs and accompanied by another Lancaster of 463 Squadron carrying a film camera, took off from Lossiemouth in Scotland. About seven hours later the 45,000 ton German battleship *Tirpitz*, already little more than a hulk, rolled over and dug her superstructure into the mud at the bottom of Tromsø fjord in Norway. The utter destruction of what had once been among the most powerful fighting ships in the world by two squadrons of heavy bombers was the climax of a long and controversial struggle between the aeroplane and the capital ship.³

This was a struggle which had its origins in the daring exploits of General Mitchell long before the war and with which, for Bomber Command, the Second World War had inauspiciously begun at Wilhelmshaven. By November 1944, it embraced the calamitous American experience at Pearl Harbour, the British loss of the *Prince of Wales* and *Repulse* and, on the other hand, the long and trying attempts to dispose of the *Scharnhorst*, *Gneisenau* and *Prinz Eugen*. It also included a series of air attacks on the *Tirpitz* herself.

Launched at Wilhelmshaven on 1st April 1939, the *Tirpitz* as an actual fighting ship had been more an anxiety to the British than an asset to the Germans. By the time of her destruction she had, indeed, carried out only a single warlike operation and that had amounted to no more than a raid against the island of Spitzbergen in September 1943 when the opposition was negligible and, incidentally,

¹ O.R.S.(B.C.) Nt. Raid Reports, Bomber Cmd. O.R.B. July-Dec. 1944, and Dec. 1944. For the night photograph plots see Maps 6 and 7.

² Bomber Cmd. O.R.B. July-Dec. 1944.

³ O.R.B. (617 and 9 Sqdns.), 12th Nov. 1944. See Map 8.

the White Ensign was flown.¹ Even so, the possibilities of this great, powerful and fast battleship were much greater than her actual achievements. She might have broken out into the Atlantic to prey upon convoys there or she might have fallen upon allied shipping making the already desperate passage to Russia. She was a fleet in being and by her very existence she demanded the presence in northern waters of at least one fast battleship and one Fleet carrier of the Royal Navy. Even with this counter there could be no assurance of bringing her to action either promptly or without grievous loss.² The naval and air action with the attendant loss of H.M.S. *Hood* which resulted in the destruction of the *Bismarck*, a sister of the *Tirpitz*, was enough to show the potential danger of the latter. Obviously then the existence of the *Tirpitz* was something which the British could not afford to ignore and it was something which the Prime Minister found it hard to tolerate. The problem was to find a means of destroying or at least of immobilising the *Tirpitz* while she lay at one of her Norwegian moorings. It was, Mr. Churchill said at the beginning of 1943, 'a terrible thing that this prize should be waiting, and no one able to think of a way of winning it.'³

Such was the prize which Bomber Command did win on 12th November 1944, but it was not for lack of trying nor for the lack of outstanding gallantry that it was not won earlier either by the Royal Air Force or the Royal Navy. On one of her rare voyages in March 1942, the *Tirpitz* had been inconclusively attacked by carrier-borne aircraft of the Fleet Air Arm. In July she had been intercepted and attacked by a Russian submarine but, as will be recalled, the plan to strike at her with a smaller version of the Wallis dams bomb had come to nothing. Reporting in March 1943, when the *Tirpitz* was lying in Trondheim fjord, Sir Arthur Harris was far from optimistic about what Bomber Command could do to her. The difficulty of reaching Trondheim at all was considerable and would probably mean taking off from Scotland and landing in Russia. Moreover, even if the ship could be reached, there would be a formidable sighting problem because the Norwegian fjords were often covered with dense cloud and, in any case, the *Tirpitz* could be rapidly and completely enveloped in a smoke screen.⁴ There was also the question of whether any kind of bomb then available would do much damage to such a formidable target and the Air Staff showed little enthusiasm for a Bomber Command attack until some special weapon had been perfected and introduced.⁵

¹ R.A.F. Story of attacks on *Tirpitz*.

² Report by J.P.S., 23rd Aug. 1944.

³ Min. Churchill to Portal and others, 16th Feb. 1943.

⁴ Letter and enclosure Harris to Brockman (Secretary to First Sea Lord), 21st March 1943.

⁵ Mins. and Letters, April and May 1943.

Meanwhile, the Admiralty was working up a series of midget submarines and in September 1943 these strange and forbidding craft were used by the Royal Navy in a very gallant and by no means ineffective attack on the *Tirpitz*. Extensive damage was done and the battleship had to lie up in Alten fjord undergoing repairs for some months. By March 1944, however, the Admiralty once more had to assume that the *Tirpitz* was ready to put to sea and further attacks were launched, this time with good results, by carrier-borne aircraft of the Fleet Air Arm. By the end of the summer, however, Air Staff plans for what were to be the final blows were maturing. While the *Tirpitz* remained in Alten fjord she was beyond the range of Lancasters flying from and back to British bases, but now that *Tallboy* bombs were available, it was resolved that she should be reached by Bomber Command. Arrangements were made with the Russians for 617 and 9 Squadrons to use the base at Yagodnik in Archangel.

These arrangements were most complicated. Plans had to be made to accommodate the ground and air crews in Russia, and for the servicing of the British aircraft while they were there. Understandings had to be attempted about recognition signals, radio frequencies and flying control procedures. Sixty thousand gallons of hundred octane petrol had to be found at Yagodnik and, in addition, five hundred gallons of oil and fifteen of glycol were needed. Eventually, as it turned out, a bill for 9,239 roubles, which had been incurred by the Russians in the entertainment of their allies, had to be paid, and to all these difficulties others were added by last-minute changes of plan.¹

In the event there was much confusion, and to make matters worse the weather in Archangel when the British aircraft reached it was appalling. From the thirty-eight Lancasters of 617 and 9 Squadrons which embarked on their transcontinental expedition on the evening of 11th September 1944, one had to return early to its English base because its *Tallboy* bomb came adrift and had to be jettisoned, six more were forced to make crash landings in Russia and had to be abandoned and two arrived so badly damaged that they were unfit for operations.² Nevertheless, a wonderful feat of organisation, which included the flying to Yagodnik not only of the operational aircraft and crews, but of the ground crews in two Liberators, a Mosquito for weather reconnaissance and a Lancaster of the film unit, was achieved, and on 15th September twenty-eight Lancasters set off from Yagodnik to attack the *Tirpitz* in Alten fjord.

Earlier the Mosquito surveyed the weather there and came back

¹ Messages between 30 Mission (Russia) and Air Ministry, Sept., Oct. 1944. The original plan was to attack the *Tirpitz*, not as was actually done from Yagodnik, but on the way to it. 5 Group Operation Order, 7th Sept. 1944.

² These aircraft and the equipment they carried were, no doubt, not unwelcome to the Soviet Air Force.

with a favourable report. The question was, however, whether the Lancasters could get over the battleship before she hid herself in a smoke screen, and whether any last-moment change in the weather would blow cloud over her. The attacking force was divided into two sections. In the first, there were twenty-one Lancasters each armed with a *Tallboy* bomb, and in the second there were six Lancasters each armed with a number of the much smaller so-called *Johnny Walker* anti-shiping bombs. The remaining Lancaster which came from 463 Squadron was there to film the proceedings. Seventeen of the bombing Lancasters, led by Wing Commander J. B. Tait, came from 617 Squadron and ten, led by Wing Commander J. M. Bazin, from 9 Squadron.

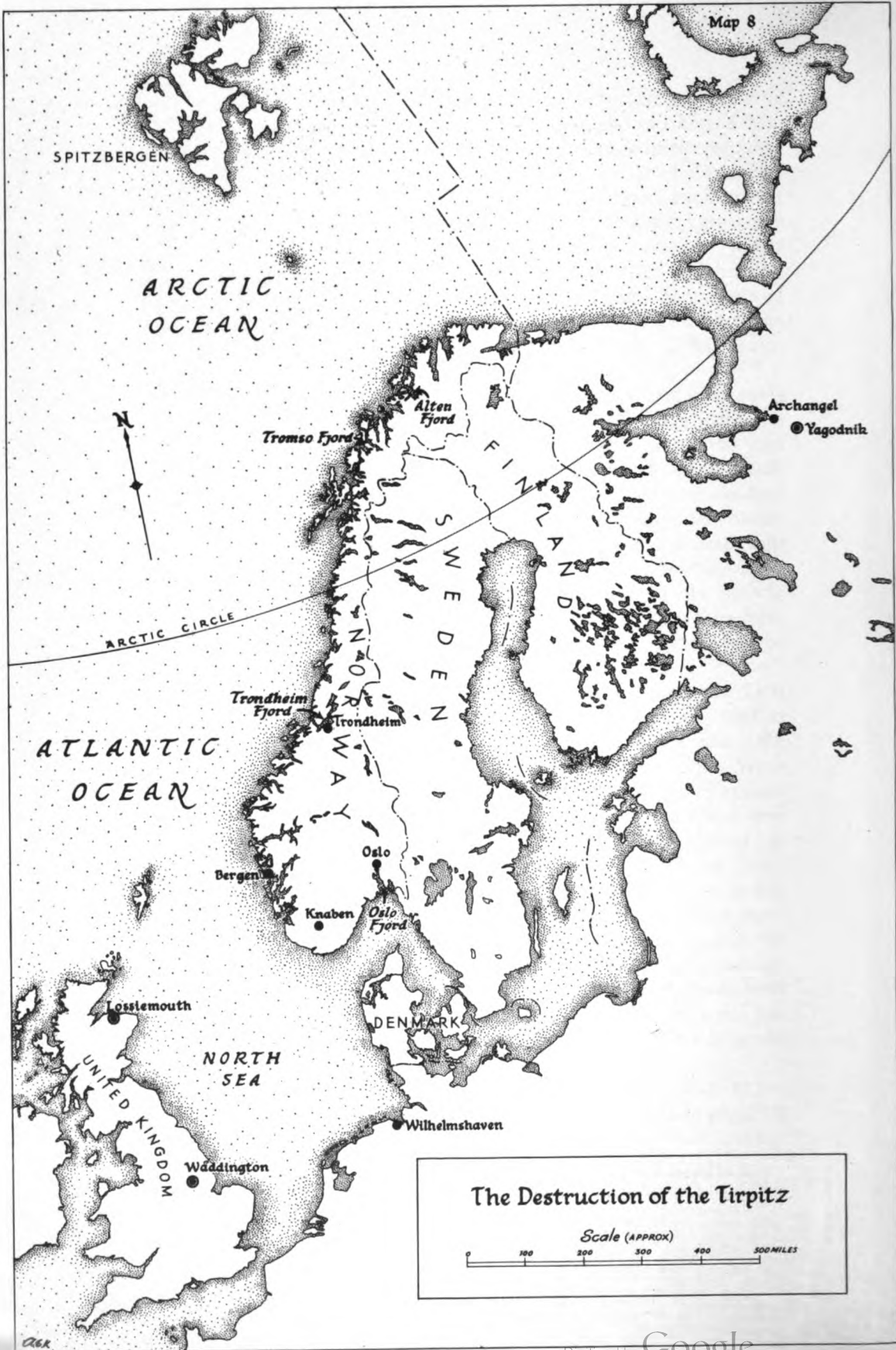
The plan was for the *Tallboy* Lancasters to attack first in sections of five aircraft each disposed between 14,000 and 18,000 feet. The *Johnny Walker* aircraft were to attack from between 10,000 and 12,000 feet, but in order to achieve surprise, the force was to approach at less than 1,000 feet until the Finnish border was reached. At that point they were to climb to between two and six thousand feet above their bombing heights so that the final approach to the battleship could be made in a glide as fast as possible. Three aircraft from 9 Squadron were detailed as wind finders and were to fly slightly ahead of the rest until within sixty miles of the ship, when they were to fall behind the attacking force, which by that time would be increasing speed on the final approach.

Everything went well, except that on the final approach the *Tallboy* Lancasters found themselves considerably off track and had to make a drastic alteration of course. Nevertheless, there was little cloud over Alten fjord and the *Tirpitz* was taken by surprise. Wing Commander Bazin reported that the smoke screen began to appear at 12.55 (D.B.S.T.), but within the next minute at least five and perhaps six *Tallboys* had been dropped.¹ The first one appears to have come from the 9 Squadron Lancaster flown by Flight Lieutenant J. D. Melrose and he later reported that he had seen five *Tallboys* fall between ship and boom. The smoke screen now thickened and no one could be sure of what was happening, but the attack went on with the flak bursts from the *Tirpitz* as the aiming point. Various crew reports suggested that the ship might have been hit by at least some of the seventeen *Tallboys* which went down, but neither Wing Commander Tait nor Wing Commander Bazin could see enough to make any definite report.²

All but one of the bombers regained their base at Yagodnik, but the film Lancaster flew straight on from the scene of the operation

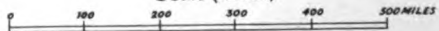
¹ For an illustration of the prevailing conditions see the photograph facing p. 238.

² O.R.B. (617 and 9 Sqdns.), 11th and 15th Sept. 1944.



The Destruction of the Tirpitz

Scale (APPROX)



to England and landed at Waddington, though without conclusive evidence, after a flight of some fourteen and a half hours. No sooner was this epic Bomber Command action over than cloud began to blow up Alten fjord, and when the reconnaissance Mosquito got there about two hours after the attack, its pilot was able to catch only a fleeting glimpse of the *Tirpitz*. All he could deduce was the depressing fact that the ship was still afloat. Five days later a photograph was produced which suggested that the ship had been hit, but the picture was of poor quality and the extent of the damage could not be determined.¹

The *Tirpitz* smoke screen at Alten fjord had prevented the crews of 617 and 9 Squadrons from seeing what they had achieved, but it had not prevented them from achieving it. The battleship had, in fact, sustained all but mortal damage, which the Germans estimated would have taken nine months to repair, even if she could be got back to a German port. This, however, they decided not to attempt, and when the *Tirpitz* crawled out of Alten fjord at six or seven knots and proceeded for indefinite reasons to Tromsø she was near the end of her tether, and, indeed, because Tromsø was just within range of Lossiemouth, near the end of her life.

On 12th November 1944, after a number of false starts,² thirty-one Lancasters of 9 and 617 Squadrons took off, as has already been recorded, with *Tallboys*. They had been specially fitted to make the long flight to Tromsø and back. This time there was no cloud over the ship. No smoke screen was put up, no enemy fighters appeared and the anti-aircraft fire from the battleship was inaccurate and largely ineffective. Of the thirteen 9 Squadron aircraft, two arrived too late to bomb and one, having been badly damaged, made a forced landing in Sweden. The other ten dropped their bombs, as also did all the eighteen Lancasters from 617 Squadron. Most crews thought the bombing had been accurate and some reported direct hits followed by explosions and much smoke. When they turned for home, the great ship had taken on a noticeable list. The attack was executed from between 12,850 and 16,000 feet.³

¹ In addition to the sources cited the following have also been consulted: Report by 5 Group to Bomber Command, 15th Oct. 1944, Report by Group Captain C. C. McMullen, who commanded the expedition, to 5 Group, 1st Oct. 1944, with appendices entitled Accommodation, Diary, Medical Officer's Report, Engineer Officer's Report, Signals Report, Pilots' Reports on Crashes, Russian Co-operation, North Russian Airfields, and Yagodnik Airfield. The *Tirpitz* Log, 5 Group News, Nov. 1944, Investigation into sinking of *Tirpitz* by British Bombing Research Mission. The excellent published account in *No. 5 Bomber Group*, pp. 203-215, has also been used, though in some respects it differs from the above narrative.

² One of which led on 29th October to an actual attack. Low cloud at about 8,000 feet covered the *Tirpitz*, but thirty-two *Tallboys* were dropped by 617 and 9 Squadrons, whose crews aimed through partial gaps in the cloud. One aircraft subsequently crashed in Sweden, but the crew survived. It is not clear whether any damage was done to the *Tirpitz* on this occasion.

³ O.R.B. (617 and 9 Sqdns.), 12th Nov. 1944.

Soon afterwards the *Tirpitz* turned over and became a total wreck. The first *Tallboy* to find its mark had struck amidships and caused a list to starboard. A second direct hit caused the ship to roll over into a severe port list. So terrifying was the experience of those on board that no clear account can be reconstructed of what followed, but it seems that a sudden internal explosion tore a hole in the battleship from keel to deck and almost at once she turned turtle. Of the 1,900 men on board, 1,000 were killed or injured and a great ship had been disposed of in a final blow which cost Bomber Command one aircraft and not a single life.¹

In addition to this salient contribution to the war at sea, Bomber Command carried out a number of other operations against naval targets in the last quarter of 1944. Port areas and shipping at Ijmuiden, in Oslofjord and at Gdynia were bombed and devastating attacks, sometimes with *Tallboy* bombs, were made on submarine and E-Boat pens at Bergen, Ijmuiden, Rotterdam and Trondheim. But the effort devoted by Bomber Command to these and other naval targets was small by comparison with that which continued to be harnessed to the direct support of the armies in the field. These operations, though not always approved by Sir Arthur Harris, Sir Charles Portal or Sir Arthur Tedder, were of extraordinary variety and, at any rate from the operational point of view, effectiveness. They included high-explosive obliteration attacks on German towns in the front line where strong points had been established. In support of the American army offensive, Düren, Jülich and Heinsberg were devastated by Bomber Command on 16th November and earlier, to guard the flank of the British Second Army, Kleve and Emmerich had received similar treatment. In October, Bomber Command took part in the reduction of the Walcheren Fortress. The sea wall was breached in several places and gun positions near Breskens, Flushing, Westkapelle and elsewhere were bombed. On 7th October, thirteen *Tallboy* Lancasters of 617 Squadron, led by Wing Commander Tait, resumed their original role and in a brilliant operation breached the Kembs Dam on the Rhine. The object of this was to prevent the Germans controlling the level of the Rhine and, perhaps, letting loose a flood while the allies were crossing it. Other dams, including the Sorpe, were also attacked, but though accurate bombing and some damage was achieved, these dams withstood the onslaught.²

There were, however, few targets in Germany which could any longer resist the destructive power of Bomber Command and, during

¹ B.B.R.M. Report.

² *Bomber Command Quarterly Review*, Oct.–Dec. 1944, and O.R.B. (617 Sqdn.), 7th Oct. 1944. Thirteen feet of the top of the Urft Dam, which was attacked several times in December, were broken off, but the Germans succeeded in preventing the erosion of the dam by manipulating the water level. The Sorpe Dam was attacked with *Tallboys* by 9 Squadron, and several direct hits were achieved. The dam did not give way.

October, November and December 1944, in its three principal roles of prosecuting the strategic air offensive, contributing to the war at sea and supporting the armies in the field, Bomber Command displayed practically the whole range of its now formidably versatile and immensely powerful striking force. Towns, oil plants, marshalling yards, dams, battleships and concrete emplacements were crumbling beneath a weight and concentration of bombardment unprecedented in the history of warfare. The question in 1945 was no longer what could be destroyed but what ought to be destroyed.

In January 1945, the daily average of Bomber Command aircraft in the squadrons and immediately available with their crews for operations was 1,420. Of the aircraft available for operations, 1,305 were four-engined heavy bombers and 148 were Mosquitoes. By April 1945 the daily average of aircraft available with crews for operations had increased to 1,609. Of the aircraft available for operations, 1,440 were four-engined bombers and 203 were Mosquitoes. Thus, in the three years of Sir Arthur Harris' command, the striking power of the force, expressed in this way, had increased by more than fourfold. In February 1942 the daily average of available operational aircraft with crews had been 374. In February 1945 it was 1,431.¹ But in the same period, owing to the greatly improved quality of its aircraft, the available bomb lift of the Command had increased by more than tenfold. In February 1942 it amounted to a daily average of 510 tons. In February 1945 it was 5,216 tons.² In accuracy of attack the improvement was even more radical. For night attacks on German cities, excluding Berlin and in conditions of good and moderate weather, the percentages of aircraft which dropped their bombs within three miles of the aiming point, were, on the evidence of night photography, sixteen in October and November 1941 and ninety-six in October and November 1944.³

In 1945, between the beginning of the year and 8th May, Bomber Command dropped over 181,000 tons of bombs, which amounted to

¹ Bomber Cmd. O.R.B. The April 1945 average was the highest ever achieved, but the number of operational aircraft for January 1945 was lower than the levels reached in October and November 1944 when the figures were: October, 1,348 four-engined bombers and 120 Mosquitoes; November, 1,346 four-engined bombers and 137 Mosquitoes.

² *Harris Despatch*. These are theoretical figures based on the product of the available strength in numbers of aircraft and the average tonnage dropped in the month by the various types of bombers which claimed to have reached their targets. The figures are, therefore, influenced by the range of the attacks made and also by the kinds of bombs carried. Thus, in November 1944 when attacks were generally of short penetration and high-explosive loads were common, the daily average bomb lift amounted to 6,521 tons. This was the highest figure ever calculated.

³ *Harris Despatch*. In poor weather there was naturally little or no photographic evidence. The early figures are liable to a bias due to the fact that only a small proportion of the force carried cameras and these, the *Despatch* suggests, 'were usually carried by the best crews'. The first figure was based on the examination of ninety-two plotted photographs and the second on 2,399 plotted photographs.

nearly a fifth of the aggregate for the whole war. In operations of all kinds during the same period Bomber Command despatched some 67,483 sorties from which only 608 aircraft failed to return. The pattern of this great offensive in terms of the distribution of bomb tonnages was similar to that established in the last quarter of 1944 except that a proportionally greater effort was made against oil targets and a smaller one against industrial cities. The latter, however, still formed the principal target system of Bomber Command and absorbed about thirty-six per cent of the total bomb tonnage.¹

In this part of the offensive there were thirty-six major operations against thirty different towns, all of which were carried out in January, February and March.² The smallest of these attacks was that made against Gelsenkirchen on the night of 22nd January when 152 bombers were despatched. The largest was the daylight attack on 12th March when 1,107 aircraft, carrying about five thousand tons of bombs, were despatched to Dortmund, but undoubtedly the most destructive was the operation carried out in two waves against Dresden on the night of 13th February, when some 805 bombers were despatched. In all these major area attacks 15,588 sorties were despatched, 240 bombers failed to return and over 57,000 tons of bombs were dropped. The ratio of high explosives to incendiaries was about 3 : 2. Twenty-four of the operations were at night and twelve in daylight. The losses were more or less consistently low by day and by night except on one occasion which, by a curious coincidence, was that of the attack on Nuremberg on the night of 16th March. A force of 293 bombers consisting of 231 Lancasters from 1 Group and forty-six Lancasters and sixteen Mosquitoes from the Pathfinder Force, was despatched. Twenty-four aircraft, all of them 1 Group Lancasters, did not return largely as a result of a temporary

¹ *Bomber Command Review 1945*, which gives the distribution of effort in bomb tonnages 1st January to 8th May 1945 as:

Category	January	February	March	April	May	Total	Percentage
Cities	11,931	21,888	30,278	2,322	63	66,482	36.6
Troops and Defences . .	2,072	3,756	8,042	12,056	155	26,081	14.4
Transportation	8,459	5,505	6,229	7,909	—	28,102	15.4
Naval Targets	129	561	3,924	6,526	—	11,140	6.1
Oil	9,028	14,109	18,936	5,437	—	47,510	26.2
G.A.F.	—	—	5	596	36	637	0.4
Specific Industries . . .	1,221	—	11	4	—	1,236	0.7
Miscellaneous	83	70	212	104	83	552	0.2
Totals	32,923	45,889	67,637	34,954	337	181,740	

These figures serve as an indication only and should be read with some caution.

² By major operations is here meant those in which more than a hundred heavy bombers took part.

resurgence of the German night fighter force. Nuremberg was not, however, always an unfortunate target for Bomber Command and, on the night of 2nd January, a force of 521 aircraft was despatched to it and only three of them failed to return.¹

This major area bombing offensive was supplemented by an independent Mosquito contribution which had now become formidable. The heavy aircraft of Bomber Command did not attack Berlin in 1945 but from the beginning of the year until the Russians got there no fewer than 3,900 Mosquito bomber sorties were despatched to the German capital. These little aircraft dropped over 4,400 tons of bombs on it and among them were 1,479 four-thousand pounders. Only fourteen of the Mosquitoes failed to return from these operations, which represented about half of their independent contribution to the offensive in 1945.²

The Bomber Command effort in the oil campaign was intensified in 1945 and throughout the period from January to April it was sustained and effective, to a greater extent than might be suggested by the fact that only twenty-six per cent of Bomber Command's destructive tonnage was devoted to it. It was, as had long since been understood, a fallacy to suppose that oil targets, because of their vulnerability, did not require heavy and destructive attacks, but when, as was now the case, these relatively small objectives could be accurately and consistently struck by Bomber Command at night or in daylight and even through ten-tenths cloud, adequate devastation could be caused by much smaller forces than those required to disrupt a whole city. What was important was that as many plants as possible should be devastated and that they should be attacked again whenever they showed signs of resuming production. In January, February, March and April 1945, Bomber Command carried out seventy-four operations against forty-nine oil targets, which involved the despatch of 12,588 sorties, from which 11,849 sorties resulted in 46,636 tons of bombs being aimed at the targets. Thirty-eight of these operations were carried out at night and thirty-six of them in daylight. Of the latter, twenty-eight attacks were made by the *G-H* technique in formations of about a hundred bombers on each occasion, and the majority of these, which were nearly all highly successful, were delivered from above ten-tenths cloud. These

¹ O.R.S.(B.C.) Nt. Raid Reports. The targets for these major area attacks with the numbers of aircraft despatched against them were:

Barmen (354), Bonn (238), Chemnitz (717 and 720), Dessau (531), Dortmund (528 and 1,107), Dresden (805), Duisburg (373), Essen (342 and 1,079), Gelsenkirchen (152), Hagen (277), Hanau (433 and 285), Hanover (662 and 275), Hildesheim (235), Karlsruhe (261), Kassel (276), Ludwigshafen (400), Magdeburg (371), Mainz (458), Mannheim (478), Munich (654), Münster (175), Nuremberg (521 and 293), Osnabrück (156), Paderborn (276), Pforzheim (374), Wiesbaden (497), Witten (324), Worms (349), Würzburg (236) and Zuffenhausen (376).

² *Bomber Command Review*, 1945.

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daylight operations against oil targets were carried out on twenty-six of the sixty-nine days in the period on which Bomber Command operated at all. The night attacks were even more concentrated. On nine occasions two, and twice three, oil targets were attacked in a single night. On twenty-five of the forty-seven nights on which Bomber Command operated at all, oil targets were bombed. Thus, if by no means a maximum effort, the Bomber Command part in the oil campaign of 1945 was intensive and concentrated. It was also exceedingly destructive and, in combination with the even more frequent but somewhat lighter attacks of the United States Strategic Air Forces, it proved to be a great deal more than the already badly mauled oil industry could withstand.¹

The eighty-one Bomber Command attacks which were directed against synthetic oil plants, refineries, benzol plants and fuel storage depots, were carried out by substantially the same means as those which had preceded them in the last three months of 1944.² Four of the operations, two of them in daylight and two at night, serve to illustrate the tactical pattern of the offensive. The weather over the Ruhr on 10th March was forecast to be cloudy and for that reason the attack on the synthetic oil plant, Scholven-Buer, was planned as a *G-H* operation. 155 Lancasters from 3 Group were despatched and, as had been expected, they found ten-tenths cloud at five to ten thousand feet over the target. 153 of them carried

¹ *Bomber Command Review 1945*. The parts of Bomber Command and of the U.S. Eighth Air Force in the oil campaign (May 1944 to April 1945) are illustrated by the following figures for attacks on synthetic plants and refineries in Germany:

Number of plants attacked	42
" " Bomber Command attacks	82
" " Eighth Air Force attacks	170
Tons of bombs dropped by Bomber Command	63,674
" " " " " Eighth Air Force	45,617

² Twenty-six attacks, involving the despatch of 6,011 sorties, were made on synthetic oil plants. They were distributed as follows. One attack each was made on Zeitz, Dortmund, Sterkrade-Holten and Brück. Two attacks each were made on Gelsenkirchen, Pöhlitz, Wanne-Eickel and the Scholven plant at Buer. Three attacks each were made on Leuna and Lützkendorf. Four attacks each were made on Böhlen and Kamen. Thirty-four attacks, involving the despatch of 3,078 sorties, were made on benzol plants. They were distributed as follows. One attack each was made on Hüls, Wanne-Eickel (Herne), the Gneisenau and the Minister Stein plants at Dortmund, Königsborn, the Prosper plant at Bottrop, Killwinkel and Molbis. Two attacks each were made on Datteln, Recklinghausen (Erkenschwick), the Bruchstrasse plant near Bochum, Brückhausen, the Hansa plant at Dortmund, Hattingen, the Mathias Stinnes plant at Bottrop, Osterfeld near Bottrop, Salzgitter and the Alma Pluto plant at Gelsenkirchen. Three attacks each were made on the Consolidation plant at Gelsenkirchen and Castrop Rauxel. Fifteen attacks, involving the despatch of 2,462 sorties, were made on refineries. They were distributed as follows. One attack each was made on the Deutsche Petroleum refinery at Hamburg, Rositz, Bremen, the Ebano and Rhenania Ossag refineries at Harburg, Misburg, Dortmund, Monheim, Reisholz, Vallo and Salzbergen. Two attacks were made on Heide. Three attacks were made on Misburg. Six attacks, involving the despatch of 365 sorties, were made on oil storage depots. They were distributed as follows. One attack each was made on Dülmen, Farge, Hamburg and Regensburg. Two attacks were made on Rüthen. O.R.S. Nt. and Day Raid Reports, Bomber Command O.R.B., C.S.T.C. Oil Committee.

out a formation attack through the overcast and dropped 755 tons of high-explosive bombs among which were one 12,000-lb., two 8,000-lb. and a hundred and fifty 4,000-lb. High Capacity bombs. Obviously this was a most destructive load, but it was also very accurately placed. Subsequent daylight reconnaissance photographs showed that the plant had been left in a state of devastation. There was no fighter opposition and all the Lancasters returned, though nine of them had been damaged by flak.¹

On 24th March, clear weather over western Germany was forecast and a Pathfinder Force controlled *Oboe* ground marking attack by Lancasters of 1 Group was planned against the Harpenerweg refinery at Dortmund. Nine Lancasters and six Mosquitoes of the Pathfinder Force were despatched to lead eighty Lancasters from 1 Group. Four of the Lancasters made abortive sorties, but all the other ninety-one aircraft reached the target and dropped about 425 tons of bombs on it, including seventy-nine 4,000 pounders. The ground marking was clearly visible just short of the aiming point and the bombing was highly concentrated. Later the target became obscured by smoke and the master bomber instructed the crews to bomb the upwind edge of the black oily smoke which eventually rose to an immense height. Photographic reconnaissance showed that the plant had been put out of action but it had not been so severely damaged as was originally hoped. Much of the attack, from which three of the 1 Group Lancasters failed to return, had fallen slightly to the west of the target.²

For the night of 14th January there was forecast to be a good chance of a cloudless sky over Leuna, but the visibility was not expected to be good. A double attack upon the oil plant there with alternative tactics was planned. Two hundred and sixteen Lancasters, eight of them from 1 Group and the rest from 5 Group and eight Mosquitoes, also from 5 Group, were despatched in the first wave which was due to attack at 9 p.m. The second wave, which was to attack four hours later, consisted of three hundred and fifty-five Lancasters from 1 and 6 Groups and the Pathfinder Force and six Mosquitoes of the Pathfinder Force. If the conditions were suitable, the plan was to use the controlled *Newhaven* marking technique, but, if cloud or visibility made that impossible, resort was to be had to blind sky marking.

The first wave found reasonably good conditions and a ground

¹ O.R.S.(B.C.) Day Raid Report, Immediate Interpretation Report, 13th March 1945, Supplement, 18th March 1945 and Damage Assessment Report. These day raid reports, which had been discontinued in 1943, when Bomber Command ceased to take part in daylight activities, were curiously not resumed till March 1945 when a new series was begun.

² O.R.S.(B.C.) Day Raid Report, Immediate Interpretation Report and Supplement, 25th March 1945.

marking attack was undertaken. The initial markers were somewhat scattered but the master bomber succeeded in locating some accurate ones and in getting the bombing well concentrated. By the time the second wave reached Leuna the sky had completely clouded over and no ground marking was possible. *H2S* checks suggested, however, that the sky marking was well clustered over the aiming point and since at 16,000 feet there was a wind of only about twenty miles an hour it is possible that the bombing was more than usually accurate. At any rate, reconnaissance photographs showed that the plant had been heavily and extensively damaged in these two attacks. In fact, there was scarcely an important installation which had not been hit. In this double operation, from which eight Lancasters did not return, over two thousand tons of bombs, including 491 four-thousand pounders, were dropped.¹

The last example is provided by the attack on the night of 22nd January against the benzol plant at Brückhausen. Two hundred and eighty-six Lancasters and sixteen Mosquitoes of 1 and 3 Groups and the Pathfinder Force were despatched. Once again the plan was to have either ground or sky marking according to the weather, but fortunately the latter was not, on this occasion, necessary, and after passing some cloud on the way, the crews found none at the target. The visibility was excellent and by the moonlight the bomb aimers could see not only the *Oboe* ground marking but the benzol plant itself. This was lucky because the concentration of bombing, for a time, completely obliterated the marking. Photographic reconnaissance showed that the plant had been heavily damaged. There had, however, been some inaccurate aiming or mistaken identification and a considerable weight of attack fell on the August Thyssen steel works which lay to the north of the target. From this operation, in which more than 1,200 tons of bombs, including 259 four-thousand pounders, were dropped, two Lancasters failed to return.²

Meanwhile, Bomber Command was receiving the last and the greatest of its war-time weapons. On 21st February 1945 it was decided to expand 617 Squadron from two to three flights. One of these was to retain its *Tallboy* Lancasters and the other two were to be equipped with Lancasters capable of carrying the new twenty-two thousand pound earthquake bomb known as the *Grand Slam*. This ten-ton monster had undergone a long and difficult birth. Its designer, Mr. B. N. Wallis, had foreseen the need for such a weapon in the early days of the war and though his proposals, which included

¹ O.R.S.(B.C.) Nt. Raid Report. Immediate Interpretation Report, 23rd Jan. 1945, Supplement, 5th Feb. 1945.

² O.R.S.(B.C.) Nt. Raid Report. Supplementary Report on Night Photographs. This was one of the occasions on which 3 Group operated with the main force and not independently as a *G-H* force.

plans for a huge aircraft to carry the bomb, had been encouraged by Sir Henry Tizard, who was then the Scientific Adviser to the Chief of the Air Staff, they had eventually been rejected by the Air Staff on the grounds that there was no scientific case 'in favour of a bomb larger than could be carried on existing aeroplanes.' This, in view of the potentiality of the Lancaster, was an unfortunate decision, but it was, perhaps, an inevitable one because nobody, including Mr. Wallis and even its designer Mr. Roy Chadwick, fully foresaw what this remarkable aircraft would be able to do.¹

After the success of the rotating weapon which breached the walls of the Möhne and Eder dams in May 1943, more attention was paid to Mr. Wallis' seemingly impossible ideas and this led to the production of a scaled-down version of the ten-ton bomb which was known as the *Tallboy*. The success of this weapon in 1944 has already been noticed in several places and it will be remembered that it was this bomb which made the destruction of the *Tirpitz* possible. Plans for the development of the *Grand Slam* were also pushed ahead and arrangements were made for its production both in England and in the United States, but this progress was arrested in September 1944,² when, in the light of the War Cabinet's expectation that the war would be over by Christmas, the Air Staff cancelled *Grand Slam* production in both countries. This too was an unfortunate decision, but it was redeemed in October by a characteristically far-sighted, independent and courageous decision by the Chief Executive at the Ministry of Aircraft Production, Air Chief Marshal Sir Wilfrid Freeman. This set the wheels of production in motion once more. On 13th March 1945 the first explosive-filled *Grand Slam* was experimentally dropped on the Ashley Walk bombing range. It produced a crater thirty feet deep and 124 feet in diameter.³

Here then, if rather late, was an important addition to the striking power of Bomber Command. No more time was lost and on 14th March, the day after the experiment, the first *Grand Slam* was dropped operationally by 617 Squadron. The target was the railway viaduct at Bielefeld which carried the main line from Hamm to Hanover. It had been attacked on a number of occasions previously. Aircraft of the United States Eighth Air Force had damaged two spans and a pier with 1,000-lb. and 500-lb. bombs, but the Germans had been able to relay the track by placing girders across the damaged sections. They had also succeeded in making good the much more serious damage done by Bomber Command *Tallboys* on 22nd February 1945.

For the operation on 14th March, which took place after a series

¹ A.H.B. Monograph on Armament.

² *Tallboys* were already being produced in the U.S.A.

³ A.H.B. Monograph on Armament.

of abortive attempts, fifteen Lancasters of 617 Squadron, a Mosquito of 627 Squadron and four *Oboe* Mosquitoes of the Pathfinder Force were despatched. Fourteen of the Lancasters carried *Tallboys* and to the fifteenth, which flew without a wireless operator or mid-upper gunner, was attached a *Grand Slam*. The *Oboe* Mosquitoes were to lay down proximity marking which was especially necessary in view of the expected haze in the target area.

The 617 Squadron Lancasters began to take off from Woodhall Spa just before a quarter to two in the afternoon and at about half past four they all reached the Bielefeld Viaduct where the *Oboe* marking could be seen on the ground some three hundred yards to the south-south-west of the target. While one of the Lancasters was opening its bomb doors, the *Tallboy* fell off. Another crew lost their bearings on the run up and dropped a *Tallboy* by mistake on a cross-roads some 750 yards from the target. A third brought its *Tallboy* back owing to a breakdown in the bomb-sight at the last moment. The remaining eleven *Tallboy* Lancasters made extremely accurate attacks and several of the crews claimed direct hits. The *Grand Slam* Lancaster, flown by Squadron Leader C. C. Calder, was one of the first to attack and the crew believed that their ten-ton bomb had undershot the viaduct by thirty yards. Another crew attacking five seconds later reported that the 'Special Stores fell on or very close.' A third crew which attacked within half a minute of Squadron Leader Calder thought that the big bomb had 'made a very near miss on the southern end of the viaduct.' All the Lancasters attacked from between eleven thousand and just over thirteen thousand feet where the cloud base was. The *Grand Slam* was dropped from 11,965 feet, which was much lower than ideal for a penetration bomb.¹

Despite this, it seems likely that the ten-ton bomb penetrated deeply into the rather soft water-logged ground on which the viaduct stood and, of course, a 'near miss' was the correct application for its undermining earthquake activity. It proved impossible to distinguish between the effects of the *Tallboys* and the *Grand Slam*, but photographic reconnaissance did show that the viaduct had been wrecked over a length of more than a hundred yards. No doubt the *Grand Slam* had an important bearing upon this satisfactory and remarkable result.² This was the first of the forty-one *Grand Slams* dropped by 617 Squadron on similar targets before the capitulation of Germany.³

¹ O.R.B. (617 Sqdn.), 14th March 1945, Bomber Cmd. O.R.B. 1945 and O.R.S.(B.C.) Day Raid Report.

² See the photograph between pages 238 and 239. Since the war, the viaduct has been by-passed by a loop line, but the wrecked structure itself remains to this day as a monument to the destructive power of Bomber Command.

³ A.H.B. Monograph cited above. Between their operational introduction in June 1944 and the end of the war in Europe, Bomber Command dropped 854 *Tallboys* on targets

The *Tallboy* and *Grand Slam* attacks on bridges and viaducts were an important part of the communications offensive which was at the same time carried on in many other ways. Operations against the Dortmund-Ems and the Mittelland canals were continued whenever they seemed to be necessary and no great difficulty was experienced in draining them on each occasion. A heavy concentration of attack, much of it in direct support of the armies, was devoted to marshalling yards and other railway targets, and Bomber Command played an important part in the ultimate demise of the German navy by continuing to attack its bases. In one of these operations, which took place on the night of 9th April, the pocket battleship *Admiral Scheer* was capsized in the course of an attack on the shipping yards at Kiel.¹ But from all these tasks of tremendous destruction which Bomber Command could at last so amply fulfil, the force was soon able to turn to the agreeable duty of bringing home thousands of prisoners of war, among whom were many who had themselves flown with Bomber Command in its less prosperous times.

in Germany and occupied territory. Latterly, as in the case of the Bielefeld Viaduct, they were often used in combination with *Grand Slams*. Targets destroyed in this way included the Arnsberg Bridge, see the photograph following p. 238, a few miles from the Möhne Dam (Eight *Grand Slams* in two attacks), Arbergen Bridge (Two *Grand Slams*), Nienburg Bridge (Five *Grand Slams*), see the photograph facing p. 239, and Bremen Bridge (Five *Grand Slams*).

¹ *Bomber Command Review 1945*, and O.R.S.(B.C.) Nt. Raid Report.

CHAPTER XIV

THE CULMINATION OF
THE OFFENSIVE:
APPRECIATIONS AND RESULTS

1. Changes in allied methods of appreciation and the German response to allied bombing
2. The attack on oil
3. The attack on communications
4. The direct attack

'The fact that the operations of the immense Strategic Air Forces are supposed to be directed by a committee advised by a series of committees and sub-committees is so remarkable and constitutes such a unique method of conducting military operations that there is no risk of its being forgotten.'

SIR ARTHUR TEDDER to Sir Norman Bottomley,
8th March 1945

'The continuous attacks directed by the enemy against the Ruhr are having the most serious effect on our entire armament and war production. In addition to the bombing of production plants in the Ruhr, the systematic attacks carried out on railway installations are largely responsible for the critical situation. While the former can result in an appreciable drop in our total war output, the disruption of our communications may well lead to a production crisis which will gravely jeopardise our capacity to continue the war.'

SPEER TO KEITEL, 7th November 1944

1. Changes in allied methods of appreciation and the German response to allied bombing

THE transformation of the war which has been described in the last two chapters naturally caused changes in both the machinery for the appreciation of the strategic offensive and in the manner in which the Germans responded to it. Both were necessarily affected by the successful invasion of the Continent by the allied forces in the West and the rapid advance of the Soviet armies in the East. Just as important was the change in the tempo of the attack. The allied methods of appreciation were too slow to deal with situations which often altered considerably in a few days. For the Germans there had to be one rapid improvisation after another as vital objectives were subjected to overwhelming and skilfully directed attacks. In each case there was considerable success in quickly adapting old methods to the new conditions, but in each case there was sometimes confusion and lack of co-ordination which detracted from the success. This confusion was mostly due to the fact that the direction of the allied attack and the German defence, owing to the exigencies of the situation, fell to some extent into new hands. On the one hand, the control of the strategic air forces was until September exercised on General Eisenhower's behalf by the Deputy Supreme Commander, Sir Arthur Tedder, who had his own intelligence services in addition to those which had been set up in Britain. On the German side in the last desperate months, though Speer retained his position as Minister of Armaments and War Production until the end, he had less of the confidence of Hitler; other leaders, Goebbels, Himmler and Bormann, had an increasing influence on economic organisations and the production of weapons.

In this section the process is first traced on the allied side and then a brief account is given of the German efforts to maintain their war industries.

(a) CHANGES IN THE MACHINERY OF APPRECIATION

One important change which took place at the beginning of this period was the transfer of the Economic Objectives Department of the Ministry of Economic Warfare to the Foreign Office in April. This was due to causes unconnected with its duties of advice on and assessment of the strategic bombing offensive, and that part of its work went on much as before. But by becoming part of the Economic Advisory Branch (E.A.B.) of the Foreign Office it obtained a new position which seems to have enhanced its authority. At any rate

it secured a more influential place in the advisory system and was able to work more closely than before with the intelligence and operational departments of the Air Ministry and the United States Strategic Air Forces in Europe. Its head, Mr. Lawrence, was thus able to play an important role in the new organisation which was set up at the end of September when the control of the strategic offensive was resumed by Sir Charles Portal and General Arnold through their deputies, Sir Norman Bottomley and General Spaatz.

On the other hand, that part of M.E.W.'s work which dealt with the general economic position of Germany became less important. The hope that the war would soon be over meant that less thought was devoted to the long-term results of the offensive. Attention was, as has been seen, concentrated on the immediate assistance that the strategic air forces could give to the armies by depriving the enemy of their weapons and the oil and communications that enabled the weapons to be used.

For the same reason a less important part was played by the appreciations of the strategic damage made by R.E.8, the special department of the Ministry of Home Security. Their studies of particular attacks on oil or aircraft plants took too long a time to prepare, though they continued and were useful as a check on previous estimates. The technical skill of the department was used by representation on or advice to other committees which could work faster. R.E.8 also continued its studies of the effect of different kinds of bombs on various structures, and, as the armies advanced in France, these could be checked by the knowledge obtained of the results of the bombing on French targets which had been liberated from the enemy. But during this period it became impossible to make accurate surveys and estimates of the amount of destruction in particular German towns. They had been so heavily bombed that it was often impossible to distinguish to a sufficient degree new damage from old.

The Joint Intelligence Committee was employed as before to put the results of the work of the various committees into a convenient form for the attention of the Chiefs of Staff. It paid, however, more attention to strategy and less to industry and economics. It was used by the Chiefs of Staff to make a fortnightly report on oil, but this was largely a summary based upon the results produced by other organisations described below. It tried to estimate the effect on the land battle of the shortage of oil or the rupture of communications, but in such assessments it had new competition in the intelligence sections of the allied staff, which was directing the offensive.

During the first five months of this period these had a commanding position, for the strategic air forces were at the disposal of the Supreme Commander and his Deputy, Sir Arthur Tedder, directed

their activities. But, as has been seen, strategic bombing on Germany still continued, and for this purpose the machinery already existing in Britain was employed with some adaptation to meet changing needs. General Spaatz and Sir Arthur Harris had comparative freedom as regards those target systems in which S.H.A.E.F. had no special interest. But for information as to the nature and location of the targets and appreciations of the results of the attacks, they had to use the organisations already set up for that purpose. The estimates of the oil situation were in the hands of the Hartley Technical Committee, but the oil section of M.E.W. had taken an increasing share in the calculations concerning consumption and production. The Enemy Objectives Unit of the Economic Warfare Division of the United States Embassy also had its own advisers, who took part in the discussions and conveyed the views of experts in the United States, where the subject was given much attention in the Petroleum Committee of the Board of Economic Warfare.

The success of the oil offensive in which the three strategic bomber commands were taking part showed that this machinery was not sufficiently co-ordinated or able to act with the necessary rapidity. In July, therefore, a new organisation was set up in the Joint Oil Targets Committee by the Air Staff and the United States Strategic air forces, composed of representatives of the Bomber Operations and Intelligence Directorates of the two staffs, M.E.W., the Enemy Objectives Unit of the United States Embassy, and the War Office. It was recognised that this committee was too far away from the Fifteenth Air Force, which was playing an important part in the campaign, to advise it effectively. The Committee, therefore, sent experts to Italy to augment the machinery already set up there for target information and appreciation of results; later the same thing was done to assist the reconnaissance and photographic work on which to a large extent the whole success of the offensive depended.

For during this period photographic intelligence became of even greater importance.¹ Fortunately the joint British and United States organisation for this service had been able to resist the attempt to divide them made by Lt.-Col. Eliot Roosevelt and in May was reorganised so as to make it even more effective.² In that month a Joint Photographic Reconnaissance organisation was set up to allocate the use of the reconnaissance aircraft of the two countries to the most essential needs and at the same time the Central Interpretation Unit was given the prefix 'Allied' and enlarged to serve,

¹ The information in this and the following two paragraphs is largely derived from Volume II of an Air Historical Branch Narrative on Photographic Reconnaissance and from the Programme of Work of the J.O.T.C., 6th July 1944.

² See above, Vol. II, p. 222. No one appears to have been better satisfied with this result than Lt.-Col. Roosevelt himself; for he pays a warm tribute to the British reconnaissance experts in his book, *As He Saw It*, (New York, 1946), p. 215.

as it had always done, both the Royal Air Force and the Eighth Air Force. Thus, the progress of the strategic offensive was surveyed by a common organisation, which, so far as operations were concerned, was independent of all other Commands. New photographic machines and processes, some devised in the United States, were also introduced, while the Spitfire XIX, though in short supply, began to be used for high-speed and high-altitude reconnaissance.

Just as important was the necessity of obtaining the assessment of the results of a raid as rapidly as possible in order to ascertain if it had to be repeated. Since thousands of photographs were delivered every day at the Unit's headquarters, this was no easy task; it was nevertheless accomplished with great skill. Throughout the offensive a first estimate of the results of the attacks on the refineries and oil plants could be supplied to the air forces in a matter of twenty-four hours so long as the weather allowed photographs to be taken of the target. This was an important qualification for the weather often placed insuperable obstacles in the way of finding out what had been done, though great efforts were made to overcome them by low flying and the use of the night photographs. Whenever possible also the targets were under continual survey from the air and the Unit was thus able to report when a new attack was necessitated by the progress of repair.

There was much other intelligence of various kinds and this was increased when the occupation of France began and the prisoners of war multiplied. To assess this kind of material an Enemy Oil Intelligence Group had been set up in 1942 in the Ministry of Economic Warfare. In this Committee representatives of the different agencies discussed the evidence and put it into practical shape in a weekly bulletin. This information was neither so rapid nor as accurate as that derived from aerial reconnaissance, but it supplied on occasions new facts concerning the purpose of the different oil plants, the erection of new ones and the character and volume of their production.¹

The photographic appreciations needed special technical knowledge besides the skill to interpret the photographs. The organisation had been divided, therefore, into different sections and technical experts were attached to each. In July, after some criticism of the oil intelligence by experts, the oil division was reinforced for this purpose.² The success of its appreciations was, perhaps, more

¹ *Oil as a Factor in the German War Effort, 1933-1945*. Lack of technical knowledge prevented underground channels from providing much useful information. Other sources were escaped prisoners of war, transport information, commercial messages, information in the liberated territories from men who had worked in the plants. Memo. by Lawrence, 3rd Jan. 1945.

² This reinforcement was due to a report of Lt.-Col. Foster, an oil expert. R.E.8 were also called upon to assist the Oil Division of the Central Interpretation Unit.

remarkable than those of any other target system. Much of this success was due to the manner in which the Hartley Committee and the oil section of M.E.W. had studied the problem in previous years. But the duty now became very exacting and important and it should be noted that the main responsibility for the final photographic appreciations was borne by an officer of the Royal Air Force of junior rank, Flight Lieutenant P. E. Kent, to whose exceptional talents high tributes were paid in the Oil Committees.¹

It was on these committees that the strategic air forces depended for their target information during this period and it was on their findings, which were circulated in a weekly bulletin, that the J.I.C. reported to the Chiefs of Staff the great success of the attack in spite of the fact that only a small percentage of the bomber forces were engaged in it. It was upon such exact information that Sir Charles Portal based his arguments in the correspondence with Sir Arthur Harris described in Chapter XII.

The existing machinery also served for the other strategic target systems which, however, were not so much in evidence in this period. The 'Jockey' Committee continued its assessment of aircraft and aero-engine production and the Air Ministry issued a weekly list of targets. M.E.W. continued its appreciations of the state of the ball-bearings industry. A special committee was set up to consider attacks on German armoured fighting vehicles and motor vehicles. R.E.8 continued to make appreciations of some of these targets and on occasion of the results of an area attack, but, as has been noted, these received less attention when all thoughts were concentrated on the land offensive. The attacks on the sites of the new V-weapons were largely directed by a special committee set up to co-ordinate the defence against them.²

This loosely controlled complex served well enough for the strategic offensive while the strategic air forces were subordinate to S.H.A.E.F. But on the transfer of authority over them to Sir Charles Portal and General Arnold it was felt that more co-ordinated and scientific direction was needed. This was at any rate the view held both in the Air Ministry and at the headquarters of the United States Strategic Air Forces in Europe. General Spaatz, who continued to reside mainly at headquarters in France, had not welcomed the change any more than Sir Arthur Harris. But Air Commodore Bufton and Colonel Maxwell, his opposite number at the United States Strategic Air Forces in Europe, were able to secure in October

¹ Mins. of 28th Mtg. of the C.S.T.C., 2nd May 1945. 'The work of damage assessment has been performed almost entirely from aerial photography. This work has called for a special order of skill in technical industrial interpretation, and the consistent accuracy of the results achieved testifies to the exceptional talents of *Flight Lieut. Kent* and the staff of D. Section, A.C.I.U.' (Allied Central Interpretation Unit).

² See Basil Collier: *The Defence of the United Kingdom*, p. 379.

the establishment of a new advisory committee to review and co-ordinate the economic intelligence. Thus, as has been seen in Chapter XII, the Combined Strategic Targets Committee was set up, of which they were joint chairmen.¹ Represented on it originally were the Operations and Intelligence Directorates of the Air Ministry, the United States Strategic Air Forces and the British and United States Embassy economic departments already serving on the oil committee. Representatives of S.H.A.E.F., Bomber Command and the Eighth Air Force were also present, and it was soon seen that they must become permanent members of the committee and each had generally two representatives.² 'In this way', Air Commodore Bufton was reported as saying, 'the Staffs of the Operational Commands would have a direct and continuous knowledge of the background of current bombing policy and the Committee would have the benefit of operational advice.'³

Thus, for the first time there was in a position of considerable, if by no means undisputed, authority as the main advisory body of the offensive such a committee as Mr. Vickers had suggested in 1942, on which economic and other technical advice was brought into the closest co-operation with operational experience.⁴ Neither the Admiralty nor the War Office were represented, as they had been in the defunct Bomb Targets Information Committee, but it was agreed that they should receive the minutes and attend when necessary.

The terms of reference of the Committee were wide:

- '(i) To advise jointly the Deputy Chief of the Air Staff and the Commanding General, U.S.St.A.F.E. and to make recommendations in regard to:
 - (a) The priority of targets within the various systems of strategic objectives selected for attack under the current directive.
 - (b) The priorities which should be established between the different target systems.
 - (c) The need which may arise at any time for a major change in the current directive.
 - (d) Any proposals submitted by S.H.A.E.F., the Admiralty and War Office involving the employment of strategic bomber forces.

¹ Its name was suggested by General Spaatz himself. Letter Anderson [deputy for Operations, U.S.St.A.F.E.] to Bottomley, 5th Oct. 1944.

² In addition to the two chairmen, the Directorates of Intelligence and Bomber Operations of the Air Ministry had generally each two representatives, U.S.St.A.F.E. two representatives, E.A.B. two representatives, Bomber Command and the Eighth Air Force each two representatives. The attendance, of course, varied from time to time and other officers and experts were summoned for special problems. Squadron Leader J. Strachey acted as Secretary.

³ Mins. of 4th Mtg. of the C.S.T.C., 8th Nov. 1944.

⁴ See above, Vol. I, p. 465.

- (ii) To issue, on behalf of the Deputy Chief of the Air Staff and the Commanding General, U.S.St.A.F.E. weekly priority lists of strategic targets for attack under the current directive.
- (iii) To formulate and to submit to the Deputy Chief of the Air Staff and the Commanding General, U.S.St.A.F.E. joint proposals to meet specific situations as and when these may arise.'¹

Thus these terms involved, as has already been pointed out in Chapter XII, strategic advice to those directing the attack, but the validity of this advice depended on the machinery for the appreciation of the different target systems. The Committee, therefore, absorbed or made subordinate to itself as sub-committees (called in the jargon of the time 'working committees') all the organisations set up for particular target systems. It took over itself the functions of the Joint Oil Committee, both of its chairmen being amongst the strongest supporters of the priority given to oil. The working committee on oil, of which Mr. Lawrence became Chairman, reported to it and Mr. Lawrence himself served on the C.S.T.C. It was thus at the outset, and continued to be, strongly biased in favour of oil as the most important target system, a fact which was well known in other bodies both in France and Britain. Indeed, at one meeting Colonel Maxwell felt it necessary to assert that the opinion that the Committee were 'oil fanatics' was not true, but he added that oil was 'by far the most profitable target system'.²

But the whole attack had to be reviewed and the other working committees reported to the C.S.T.C. each week or when it was necessary to do so. There were two other main ones at the start. One dealt with aircraft construction, the old 'Jockey' Committee, which had been functioning for so long, and was now termed 'working committee for the G.A.F.' The other was for Army objectives now called 'working committee (A.F.V.)' (Armoured Fighting Vehicles) which dealt with tank construction and, at a later date, with ordnance depots. For a considerable period these two systems were only used as 'filler' targets when the overriding priority of the oil target system had been considered. The business that was always first was the report of the working committee on oil and the respective merits of hydrogenation plants, refineries and benzol plants were debated in the light of the extensive information provided. The Oil Committee also had from the first the storage tanks as one of the targets which it must consider, though for a long period the more numerous field depots were left to be dealt with by the tactical air

¹ Mins. of 1st Mtg. of the C.S.T.C., 18th Oct. 1944.

² do. 20th Mtg., 2nd March 1945.

forces under the direction of S.H.A.E.F.¹ Flight Lieutenant Kent was added to the C.S.T.C. so that the committee might learn from the fountain-head the exact state of the targets under discussion.

It will be noted that there was, thus, no working committee for communications, but this situation was soon radically changed. For the action of Sir Arthur Tedder succeeded in placing it first among the second priorities and it immediately, as has been seen, assumed a prominent place in the strategic offensive. There can be no doubt of the dismay of the C.S.T.C. when it had to devote so much attention to communications. It was afraid that this objective would divert forces from the all-important oil targets. But the C.S.T.C. had, of course, to consider the problem which Sir Arthur Tedder had referred to it.²

Sir Arthur Tedder had, it is true, his own advisers on communications. He had also, after the dissolution of the Allied Expeditionary Air Force and the transfer of its Commander, Sir Trafford Leigh-Mallory, been able to reconstruct the intelligence staff of S.H.A.E.F. more to his liking, adding S.H.A.E.F. (Air) to the previous intelligence department, G.2.³ But this organisation was concerned mainly with the tactical aspect of the communications problem. Sir Arthur Tedder accordingly insisted that the C.S.T.C. should consider the problem and should set up machinery for this purpose.

A working committee of the C.S.T.C. on communications was, therefore, added to the others. Its first chairman, significantly enough, was Mr. Lawrence, but after a time he relinquished that post to Mr. Wood, who was also a member of the Economic Advisory Branch. The Committee was staffed by experts from the Air Staff, the War Office, the United States Strategic Air Forces in Europe and the Eighth Air Force and it included Mr. Brant of the Railway Research Service, who had long been a principal adviser on this target system.⁴ Representatives from S.H.A.E.F. also attended it and

¹ C.S.T.C. Working Cttee. (Oil) Review, 21st June 1945. For the description of the storage and distribution system, see above, Vol. I, p. 287.

² Mins. of 2nd Mtg. of the C.S.T.C., 25th Oct. 1944. This had been preceded by a special meeting of some of its members on 24th October to consider the new demand on it. Only the effect on the military situation was considered. A number of railway experts and intelligence officers attended this meeting. 'All were in agreement that except in the zone immediately behind the battle the enemy's rail facilities were so vastly in excess of his military requirements that no appreciable effect could possibly be achieved within the envisaged time period' [i.e. the ninety days in which it was hoped to end the war]. Summary of statements by railway experts at the meeting, 26th Oct. 1944, and mins. of the Mtg., 24th Oct. 1944.

³ *The Army Air Forces in World War II*, Vol. III, pp. 621-622.

⁴ Mins. of 3rd Mtg. of the C.S.T.C., 1st Nov. 1944. It consisted at first of eleven members in addition to the Chairman, two each of Operations and Intelligence Directorates of the Air Ministry, two from U.S.St.A.F.E., one from S.H.A.E.F., one from the War Office, one from the Enemy Objectives Unit of the U.S. Embassy, one from the Eighth Air Force and Mr. Brant. Additions were made from time to time and the Committee finally consisted of fifteen members.

S.H.A.E.F. itself continued to make its own appreciations of the situation which by no means always agreed with those of the working committee or with the C.S.T.C. There was thus always controversy over appreciation of this target system and the results obtained by the attacks on it.

After the strategic plans had been interfered with by the Ardennes offensive and an early termination of the war had grown less probable, all the three services demanded a larger share of the effort of the strategic air forces for direct assault on the weapons of the enemy. Thus, the working committee on the G.A.F. were much exercised by the possibilities of the new jet aircraft and that on the Armoured Fighting Vehicles and ordnance depots had to make more detailed studies of the manufacture and storage of tanks, motor vehicles and other weapons. The Admiralty was similarly concerned about the new U-boats. It had its own special committee on that target system which had also always reported to the C.S.T.C. and now pressed its claims upon it. There was thus a complicated problem of deciding priorities within target systems, which in the directives had an equal position.

Finally, though there was no working committee to assess the area offensive, the relation of the attack on towns to those in the other target systems had to be considered by the C.S.T.C., for the former became of considerable importance both to the oil offensive and to that on the communications of the Ruhr.

The machinery thus constituted was undoubtedly far better adapted to the needs of the offensive than any that had preceded it. There were, however, conditions which made the appreciations less authoritative than they might otherwise have been. Neither of the two Commanders was prepared to accept the advice of the Committee except when he agreed with it. Sir Arthur Harris, as has been seen, did not admit the authority of the Committee to decide the targets inside the target systems. General Spaatz remained for the most part in France and took advice from the intelligence departments of S.H.A.E.F. as well as from those in London. The Deputy Supreme Commander and his United States colleagues had no great opinion of direction by committee as the quotation at the head of this chapter indicates.¹ He continued to claim an equal if not preponderant authority in assessing the results of the offensive on communications and the selection of the targets which should be attacked until, in the final stages of the war, the offensive was entirely controlled by his advisers in S.H.A.E.F. or the commanders in the field.

¹ He later denied that this observation was directed against the C.S.T.C. and its working committees, but rather to the whole system from the Combined Chiefs of Staff downwards. But it was drawn from him at a time of controversy between his own advisers in S.H.A.E.F. and the C.S.T.C. and its working committee on communications. Tedder to Bottomley, 8th March 1945, Min. Bottomley to Portal, 9th March 1945.

(b) INTRIGUE AND IMPROVISATION IN GERMANY

Speer maintained his position as Minister of Production and Armaments to the end of this last period. But he was engaged in a struggle with his enemies in high places; he had to yield to them areas of control and share his duties with them to some extent. Hitler refused to part with Speer until, two days before his death, he appointed Saur in Speer's place in his will. But Speer had from the beginning of this period less of Hitler's confidence and found it more and more difficult to obtain the decisions which he required for his work. Gradually he began to ignore or defy his leader and even claims that he planned to murder him. It is difficult to discover both in what manner exactly his position was weakened or how it was that Hitler allowed him to go on at all. For some of his assertions there is ample evidence in the contemporary documents which he handed over to the investigators. But for others there are only his own statements in the interrogations. Nevertheless, the impression of candour that Speer made on many of his interlocutors has to be remembered. If there are inconsistencies in his accounts and those of his subordinates that was inevitable in so prolonged an examination which dealt with such complicated matters. Here all that need be said is what is necessary to give the background of the final collapse of the German economy as a result of the Combined Bomber Offensive.

Speer's position had begun to deteriorate at the very beginning of this period. Even at the end of 1943 he had found it more easy to deal with Hitler by reports than by personal interviews which often led to exhausting argument.¹ In February 1944 he became ill and did not fully recover until June.² This interval gave his enemies, Bormann, Sauckel and Himmler, an opportunity to undermine his influence with Hitler in which they had so much success that Speer contemplated resignation. Hitler made a rather vague order in Sauckel's favour about the use of labour in the occupied territories, a perennial source of dispute between the latter and Speer. Speer was able to evade the consequences of this equivocal decision but there was a more important setback. Speer had refused the materials which the Gauleiters demanded to carry out their own building projects which he wished to stop. Bormann succeeded in getting Hitler to decide in their favour, and Dorsch, one of Speer's subordinates, was

¹ Speer Interrogation, 1st June 1945.

² Speer did not state the nature of his illness or its exact duration, but he visited Hitler at Berchtesgaden on 13th May (Mins. of the Conf., 14th May 1944, Speer Docs. (Hamburg Series) and made a speech in May. He seems always to have been in touch with his work, e.g. Milch visited him towards the end of February to discuss the setting up of the Fighter Staff. He corresponded with headquarters and his subordinates. Milch stated at Nuremberg that Speer's illness 'started in February and I think it lasted until about June'. *The Trial of German Major War Criminals*, Part 8, p. 264. Speer himself stated 'From January until May, 1944, I was seriously ill . . .', do., Part 17, p. 22.

appointed to control such allocations under Hitler's own directions.¹ Himmler was increasing his efforts to penetrate armaments control and had succeeded in securing that of the V-weapons for his protégé, Kammler. As the year went on he was given a number of new offices including, after the 20th July assassination attempt, the command of the Home Army. He and Bormann had succeeded in getting Ohlendorf, who was under Himmler's command in the *Sicherheitsdienst*, placed in an important position in the Ministry of Economics where he stirred up trouble. One or other of these was, perhaps, designed to replace Speer if he could be ousted.²

After the July plot Goebbels was given the post of Reich Commissioner for the Total War Effort, to obtain the maximum manpower for armed services and armaments. This enabled him to enter to some extent into Speer's territory to ensure that manpower was not being wasted. Speer had to appeal to Hitler, for example, to prevent indispensable workers from being called up.³ Bormann, Himmler and Goebbels thus controlled the *Volkssturm* raised in these last months. It was, perhaps, partly due to their influence that so many weapons were wasted on new and raw divisions instead of being given to those which had lost their equipment in battle.

Moreover, during Speer's illness Hitler dealt directly with Saur, Speer's principal and most energetic subordinate, who remained, at any rate until the end of 1944, far more optimistic about the result of the war than Speer was himself. He could not, in any case, in a position much inferior to Speer's, have the possibility of challenging Hitler's decisions or persuading him to adopt more sensible ones as Speer had done. Saur was exonerated by Speer from disloyalty or any attempt to obtain his office. But Speer thought that he was too ambitious and not sufficiently realistic. Others described him as arrogant and bullying. At any rate he failed to support Speer's efforts to make Hitler realise that the war could not be won.⁴

¹ Notes on Confs. with Hitler, 6th and 7th April 1944, written on 9th April 1944, Speer Docs. (Hamburg Series). Letters from Speer were read. Hitler, while agreeing to the continuation of the blocked industries, said that Speer must satisfy Sauckel. Speer Interrogation, 1st June 1945. *Trial of German Major War Criminals*, Part 17, p. 24. Part of the correspondence is given in the Speer Docs. (Hamburg Series). Similarly, Hitler dealt directly with Dorsch concerning bombproof aircraft factories.

² Speer Interrogations, 1st June 1945, and Report, 20th Aug. 1945. He stated during his trial that his powers were 'considerably limited'. *Trial of German Major War Criminals*, Part 17, p. 39.

³ Order by Hitler, 31st Jan. 1945, Speer Docs. (Hamburg Series). Speer Interrogation, 9th Aug. 1945.

⁴ Speer Interrogations, June and Oct. 1945. Koller, made Chief of the General Staff of the *Luftwaffe* on 27th November 1944, for example, called Saur self-opinionated and conceited. Speer said in a speech on 24th June, 'We all know our Saur, we know what to think of him, if he takes the gloves off occasionally and gets a bit rude to all of us, including me.' Nevertheless, Speer obtained the Knights Cross order from Hitler for his subordinate in May 1944. Notes on Conf. with Hitler, 13th May 1944, Speer Docs. (Hamburg Series).

Hitler's decisions on armaments questions became in 1944 as erratic and absurd as they were on strategy and tactics. Speer has stated that Hitler retained a real feeling for the technical problems of armaments until 1944.¹ Others have denied this, though there is much evidence that Hitler made himself familiar with the characteristics of the major weapons and could discuss them with sense and knowledge. But in this period he often pressed for production which was not only impossible but, if attempted, would have disorganised altogether such plans as could be carried out. Speer could not always disregard these orders or persuade Hitler to alter them.

Speer after the war claimed that he knew that it was irretrievably lost as soon as the allied armies had established themselves on the Continent. He did not state this openly, whatever he said on the subject, if he did, privately. In public speeches and conferences with the Gauleiters he still professed that all difficulties could be overcome if the right measures were adopted.² His energy and resource did all that was possible to save the oil plants, to solve the transport crises and rebuild the devastated Ruhr. He still exacted the utmost efforts from the widespread organisation which he controlled. But in his reports to Hitler he stressed with increasing insistence that the war could not be won unless the measures taken to protect production from the bombing attack were successful. Hitler then, as he had done before, forbade any defeatist talk and a number of persons were executed for having indulged in it—at any rate that was a reason given. Certainly no other Minister but Speer ventured to write to him with such explicit references to the possibilities of defeat.

In these circumstances it is surprising that Speer kept his position. It was, perhaps, due to three reasons. Speer certainly compromised to some extent with his enemies. He co-operated with Goebbels and praised his work in his speeches. He announced publicly a reconciliation with Sauckel at a conference with his armaments subordinates and Gauleiters.³ He seems to have used similar tactics with Himmler. At any rate he avoided, so far as he could, a head-on collision with the Party in which Hitler would have decided against him. Even so Bormann and Goebbels demanded in September that he should be

¹ Speer Interrogation, 25th June 1945. '[Hitler] had a good knowledge of technical matters, even in details. Above all, he had a good technical sense. Therefore up to Spring, 1944, the decisions he made in technical matters were clear cut. Only when the situation of the war drove him badly into a corner did his decisions become unclear and illogical.' Others (e.g. Geist, who looked after technical development) had not such a good opinion.

² Speer Interrogation, 2nd Aug. 1945. A last optimistic speech to his colleagues was made on 13th January 1945 which Speer said he regretted and that he had been highly burdened at the time and had the text prepared for him by others. The speech was a laudatory account of production in 1944 and implied that it could still continue. He gave equivocal answers to the questions which followed the speech. Text of speech and subsequent discussion. Speer Docs. (Hamburg Series).

³ Speech by Speer, 24th June 1944, Speer Docs. (Hamburg Series).

forced to resign.¹ But Speer was in a sense indispensable. Hitler must have known that no one else could carry out his work with the same efficiency. And finally Speer had a loyalty to Hitler, never completely lost even when he realised Hitler's basest qualities. In this ambivalent attitude towards his master Speer remained until the end of January 1945.

Then Speer's career became so melodramatic that it is one of the more curious stories of this extraordinary time. But as it only affects in a remote way the strategic bombing offensive it need not be related in any detail here. Suffice it to say that by devious methods he defied his leader and helped to prevent the execution of the 'scorched earth' policy by which, with the active assistance of Ley, Goebbels and Bormann, Hitler tried to destroy all Germany in the final stages of the war. This Speer gave as the reason why he still talked publicly of averting complete defeat. Had he not done so he might have driven the Gauleiters into a policy of desperation. It is hard to explain why he was allowed to go on, even to withdraw his resignation after he had made it and resume control of the destructive work in order to be the better able to prevent it. There is evidence that with the assistance of the army leaders and some sensible Gauleiters he had much success in defeating Hitler's diabolical plans. He himself said that by this time all reasonable men were on his side and ready to defy the orders that came from headquarters.

In addition he did everything that he could to preserve the two essentials, food and transport. He diverted such nitrogen as remained back to fertilisers and gave agricultural machinery priority in production.² On 16th April he prepared a speech to the nation stating that the war was lost and they must endeavour to preserve the essentials of existence.³ Meanwhile, the industrialists, the Army, the workers and the mass of the people struggled on in hopeless confusion like some mortally wounded creature whose spasmodic motions continue long after real life has left its body.

In the midst of this appalling disaster Speer still retained a personal loyalty to the man whom he said that he had planned to murder and whose pathological fury *in extremis* he had for months condemned. He was one of the last Ministers to visit the sordid scene in which Hitler passed his last days and he has stated that he was ready to remain with him to the end if Hitler had wished him to do so. This was, perhaps, partly because he had recognised his own

¹ *Trial of German Major War Criminals*, Part 17, p. 39.

² Memo. Speer to Defence Commissars, Chairmen of Main Committees and others, 2nd March 1945, Speer Docs. (Hamburg Series).

³ Speer Interrogation, 1st June 1945. The draft of the speech dated 10th April 1945 is in his papers and with the help of Gauleiter Kaufmann, a friend of Speer, it was recorded on the Hamburg Radio, but it is doubtful if it was ever broadcast. Speer Docs. (Hamburg Series).

error in accepting Hitler's dictatorship. He admitted that it placed a heavy burden of responsibility upon himself. He had long ago realised that his own system of technological control was in conflict with the basic philosophy of the totalitarian state. But at Nuremberg he admitted the fundamental error of not realising that the *Fuehrerprinzip*, which he had exploited for his own purposes, was bound to result in overwhelming disaster.¹

Yet in this final period German armament production, still in the main under Speer's direction, achieved amazing results and contributed to delaying the inevitable end. Production reached its peak in July 1944 and then declined with increasing acceleration under a hail of bombs. Even then, when, as Speer said, all was improvisation, the process of repairing the destruction and producing armaments and the means of using them went on with undiminished energy.

Numerous new expedients were tried, some with considerable success, others with complete failure. One resource was the attempt to put industry underground, or half underground, with huge cement roofs over it, which amounted to the same thing. This process had begun long ago in a few cases such as those of aircraft production and V-weapons. It was now considered by some as the last resource of the Reich. There was great competition for the available space, that in natural caves and pits and that specially built for the purpose. The aircraft industry had first resorted to it on a large scale after the attack in February 1944. Speer entrusted its direction to a special plenipotentiary² and, in addition to aircraft, ball-bearings and other aircraft equipment, there was added to the list optical glass, ship-building, tanks, motor car and locomotive construction, and munitions and weapons of various kinds. The oil emergency dictator planned a large programme for the oil industries, but in this case the technical difficulties were great and the process began too late for much to be accomplished. Huge bunkers were erected for the final assembly of the new U-boats. Immense quantities of labour and materials were directed to this work and as a result of the effect of bombs upon the fortifications of the Atlantic Wall the thickness of the concrete was much increased. Generally only German workers were employed in underground factories, either because they could produce more or because they insisted on being given the protection such sites afforded.³ No doubt all this did preserve some important

¹ *Trial of German Major War Criminals*, Part 17, pp. 57-58.

² Dr. Heinz Wegener, who gave an account of his work in an interrogation.

³ *Trial of German Major War Criminals*, Part 16, p. 394. The statistics as to the amount of space planned for and actually occupied by underground construction are, as might be imagined was inevitable in the circumstances, confused and contradictory. According to Frydag (former Generaldirektor of Heinkel and Head of the Aircraft Construction Committee), twenty per cent of all aircraft construction, including all that for the Me.262, the new jet aircraft, had been put underground by the end of the war. Frydag Interrogation, July 1945.

factories, but Speer himself was never an enthusiastic advocate of underground construction. He preferred his own expedients of fighter and anti-aircraft artillery defence, smoke, protection of machinery against blast and rapid repair.¹

Dispersal was also intensified, and, so long as the communications were efficient, had considerable success. But some industries could not be dispersed and when communications were attacked the effect was much increased by such methods. The breakdown of postal, telegraph and telephone services caused the gradual disintegration of central control. One of Speer's proposed remedies was to divide Germany into six armaments regions (*Ruestungsbezirke*) so that most of the components could be supplied through local arrangements and only for the balance would it be necessary to have recourse to central authority.² He also made an attempt to get some order into the Ruhr by the appointment of one of his own experts as a super-Gauleiter over the six Gauleiters of the Ruhr district, but Hitler refused to supersede old Party members in this way.³ Similarly at the end of 1944 the number of Main Committees was reduced and the organisation simplified. As early as June 1944 Speer insisted that the Army must not demand any further modifications in their weapons as such changes slowed up production considerably. Only the most essential alterations were to be permitted.⁴ But by this time the situation had gone too far to be retrieved. It was kept going by the local efforts of those in charge, aided by the flying squads of skilled repair workers which Speer had devised and the special repair organisations directed by Geilenberg and others.

The *Reichsbahn* itself was not under Speer's control. But when so much reconstruction was necessary to enable it to function, he gained considerable influence on its direction and in the end made its repair a primary object, not for waging war, but for preserving the existence of the German people. He stated that the situation was such, after the heavy attacks on it began, that it was impossible to make any general plan. All that could be attempted was a series of improvisations to meet recurring crises. Speer saved a good deal of railway transport by increasing direct delivery from the factory to the front and getting the services to give up much of their preliminary testing and modifying of armaments already completed.⁵

There was also the loss of the occupied territories and consequent

¹ Speer Interrogation, 18th July 1945, App. 37 (ii), para. 2. The allocation of smoke screen materials, in short supply because of the scarcity of sulphuric acid, was controlled by Speer himself.

² Speer Interrogation, 21st Aug. 1945.

³ Notes on Conf. with Hitler, 1st Nov. 1944, Speer Docs. (Hamburg Series).

⁴ Discussion with Speer, 9th June 1944, Speer Docs. (Hamburg Series). 'The alteration made by the firms show an average loss in production of more than 15-20%.'

⁵ Speer Interrogation, 30th May 1945, App. 37 (i), para. 13.

loss of raw materials. One of Hitler's arguments for insisting on no retreats was the catastrophic effect on the armaments industry which he said they would produce. This argument was especially used in connection with non-ferrous metals, nearly all of which came from beyond the frontier of the Reich and which were essential for weapon production. But Speer showed him that sufficient stocks remained to carry on the armaments industry for a long period and later asserted that he himself never tried to influence strategy for this purpose. Only as regards Upper Silesia did Speer appeal to the Army; for its loss at that juncture meant that it would be impossible to go on.¹

One of the reasons for which so much production could continue was that there were still surprisingly large stocks of raw materials and components which had escaped previous efforts to ferret them out. Speer instituted a special search amongst the Army dumps and a large amount of much-needed equipment was found.² It is to be noted also that the small firms were less affected by the bombing than the larger and highly organised ones. As Speer pointed out, it was those whose production had been intensively rationalised which suffered most. The aircraft components were little affected by area bombing because the factories making them were now situated for the most part outside the large towns. Thus, large quantities of weapons continued to be manufactured to the end of 1944 and even much later.³

All these measures only delayed the rapid fall in production of everything that was needed to carry on the war. Yet in the midst of the destruction the German armies still fought bravely and the workers still continued their efforts so long as the means to do so were available. They were sustained by the assurances of Goebbels that new wonder weapons would transform the situation. They were also kept to their work by the pressure of the Gestapo. Those with more knowledge still placed hope in the jet fighters and the thought that the Western Powers would fall out with the communist East when the end approached. After the war Speer and others at Nuremberg and some of the defeated Generals asserted that the demand for unconditional surrender had prolonged resistance. But the knowledge of what Germany had done to others and the hope of some miraculous change in the situation played a much greater part.

¹ Report Speer to Hitler, 5th Sept. 1944, where his estimates show that adequate supply was assured well into 1945 and in most cases into 1946. Letter Speer to Guderian, 15th Dec. 1944, Speer Docs. (Hamburg Series).

² Speech by Speer, 3rd Aug. 1944, Speer Docs. (Hamburg Series). Goebbels, who was present at the conference, when it was stated that a stock of 180,000 petrol canisters had been discovered under the heading 'water canisters', interjected, 'That is treachery all along the line.'

³ Frydag Interrogation, July 1945. Schaff (leader of Main Committee for Motor Vehicles) Interrogation, 10th Sept. 1945. Heydekampf (president of Henschel, Kassel) Interrogation.

Until the destruction of Dresden at any rate there was little decline in the will to work.¹ Less people were killed by air attacks in this period than might have been expected because they had learned how to live under such terrible conditions. To the end the workers, like the rank and file of the Army, remained faithful to the man who wished them to be totally destroyed rather than admit defeat. But the means of production had been taken away from them by the bombs of the enemy and the advance of the armies and in the closing weeks all was chaos and confusion. In the next three sections the contribution of the strategic bombing offensive to this result is examined in connection with the various tasks assigned to it.

¹ 'Pressure by the Gestapo succeeded for a long time in maintaining an artificial morale in spite of intense bombardment, but that a limit to this could be reached is clearly exemplified in the case of Dresden. When this catastrophe became known to the whole of Germany, morale disintegrated everywhere in spite of the best or worst efforts of the Gestapo.' Oberst Edgar Petersen (Head of the *Luftwaffe* experimental station at Rechlin) Interrogation, 23rd July 1945. This is only one opinion, but that of a man of wide experience. See also Speer's view, Interrogation of 18th July 1945, App. 37 (ii), Answer (f) to para. 19.

2. The attack on oil

The attack on oil, the cause of much controversy, was carried to a triumphant conclusion before the war's end, which it had done so much to bring about. One of the main factors in this success was the rapid and accurate intelligence concerning a target system composed of more than one hundred targets widespread in the greater Reich, Rumania and Hungary. The machinery by which this intelligence was produced has already been described. Consideration must now be given to the appraisals made and the results achieved.¹

The task of appraisal was complex and, in spite of the immense effort and skill devoted to it, it was inevitable that large errors should be made. Nevertheless, it was performed with sufficient success to provide a reliable guide to the conduct of the oil offensive. Some important considerations were not perceived or were not sufficiently emphasised, but this fact did not affect the constantly reiterated advice that the oil situation of Germany was precarious and that an attack on it would be more rewarding than that on any other target system. If the statistics on which this advice was founded were often inaccurate, the general trend of the oil situation was estimated correctly. Though the totals of the figures for stocks, production and consumption were too high, the variations in them were close enough to reality to enable the advice to be soundly based.

The committees failed, for example, to appreciate sufficiently the effect of the oil offensive on the production of explosives and the effect of the shortage of explosives on the production of oil, but it may be doubted whether it would have made much difference to their advice at this time if they had been able to do so. Nor were they able to assess exactly the distribution of the production of the Bergius hydrogenation plants between aviation spirit and motor petrol. It was in fact impossible to do so, for there could be no certain information of the exact use of these plants which could be directed to different processes. Still, there was less emphasis during the early months of the offensive than might be expected on the supply of aviation spirit on which the ability of the *Luftwaffe* to defend the Reich so clearly depended.

The committees' task was to some extent simplified by the fact that, though the targets were numerous, the most important were few in number, and were all well known. When the weather was

¹ This section is mainly founded on the British and United States surveys of the oil offensive together with information from the Speer papers and other German documents. For the character of the two oil surveys, see Annex V.

at all favourable they could be continually surveyed, and, perhaps, the greatest contribution of the intelligence teams was not their estimates of total production and consumption, but the detailed information concerning the different plants which enabled the air forces to direct their attacks where they could produce the most effect. Here also there were naturally some errors, but the priorities recommended were generally those which would best reward a successful attack.

Though the final campaign against the oil targets of the greater Reich did not begin until May 1944, the work of appreciation had been continued with unremitting zeal and energy through 1943 and the early part of 1944. The committees had to deal with a determined German effort to increase the supply of oil and especially the supply of aviation spirit. If the result was far below what had at one time been considered necessary, much was done and plans were made which would mature in 1944. This situation was on the whole well understood by the oil committees even though they made some mistakes in their calculations.

Since the decision not to attack oil in this earlier period was made largely on operational grounds, it is not necessary to review their reports in any detail. On two important points they made very successful assessments. They were fully aware of the extension in the Bergius hydrogenation plants and the position of the new ones though they did not realise that two of these were designed rather to increase the supply of explosives than that of petrol.¹ They were also very near the mark in their estimates of the amount of Rumanian oil produced and the proportion of it allotted to Germany itself and to its allied armies on the Eastern front.

On the other hand, now as always, they grossly overestimated the production of the Fischer-Tropsch synthetic plants as 1,300,000 tons per annum while the correct figure was 500,000 tons. The amount of oil produced by the refineries from crude oil was also overestimated. Thus, they thought that the German supply was about one million tons greater than it really was.

Fortunately a mistake of almost similar magnitude was made about the consumption of oil. The two errors tended to cancel each other out and the estimates of the general trend of production, consumption and stocks corresponded fairly closely to the actual figures revealed in the post-war surveys. If the level of stocks was placed about a million tons too high, this mistake was due to errors made in previous years. There were some other discrepancies in the calculations, but these did not substantially affect the final result. Thus,

¹ *Oil in the German War Effort. U.S.S.B.S. The German Oil Industry Ministerial Report Team 78 (No. 113), p. 80.*

the advice to the Chiefs of Staff and the Defence Committee was soundly based in spite of the errors made.¹

The United States committee made its own estimates and these differed a good deal from those produced by the British committee. At the end of June 1943, a United States team visited London and a conference took place which lasted two weeks and examined closely the various estimates, the information on which they were based and the reasoning by which the conclusions had been reached. The United States estimate of the stock position was still much higher than that of the British and no agreement could be reached on this problem—only a working hypothesis. On the other hand, the United States team was rightly very sceptical of the British estimates of the Fischer-Tropsch plants. There was, however, complete agreement on the general situation of the German oil supply and the great rewards that could be obtained from an attack on that target system when it could be made successfully. Both teams by their exchange of information, technical knowledge and ideas were able to get a better understanding of their difficult task, and this preliminary meeting of minds was to bear good fruit in the coming year.²

The German effort to increase production had been begun early in the war but the extensive plans then made were never completely carried out. Some of the Bergius hydrogenation plants in western and central Germany were extended, but, as the vulnerability of these plants was recognised, new ones were built in Czechoslovakia and Silesia. It was thought that these would be out of range of attack, though the *Luftwaffe* was also confident of its ability to defend those in the West. Consequently, in spite of some suggestions to that effect, it was decided not to undertake the formidable task of constructing any underground plants. The attack on Ploesti by the Ninth Air Force in August 1943 caused some perturbation and German engineers were sent there to advise on the situation, but, though considerable damage had been done, the alarm was only temporary.³ Moreover, the amount of Rumanian oil allotted to Germany could be increased as Italy dropped out of the war. Meanwhile, civilian consumption was drastically reduced and an effort made to use

¹ U.S.S.B.S. *The German Oil Industry*, pp. 79–84. *Oil in the German War Effort*. The main British figures as submitted to the Chiefs of Staff were given on 10th April, 25th June, 18th August and 17th November 1943. For the British appreciation of 27th May 1944 and the actual figures, see App. 49 (xxxvi), (xxxiii), (xxxiv) and (xxxv). The special difficulties as to stock calculations have been discussed in Vol. I, p. 288, fn. 2.

² Record of the American–British Conversations on Axis Oil, 28th June to 12th July 1943.

³ Report of the Operations Staff of O.K.W., undated. British Bombing Research Mission Paper, 8th Nov. 1944. The gallant low-level attack of the Ninth Air Force did more damage than was appreciated at the time, more indeed than any one of the attacks of 1944, but its casualties were so heavy that it could not be repeated until April 1944.

substitute fuels for this purpose, while military vehicles were fitted to utilise bottled methane (*Treibgas*) produced in the hydrogenation plants.

Thus, in spite of the great battles in the East, production increased more than consumption. The stocks of aviation spirit, motor petrol and diesel oil had grown by May 1944 from 800,000 to 1,336,000 tons, of which 574,000 was aviation spirit.¹ The precarious nature of the supply of aviation spirit and explosives was realised, but it was hoped that this situation would be remedied as the new plants in eastern Europe and the extensions to the others came into full operation. The use of aviation spirit had, however, to be economised as much as possible. One obvious means was to reduce the supply devoted to training. The temptation was not resisted so that the training hours of the *Luftwaffe* crews were reduced while those of the Anglo-American air forces, already larger, were being increased.²

But the real urgency of the position was still not fully recognised. An allied attack from the West was in preparation, even if some Germans in high position thought it would never take place. This would increase consumption and make it necessary to draw on the reserves. Moreover, the supply was specially vulnerable because so large a proportion of the most valuable production was centred in a small number of targets. Nearly one-third of the Bergius hydrogenation production was contained in the two large plants of Leuna and Pölitz and over a third more in five other plants. Thus, over two-thirds of their production could be lost by the destruction of seven targets. Much synthetic production was concentrated in the Ruhr and the allied advance in Italy had given new bases for attacks on the oil of Rumania and central Europe. When it is remembered that ninety per cent of the aviation spirit came from the Bergius hydrogenation plants and most of the rest from Rumanian oil, the threat to the *Luftwaffe* was obviously a great one. These plants were also a main source of supply of synthetic nitrogen and methanol.

The refineries of crude oil were a more difficult target because they were numerous and there was more refining capacity than could be used. But a number of the most important were in the West, especially at Hamburg and its twin port Harburg. The others were naturally mainly situated near the oil fields of Austria and Hungary, but these were now within range of the Fifteenth Air Force. Thus, though the danger to the oil supply was appreciated in Germany,

¹ *Oil in the German War Effort*. The total production of Greater Germany was almost eight million tons, of which forty-seven per cent was produced in the hydrogenation plants. See App. 49 (xxxiii). Other reports as to stocks vary somewhat from the figures in the text.

² The effect on operations was only gradual. German reports regarded training as satisfactory during 1943, but by May 1944 the reduction in fuel for this purpose was beginning to have effect and the effect was cumulative.

the full extent of the danger was not realised until too late. The oil target system was more vulnerable than the Germans imagined or, indeed, than the oil committees had ventured to predict.

But, as has been seen, their arguments had appealed to General Spaatz, though the attack by the Eighth Air Force in May was defended on different grounds from those put forward by the committees. Sir Arthur Harris joined in the attack in June. Even with the limited force used, the effect was immediate and greater than had been anticipated. For the first time in the war a vital target system had been chosen when the force and skill necessary to destroy it were available.

For in May the total production of automotive fuels fell to eighty-five per cent of that of April and in June to fifty per cent. This amount was progressively reduced in August and September until in the latter month it was less than twenty-five per cent. Moreover, aviation petrol had suffered the heaviest loss, for the attack on the Bergius hydrogenation plants had attained the greatest success of all. From 11th to 18th September no aviation petrol was produced by them and the total production of that month was only 10,000 tons, to which the hydrogenation plants only contributed slightly more than a half.¹ The Fischer-Tropsch plants had also been severely hit and though the refineries of crude oil had not suffered to the same extent, the supply of motor fuel was reduced by nearly two-thirds by the end of September, while the supply of diesel oil was barely half of that of the first quarter of 1944.²

This success was the result of a really combined offensive. All three strategic air forces had helped to produce it. The Fifteenth Air Force had reduced Rumanian production to less than half in June, though the Germans by taking complete control of reconstruction measures had raised this total considerably in July and August. In this last month the Rumanian fields were occupied by the Russians and this supply, which included the annual 10,000 to 15,000 tons of aviation spirit, entirely ceased. Then the Fifteenth Air Force was free to concentrate on plants in the East and the oil refineries in Austria and Hungary. Meanwhile the Eighth Air Force, in addition to attacks in the West, had severely damaged Leuna, Pölitz, Zeitz, Brück and Böhlen, the principal plants of central and eastern Germany. Bomber Command during these short nights had been confined to attacks on the oil plants in the Ruhr and west Europe. But they had done immense damage and Scholven and Nordstern near Gelsenkirchen had been almost completely knocked out with others

¹ Of the ten thousand tons 4.7 thousand was produced by the benzol and other small plants according to an Economic Intelligence Report of the *Luftwaffe* dated January 1945, see App. 49 (xxxix).

² See App. 49 (xxxiii) and (xxxiv).

of the Ruhr plants, so that production there was almost at a standstill.¹

At the same time the defence against the double attack on the Western and Eastern fronts had increased German consumption of these fuels. That of aviation spirit rose by 46,000 tons in July and, if consumption was drastically reduced in August and September, this was because stocks were rapidly decreasing. There had been a similar rise in the consumption of motor fuel and, though civilian consumption was again cut by nearly half, stocks of this fuel were also running low.

The serious nature of the attack on oil was immediately recognised in Germany and great efforts were made to cope with it. Speer at once took energetic action and he obtained from the Fuehrer headquarters complete priority for his measures of defence. The one thing unobtainable, which he recognised was the only real defence, was for the *Luftwaffe* to inflict such losses on the attackers as to cause them to abandon their attempt. But large numbers of anti-aircraft guns were sent from other localities to increase the defence of the hydrogenation plants so that they became veritable fortresses, *Hydrierfestungen*. Concrete blast walls were built round the most important parts of the plants. Smoke screens were set up or increased in volume, though the acid that produced them was in short supply because most of it was made from the products of the Leuna nitrogen plant which had been severely damaged. New decoy plants were designed to divert the bombers from the real target. Shelters were constructed for the workers in or near the plants so that they might take remedial measures or resume their work at the earliest possible moment.

All these measures had some effect. The anti-aircraft fire increased casualties to some extent and helped to reduce the accuracy of the attack but by no means prevented it. The concrete gave some protection from blast, especially that from the lighter bombs of the United States air forces, but it could not prevent these from cutting pipelines and other vital links in many places. Smoke was, perhaps, the most effective defence, but it was by no means sufficient, because of the strength and skill of the attackers. The decoy plants sometimes diverted a good part of the bombers to the wrong target but the rest were able to inflict substantial damage. The morale of the workers varied in different plants. In a few they were only kept at work by terrorisation and special supervision, but in the majority of cases they did all that was possible. They were especially affected by the raids of Bomber Command because they lasted so much longer than those of the United States air forces.²

¹ Report Speer to Hitler, 30th June 1944, App. 32 (i).

² The experts of the United States post-war survey made an assessment of all the

But Speer's main defence was to repair the plants as rapidly as possible, and he adopted his usual method of appointing for this purpose a special director with unlimited powers. He chose Edmund Geilenberg, described by him as 'the most active of my Main Committee Chiefs'. The proper functioning of his organisation, Speer said, will 'practically be decisive for the war'. He hoped also that the British Air Staff would, like the German, be so exalted by their success that they would leave too long an interval between attacks and thus enable some considerable quantity of oil to be produced.¹ This hope was not altogether unfounded though not primarily through the fault of the Air Staff and its advisers.

It was impossible to disperse the oil industry as the aircraft industry had been dispersed. The plants were too complicated to build quickly. Some dispersal was obtained by constructing numbers of small distillation plants in sheltered places and increasing the number of the benzol plants, but this could only be a small contribution to the total supply. Speer at first rejected the proposal to place hydrogenation plants underground. But after three months, almost as a policy of despair, Geilenberg was authorised to undertake this project and an enormous effort was made. None of this was effective before the war ended and, even if it had been begun earlier, it is unlikely that any substantial production could have been achieved, for the projected plants were far behind schedule.

Meanwhile Geilenberg proceeded more successfully with his task of repairing the plants as rapidly as possible after each attack. Large numbers of workers were employed; 7,000 engineers were released from the armed forces and an unlimited supply of slave labour was placed at his disposal. Large quantities of concrete and steel were used. In August, Speer stopped all new construction above ground and the machinery as well as that from irreparable plants was used for repairing others. The special repair squads were kept at the plants after repairs were finished so that the work could be immediately restarted if another attack came.² By this means plants were repaired over and over again though with more difficulty as the attack continued. It was this effort of repair that had to be overcome if the attack was to succeed as quickly as was now hoped by those surveying it in Britain.

During these summer months when reconnaissance photographs could generally be rapidly obtained their appreciations of the attack

various means of defence in the plants themselves in consultation with German officials and were able to accumulate many interesting facts. They found, for example, that at one period as many bombs fell on the Leuna decoy plant as on the plant itself.

¹ Speech by Speer, 2nd June 1944, Speer Docs. (Hamburg Series).

² Speech by Speer, 3rd Aug. 1944. Notes on Conf. with Hitler, 28th Nov. 1944, Speer Docs. (Hamburg Series).

were on the whole very successful. In spite of initial errors, the extent of the reduction in production was very accurately measured.¹ Even more important was the fact that the amount of destruction in the several plants attacked was realistically assessed and the advice as to when they should be again attacked was generally sound. Speer, it is true, claimed that, as he had hoped, the attack was often not made sufficiently quickly to prevent some production being obtained. But this for the most part was not due to errors in assessment but to other causes such as the weather, operational difficulties and the necessity, or supposed necessity, of attacking other targets.

There were, of course, some errors which are revealed by the post-war surveys. These, for example, criticise the intelligence teams for making mistakes about the exact lay-out of the plants and thus choosing the wrong aiming point; but surely mistakes of this kind were inevitable. It is suggested also that too much attention was given to the Fischer-Tropsch plants and the refineries because they produced so little aviation spirit. Certainly too great a priority was given to the Fischer-Tropsch plants because their capacity was over-rated. But when it is said that if they were bombed at all they should have been bombed heavily enough to keep them out of production altogether, this judgment takes too little account of operational difficulties.² It would appear that the Ruhr plants were as a whole over-bombed in comparison with others, but that was largely because of their proximity.

It is also, as has been already noted, surprising that more emphasis was not placed at an earlier date on the probable effect on aviation spirit, a point which might have been expected to make a special appeal to the Commanders of the Air Forces. For this was Speer's principal anxiety at this time. He had already pointed out that unless the Bergius hydrogenation plants could be enabled to produce a reasonable amount, the *Luftwaffe* would before long be unable to make any defence at all. Speer's hopes now lay in the approach of autumn when the weather would deteriorate and thus by diminishing the weight of the attack not only enable some production to be obtained but also allow the German air force and armies to be regrouped and reduce their consumption of aviation spirit and motor petrol.³

¹ See, for example, the estimate of 3rd October, App. 49 (xxxvii). The estimate for September is extraordinarily correct. These appreciations were revised each week as further information was obtained, but after a time those for the earlier months remained unchanged.

² *U.S.S.B.S. Effects of Strategic Bombing* (No. 3), p. 82. The Fischer-Tropsch plants produced only five per cent of the total supply and received twenty per cent of the bombs.

³ Report Speer to Hitler, 30th June 1944. Telegram Speer to Bormann, 16th Sept. 1944. For both documents see App. 32 (i) and App. 34. This last telegram was given a wide circulation amongst the top leaders of the Reich to combat a widely prevalent

These hopes seemed for a time to be justified. The reduction of the attack in October allowed the production of aviation spirit to rise from 10,000 to 29,000 tons and in November to 46,000 tons.¹ Consumption also decreased. Some of this was due to further drastic economies, the practical cessation of training and the use of other fuels for aero-engine testing. But much was also saved, as Speer had predicted, by the reduction in the allied attack. Not only was there less aerial activity and land fighting in the West, but the Russian attack was halted for five months except on the Hungarian front. For this reason there was also a reduction in the consumption of motor petrol while its production increased by a few thousand tons. Thus, the oil for the Ardennes offensive could be accumulated without stocks being entirely exhausted.

In November the attack on oil was increased and, so far as the Ruhr plants were concerned, was very successful. The benzol plants there were now placed high in the schedule of priorities. These were numerous but the positions of many of the most important were known and the attack was fairly successful. Some were injured by the area bombing of Bomber Command. The attack on communications also brought a heavier weight of bombs to bear on this area. It was the plants in central and eastern Germany that now needed more attention. The Eighth Air Force attacked Leuna several times, but it could not do sufficient damage to prevent some production taking place and the same was true of other plants in this area. Pölitz the Eighth Air Force could not reach in the short days and Pölitz was now producing substantial amounts of aviation spirit.

This partial recovery in production was realised by the oil committees and their findings were in October endorsed emphatically by the C.S.T.C. They, indeed, had an exaggerated view of the quantities of oil being produced. Their information was much less complete than in the summer months because reconnaissance was often impossible and they naturally in such circumstances sometimes advised unnecessary attacks on plants in the Ruhr which could not recover for a long time. Still the large plants there needed some attention and the committees were entirely right in thinking that Leuna, Pölitz and Brück were the principal producers of aviation spirit. From October onwards they began to emphasise this aspect of the attack, for the effect of the shortage on the *Luftwaffe* was already apparent. These plants with Böhlen were placed at the top of the priority list.

view that reconstruction was a hopeless task because immediately followed by a new attack.

¹ There are some discrepancies in the figure for the total amount of aviation petrol produced in November, but it was over forty thousand tons and three-quarters of this was produced in the three plants of Pölitz, Leuna and Brück.

During October and November Bomber Command made no attacks on oil outside the Ruhr-Rhineland area. Here it did as much as could be expected and only a little oil came from the large plants there. But this valuable contribution only absorbed a small part of the resources of Bomber Command. It was strongly urged, therefore, that Bomber Command should also attack the central European plants, where the bulk of the synthetic oil was now being produced. The reasons why this was not done sooner have been discussed in Chapter XII. As has been seen, the result was a substantial rise in the production of oil and especially in that of aviation spirit.

This situation was, however, changed during December and the first part of January, when, in spite of the distraction of the Ardennes offensive, the production of the central and eastern plants was much reduced. Bomber Command made an attack on Leuna on the night of 6th December following a day attack by the Eighth Air Force. It seems likely, however, that it was the night attack that caused the greater damage and practically stopped production. At the end of the month Bomber Command attacked Pölitz. In January further heavy attacks were made on Leuna and Pölitz, while Zeitz and Brück were also bombed. Meanwhile the Eighth Air Force had been able to do little in this area, but the Fifteenth Air Force in December in a most successful series of attacks not only stopped production completely at Brück, but also to a very large extent in the Silesian plants, a month or more before their capture by the Russian Army. The total result of these attacks, together with the bombing of those in the West, and the benzol plants there, was to cause a great reduction in the supply of aviation spirit. In December it was down to 26,000 tons, in January it fell to 11,000 tons and in February it was no more than a trickle. If motor petrol and diesel oil had not suffered to the same extent, the Ardennes offensive had used up oil in the West and the Russians began their winter offensive in January which caused new demands from the East. By the end of January stocks had been so reduced as to limit the *Luftwaffe* to occasional forays and made much more difficult the defence of the Eastern front.¹

There can be no doubt of the great part played by Bomber Command in this great success. Their heavy night attacks were the main cause of the principal plants being put out of production altogether, for in most cases the lighter attacks of the United States air forces could not in such a season be repeated often enough to secure this result. 'It has now been reported', wrote Speer on 19th January,

¹ See App. 49 (xxxviii) and (xxxix). The production of the benzol plants was reduced from an average of fifty thousand metric tons a month in the third quarter of 1944 to twenty-one thousand metric tons in January of which only 9,500 could be used as motor fuel. *U.S.S.B.S. The German Oil Industry* (No. 113), pp. 60-61.

'that the attacks which take place so often at night now, are considerably more effective than daylight attacks, since heavier bombs are used and an extraordinary accuracy in attacking the target is reported'. Bomber Command could hardly have had a more handsome testimonial.¹

In February and March it was comparatively easy to pursue the offensive to its logical conclusion, for there was hardly any resistance by the *Luftwaffe*. As the major plants were completely destroyed attention could be given to smaller ones, including the smaller benzol plants, and still the number of targets was decreasing. Finally only the smaller distillation units and some benzol plants were left together with the supply that came from the Hungarian fields and such refineries as were still running. There are few reliable statistics for this period, but no aviation spirit was produced and the other fuels were in very short supply. The German armies and the *Luftwaffe* were limited to the stocks in the depots. In the final stages of the war these were also subjected to devastating attacks which had important results.

These depots were, as has been seen, of two kinds, the permanent depots with underground tanks and the more numerous smaller depots and dumps of the fighting forces fed by the former. The Oil Committee had not thought at the beginning of the offensive that the underground depots were likely to be very profitable targets. But, in the course of the invasion, the tactical forces, assisted to some extent by the strategic forces, had attacked the depots in France with great success, and as a result a number of attacks were made on the main depots in Germany. It had become apparent that, while the underground storage tanks themselves could not be injured, important damage could be done to the installations above ground and the transport facilities. These attacks were not, however, persisted in systematically, because they were not given a high enough priority until late in the autumn and were then suspended because of the claims of what were considered to be more important targets during the attack on the Ruhr communications. In the closing stages of the war, however, the depots were bombed repeatedly, mainly by the tactical forces, and with important results on the last German efforts of resistance.²

Speer showed by his letter to Hitler in January that he had now lost all hope of increasing the supply of oil since no production could

¹ Report Speer to Hitler, 19th Jan. 1945, see App. 32 (v). This is confirmed by the United States team in a detailed study, *U.S.S.B.S. Oil Division Final Report* (No. 109), pp. 134-135. This was true of attacks on refineries as well as on the synthetic oil plants as was shown by a detailed examination of the large refinery at Misburg. do. p. 82.

² *Oil in the German War Effort, U.S.S.B.S. The Impact of the Allied Air Effort on German Logistics* (No. 64a), pp. 69-71.

be expected from the underground plants for several months. He had other outstanding difficulties. The attack on communications had begun to exert its effect on the supply of armaments and to affect the whole economy of the Reich. But another factor which affected even more directly the defence was the shortage of explosives. This was a direct result of the attack on oil quite unforeseen by those directing it.¹ They had not realised that the injury to the nitrogen plants would affect the production of explosives to such an extent. The manufacture of explosives was mainly centred in or near the oil plants so as to use the nitrogen produced there which in some of the larger plants could be employed either as the raw material for oil or for explosives. Leuna and Oppau (near Ludwigshafen) produced half the total supply. Since the same basic material was used to produce agricultural fertilisers, M.E.W. had always considered that any reductions in its production would fall on agriculture and not on explosives. This was true enough in the early stages of the war but not so in this period because of faulty planning and the fact that Germany no longer obtained the 30,000 tons a year produced in occupied territories. The supply for agriculture was, indeed, drastically cut down, but that for explosives had also to be greatly reduced with considerable effect on the means of defence. The manufacture of the most powerful explosive (hexogen) had to be abandoned because it consumed so much more of the basic material. Nor was there even then sufficient of this and the filling of the shells had to be supplemented with other materials, mainly with rock salt, which, of course, reduced considerably the power of their blast. Already at the end of August Speer had to report the serious effect of the oil attack on the whole chemical industry and particularly on explosives because the supply of methanol had decreased to a quarter of that previously produced while the supply of nitric acid had been halved.²

This situation was eventually recognised by M.E.W. but very late in the day and the possibility of producing such a result had not been used in the arguments put forward for the oil attack nor the consequences of its first success brought to the notice of those directing it.³ In their post-war survey the United States experts reached the conclusion that the failure to select the ammonia and

¹ This subject is examined in detail in *U.S.S.B.S. Powder, Explosives, Special Rockets and Jet Propellants, War Gases and Smoke Acid (Ministerial Report 1)* (No. 111) whose findings are endorsed by the *Oil Division Final Report*.

² Report Speer to Hitler, 30th Aug. 1944, App. 32 (iii). Methanol is the principal constituent of hexogen. In the Speer Papers there is a document of the Plenipotentiary-General for Special Questions on Chemical Production giving details of the effect of the attack on the five principal sources of methanol.

³ M.E.W. Six-Monthly Report, 28th Feb. 1945. The previous report, while recognising the reduction in the supply of nitrogen, had not foreseen the effect on the supply of explosives.

explosive plants as primary objectives was a serious mistake, and that if the situation had been realised earlier a more rapid collapse of the German resistance could have been brought about. This conclusion is, however, of very doubtful validity. No great effect could have been produced before the oil attack began, and, once that had begun, there was greater advantage in concentrating on oil than in making explosives the primary object of the attack. But, as it was, the effect was important and it is curious that the connection was not brought sooner and in a more emphatic manner to the attention of the Chiefs of Staff who would certainly have been interested in it.¹

The attack on oil also produced a similar effect on the supply of synthetic rubber. This material was produced in four big plants, all of which derived the nitric acid necessary for their purpose from the nitrogen plants of the oil installations. The damage to Leuna, Scholven, Nordstern, Ludwigshafen and the chemical works at Leverkusen deprived them of the greater part of their supply. The production of rubber was cut by half. But the loss does not seem to have had any serious effect on the German means of defence because stocks were sufficient to allow the most important products such as aircraft tyres to be manufactured in sufficient quantities. The United States post-war survey concluded that, if the connection between rubber and oil had been more clearly recognised, the attack would have been differently directed and so much loss caused as to reduce to a significant degree the supply of aircraft and motor vehicles. But, as in the case of the explosives supply, it does not seem probable that this would have made much difference to the course adopted in 1944.²

But, whatever view be taken of these problems, there can be no doubt that the attack on oil had an immense effect on the course of the war. The defeat of Germany was due to a combination of pressures, but the attack on oil made a large contribution to the allied victory. No doubt victory was certain once the allied armies had established themselves in France. But the final struggle would have been more difficult and more costly, if the attack on oil had not reduced the mobility and efficiency of the German air forces and the German armies.

The efficiency of the *Luftwaffe* was impaired by the shortening, and in September almost complete cessation, of the training of its pilots in petrol-powered aircraft. From November at least, it had not

¹ *U.S.S.B.S. Oil Division Final Report*, pp. 42-43. The British general survey (*B.B.S.U. The Strategic Air War*, pp. 152-153) does not accept the United States view but for rather different reasoning. The question is not discussed in the report of the British Oil Committee.

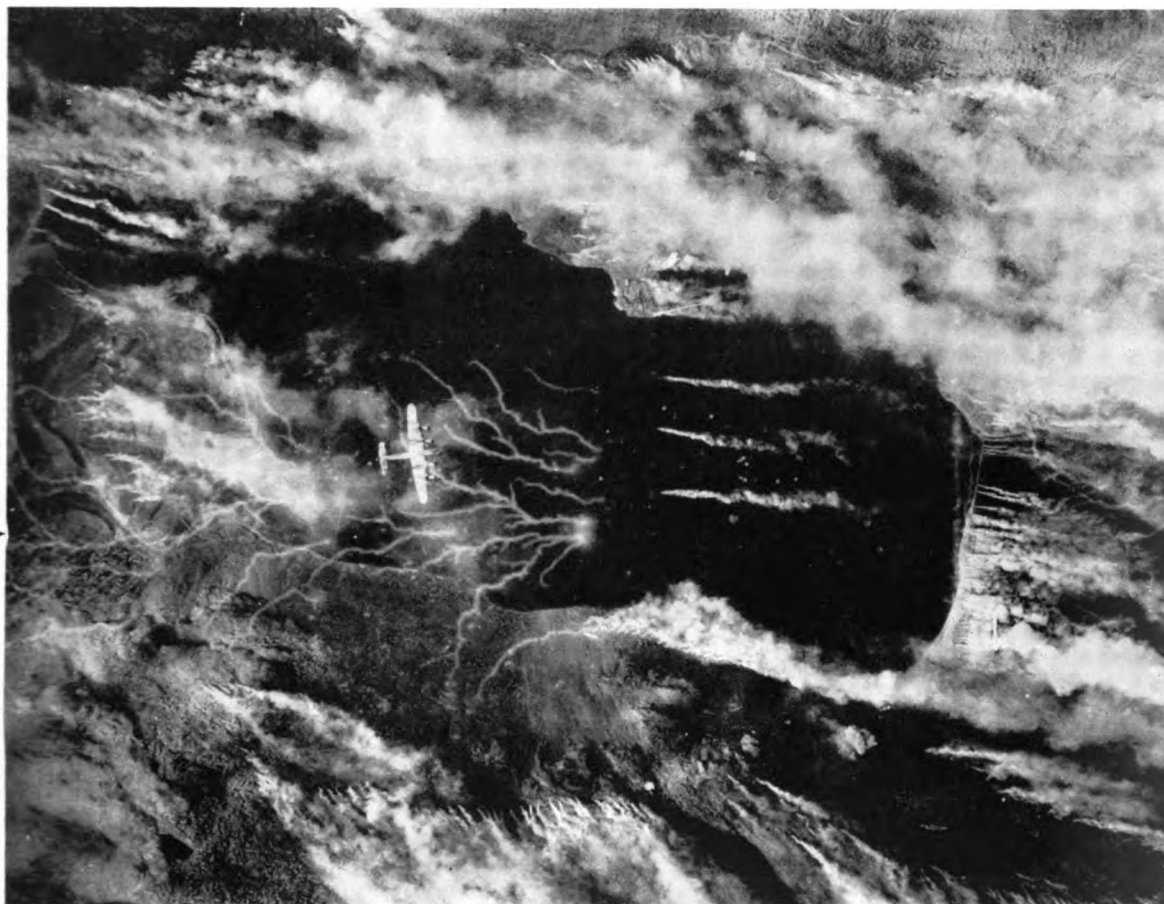
² *U.S.S.B.S. Oil Division Final Report*, p. 57. The stocks of rubber, though large, were not as large as M.E.W. supposed when it considered the question of synthetic rubber as an objective.

enough fuel to use the aircraft and pilots at its command. Though it still showed courage, neither its day nor night forces could appear in sufficient strength to make any sensible impression on their enemies. Night fighter sorties, for example, even under heavy attacks, had often to be restricted to fifty or less. In this situation both Speer and Galland, the Inspector-General of Fighters, wished to abandon this makeshift defence and wait until a force of 2,000 fighters could be accumulated and sufficiently fuelled to make a devastating attack on a large bomber fleet. But, even if this expedient had not been abandoned, it could never have had great success, for the aviation spirit did not exist to provide the necessary training for so difficult a manœuvre. Some hope was given by the acquisition of the jet fighters and there were grave fears about this new weapon in allied circles. But these too were greatly weakened by the deficiency in oil. Though there was a sufficiency of the special oil required for them until a later date, some of it was of inferior quality, owing to the damage caused in the refineries, and the pilots had lacked sufficient training in conventional aircraft and were unable to make the best use of their new machines. It was noticed how rarely and how late in the offensive they attacked the United States formations and this attitude, so different from that usually shown by the *Luftwaffe*,¹ could only have been due to the fact that they were inadequately trained.

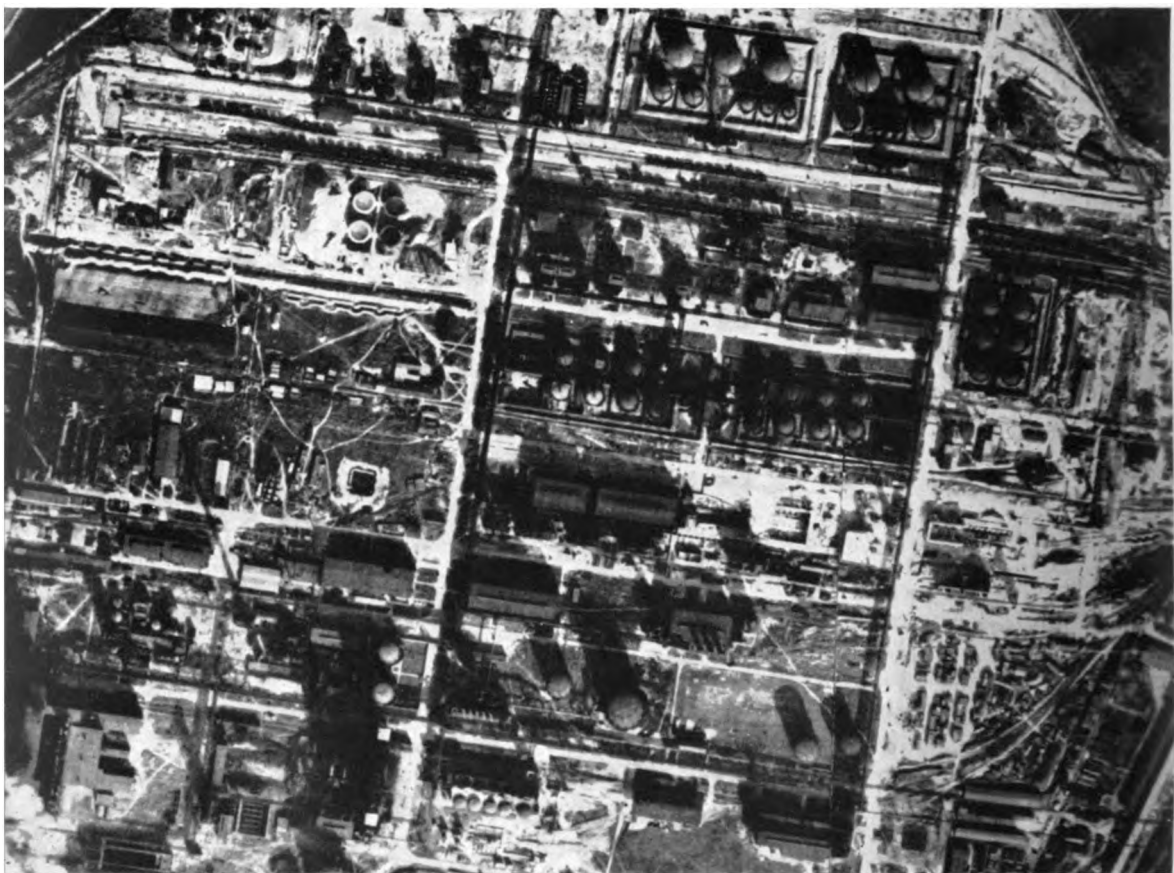
Thus, the allied air fleets, except on rare occasions, had almost complete air ascendancy both by day and by night, and it was this ascendancy that enabled them to pursue with such success the other strategic objectives of this period as well as the attack on oil. The attack on communications and those much less important but still useful ones on aircraft construction, tank factories and depots and submarine yards, were made much more effective because of it. The area bombing too would, also, have been less destructive and more costly if this situation had not been created. In addition, the reduction in the supply of explosives caused some restriction on the anti-aircraft artillery. Their gunners were ordered only to use their shells when the aircraft were immediately overhead, and they felt confident of causing casualties. For this reason, though the main plants were still heavily defended, the journey to them was less dangerous than it might have been.

Similar effects were produced on the German armies, but their extent is a more complicated and controversial question. Nor are the facts on which judgment must be based as well established as those concerning the *Luftwaffe*. The fighting in the East has not been sufficiently analysed and our knowledge comes largely from the statements of German generals which cannot be checked in the same

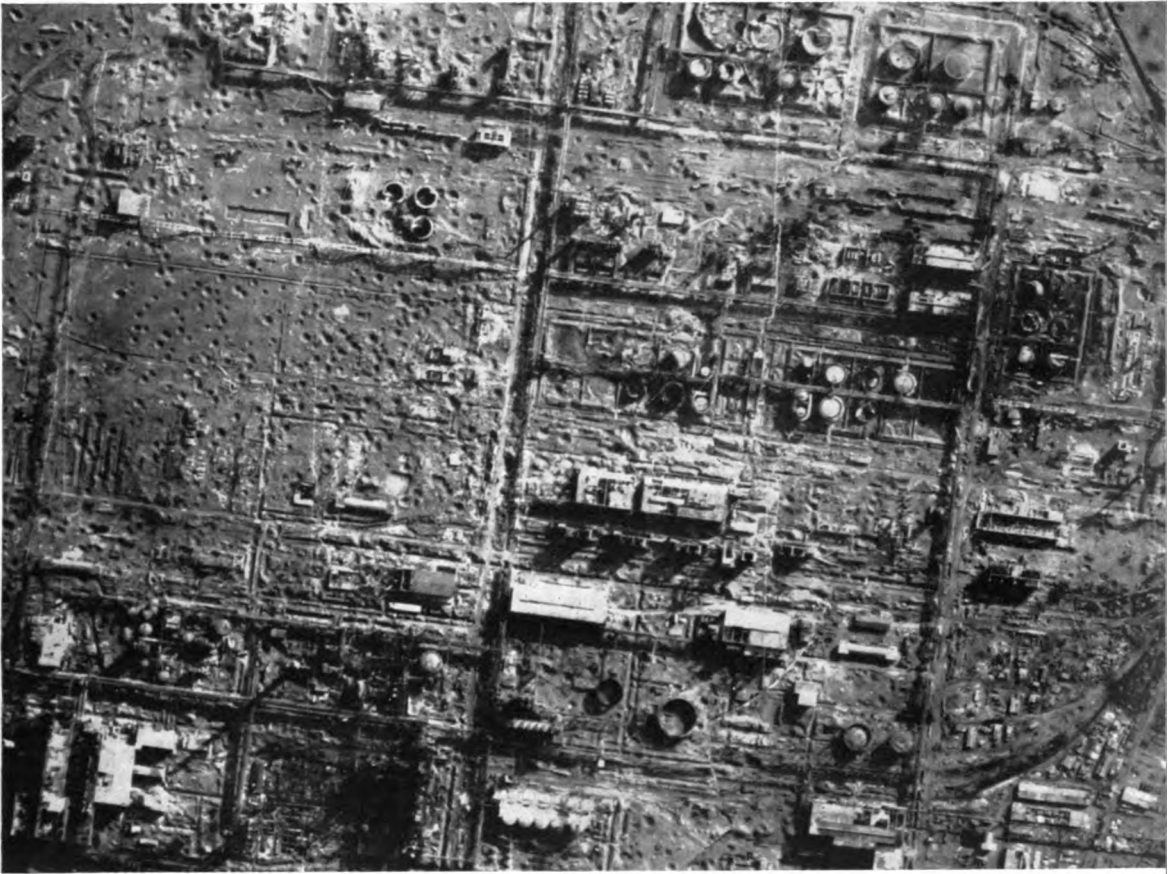
¹ *The Army Air Forces in World War II*, Vol. III, pp. 729 and 740.



17. The attack on the *Tirpitz*, 15th September 1944. This photograph was taken just before bombing began. The smoke screen obscures the battleship whose position is indicated by arrows.



18. The oil plant at Zeitz before attack.



19. The oil plant at Zeitz one month after Bomber Command's attack on the night of 16th January 1945.



20. The oil plant at Pölitz before attack.

Note: the A, B and C were placed on the original war-time photograph, but have no significance in this context.



21. The oil plant at Pölitz in February 1945 after attack.



22. The Bielefeld Viaduct on 17th March 1945.



23. A *Grand Slam* bursts on Arnberg Bridge during the attack on 19th March 1945.



24. Nienburg Bridge after the attack on 22nd March 1945, showing
Grand Slam craters.

way as those concerning the fighting in the air. In the West a number of different causes were operating and there is conflict of opinion as to the influence of each on the final result. All that can be said on this point is that their task would have been more difficult if the German fighter forces had had more training and fuel, though it must also be remembered that some of this fuel was destroyed by the bombers of the tactical forces or prevented from reaching its destination by the attack on communications. But the Russian air force had not previously established such complete air superiority and their attacks must have been assisted by the growing weakness of the German fighters.

There can be no doubt also but that the mobility of the German armies was much impaired by the lack of motor fuel. By the end of 1944 the motorised supply columns of the infantry divisions were forced to use horse transport and armoured divisions lacked sufficient fuel to move as they wished. Diesel-fuelled vehicles had to tow petrol-fuelled vehicles and much time was thus lost. It is generally recognised that the lack of fuel was one important cause of the failure of the Ardennes offensive. At any rate it is claimed that the centres of resistance such as Bastogne, so stubbornly defended by the United States soldiers, would certainly have fallen quickly if the tanks had been able to move with the speed which a plentiful supply of fuel could have given them. Some of this difficulty may have been caused by the attack on communications, but the number of oil units allotted to the Panzer divisions was quite inadequate in such a terrain and in such weather as they had to contend with. This is the classical case of a direct and immediate effect in the West. There is another for the East. Both Jodl and Speer insisted that the Russians could not have broken out of the Baranov bridgehead and captured Upper Silesia if 1,500 tanks accumulated for its defence had not been incapable of tactical manœuvre because of the lack of fuel. Speer added that a similar effect had been produced during the Ardennes offensive and, indeed, from December onwards on the fighting efficiency of all the German forces, because they could not use even such armaments as could still be supplied to them. For this reason, he thought that the lack of oil fuel had an even more decisive effect on the course of the war than the difficulties in armaments and communications.¹

¹ The Baranov offensive was often referred to but the above reflection is taken from a special report of Speer which includes much documentary evidence. His final words were: *‘Durch die Verluste in der Treibstoffindustrie war auch die verringerte Rüstungsproduktion für den Kampf bereits im Dezember 1944 und Januar 1945 nicht mehr auszuwerten. Der Verlust an Treibstoff war daher für den Kriegsverlauf nach meiner Ansicht noch entscheidender als die Schwierigkeiten in der Rüstung und im Verkehr.’* (‘As a result of the losses in the fuel industry it was no longer possible even in December 1944 and January 1945 to make use of the reduced armaments production in the battle. The loss of fuel had, in my opinion, therefore, a more decisive effect on the course of the war than the difficulties in armaments and

It has been suggested, indeed, that no sensible effect resulted from this cause until February 1945.¹ But this view can hardly be accepted. There is much other evidence of effects similar, if smaller and less catastrophic, than those produced in the Ardennes and Upper Silesia.² Though the German commanders were used to working with a minimum of oil and for months previously had employed every kind of means to reduce dependence upon it, yet their power of resistance was obviously impaired by lack of it. The shortage of explosives must also have had an effect though this is hard to measure. Only the stubborn fighting of their infantry and the inability of the allied armies in the west and Italy to overcome the difficulties of terrain and logistics that confronted them enabled the resistance to be so long prolonged.

It had been expected that even when the forces of the Reich had been broken to pieces much isolated and costly fighting would have to take place before they were finally overcome. That this did not occur was also in part due to the destruction of their last few stores of oil by the allied air forces, the tactical forces playing the most important role in this offensive.³ It can thus be said that while there were many factors in the final defeat of the enemy, the reduction and eventually almost the entire destruction of their oil supply and especially of their aviation spirit was of the first importance. None of the other means of pressure could have been applied with such success if the attack on oil had not taken place. It is, perhaps, also as well to remember at this point that the attack on oil could not have been successfully pursued had not allied air superiority over Germany first been established. But the attack on oil was an important factor in the maintenance of that air superiority and its eventual development into air supremacy, even when the Germans had a significant lead in the design of fighter aircraft through the new jet-propelled machines.

The attacks on other objectives during this period must also have contributed something to the success of the attack on oil. Some of the United States experts did not, however, consider that this contribution was of much importance. They did not think that the attack on communications had much effect on the supply of oil until a date when the destruction of the plants was already nearly complete.⁴ It certainly, however, at an earlier date affected the

communications.') Report compiled by Speer from original documents, 6th Sept. 1945, Speer Docs. (Herford Series).

¹ *U.S.S.B.S. Effects of Strategic Bombing* (No. 3), p. 81.

² *Oil in the German War Effort*. The shortage also affected the training of the tank crews as it did that of *Luftwaffe* pilots.

³ *U.S.S.B.S. Impact on German Logistics* (No. 64a), p. 71.

⁴ The British survey does not agree with this conclusion, but the United States team based its opinion on an examination of the situation in a number of plants and it seems

programme of dispersal and the distribution of the oil to its final destination. There was little storage room at the plants and, when the supply of tank cars was inadequate, production had to be somewhat reduced.¹ It is also sometimes claimed that the underground plants would have been completed if transportation difficulties had not slowed up the process. Here again, however, the effect was too late in the day to have made any important difference to the result.² In most of the plants also raw material was close at hand and its supply little affected by damage to rail transport. Similarly area bombing, though it often reduced electric power and water for a short time, had not, in the opinion of the German technicians, any important effect on the production of oil. The plants in the Ruhr where it might have produced this effect were destroyed at an early stage of the offensive. But, as has been noted, some of the benzol plants there were destroyed by area bombing and no doubt production in others was reduced by the same cause. The large mobile units necessary for the work of repair and rehabilitation also used up some motor petrol which could ill be spared. All this bombing and that on other targets in Germany which was going on in these months added to the general strain on the German direction and the German people and the cumulative effect no doubt increased somewhat, if only a little, the rate at which the decline in oil production proceeded.

Moreover, much depended on how fast the effect could be produced. It has been seen how production, which seemed in September to be about to be reduced to an insignificant amount, increased in October and November and that it was not until December and January that the decline began again at an accelerated rate. Damage was then inflicted which could not be repaired soon enough to get any production before another attack could be made. The heavy bombs of Bomber Command nearly always caused damage which it was difficult to repair and in December the attacks of the Fifteenth Air Force seem to have been very effective. No doubt also, as Speer reported, after repeated bombings it took longer to repair the same amount of damage owing to the general deterioration of the plants.³

One handicap in the bomber offensive should be mentioned here. It was the large percentage of bombs that failed to explode. It appears

well founded. Both teams also suggest that the destruction of communications would ultimately have produced the same result by depriving the plants of their raw material. But apart from the fact that the decline in the supply of oil aided the attack on communications, the latter could not have produced the result in the same period of time. *B.B.S.U. The Strategic Air War*, pp. 153-154. *U.S.S.B.S. Oil Final Report* (No. 109), p. 32.

¹ Speer Interrogation, Aug. 1945. *U.S.S.B.S. The German Oil Industry* (No. 113), p. 64.

² 'It is safe to say that under the most favourable conditions, it would have been at least a year before any substantial production would have come from the underground plants.' *U.S.S.B.S. Effects of Strategic Bombing*, p. 62.

³ Speer Interrogation, Aug. 1945.

also that the percentage of such British bombs was higher than that of the United States bombs. The main cause does not seem to have been due to faulty fusing but to the fact that the tails of the bombs broke away so that they fell flat.¹ If this heavy wastage could have been reduced the production of oil would have been lowered at an even more rapid rate.

Could this result have been obtained two or three months earlier if a greater effort had been made in the autumn to complete the destruction of the remaining Bergius hydrogenation and Fischer-Tropsch plants? There can be no certain answer to this question because no one can say exactly how successful the attempt would have been or how far it would have reduced the German resistance. But as has been seen in Chapter XII, there seems to have been at least a fair chance that the attacks would have been almost as successful in October and November as they undoubtedly were in December and January.

In December also the attention of the strategic forces was diverted to the protection of the armies during the Ardennes offensive. Had that offensive not taken place undoubtedly more attacks would have been made on the oil targets. How many could have been made in the three months October–December if Sir Arthur Harris had had the same view of the situation as Sir Charles Portal it is impossible to say. In any case some production would have been possible in the smaller plants and the distilleries. But if the supply of aviation spirit could have been prevented from rising above the September level, the *Luftwaffe* might have been in almost the same position by the end of January as it in fact was three months later.

It is by no means certain that this would have stopped altogether the Ardennes offensive for the final stocks might have been used for that purpose. Nor would it have induced the Russians to resume their offensive on the main Eastern front for their inaction was due to other causes. In any case the Germans would have prolonged this resistance by the stubborn fighting of their infantry as they did in the final stages of the war. All that can be said is that, if it had been possible to press home the attack earlier, there can be little doubt that the collapse of Germany would have come sooner.²

¹ *U.S.S.B.S. Oil Division Final Report* (No. 109), pp. 130–132. The judgment is based on the records of a number of plants which showed unexploded U.S.S.A.F. bombs 12·2 per cent; R.A.F. bombs 18·9 per cent; unidentified bombs 24 per cent; a British team found that as many as 29 per cent failed to explode on one Ruhr plant. O.R.S.(B.C.) Report, 6th Nov. 1945.

² The United States special oil investigators have no doubts on this problem. They roundly declare that 'Even a small part of the bombs dropped on cities would have sufficed to completely knock out oil targets at a very early date.' This judgment does not consider the question of dates and ignores the operational difficulties. *U.S.S.B.S. The German Oil Industry* (No. 113), p. 64. The United States general survey does not pronounce on this question. The same view was put forward by many German high-ranking civilians

It is thus hardly possible not to agree with the judgment which Sir Charles Portal had at the time that neglect of the opportunities provided by the oil offensive might prolong the war for several months. As has been said in Chapter XII, this view was shared neither by Sir Arthur Harris nor by some others in a position to influence the objectives of the attack. Fortunately when Sir Charles Portal made the observation the turning point had already come. But had it come earlier the unreasoning pessimism of the Western Alliance in January might have been avoided and the more optimistic view of October might have continued to persist. In this case less thought would have been given to using the strategic air forces to assist the Russian offensive and more to winning a rapid victory in the West. If this could have been achieved not only would many German and Allied lives been saved, but there would also have been political consequences of great importance to the future of Europe. So great were the stakes of the oil offensive.

and military men, but without consideration of the operational factors of which they knew little. The British general survey does not consider 'that many tactical opportunities for the attack of oil targets were missed'. *B.B.S.U. The Strategic Air War*, p. 24.

3. The attack on communications

There was much controversy concerning the choice of targets in the communications target system. This was partly due to its extent; for this target system was much the largest and most complicated. But there were other causes of disagreement about it. There were from the outset two intelligence organisations studying it and they differed radically from one another in their appreciations. The Working Committee in London and its parent, the C.S.T.C., had little belief that an attack on this target system would produce important strategic results. A very different point of view was taken by Sir Arthur Tedder, who initiated the attack, and his advisers in S.H.A.E.F., especially Professor Zuckerman, who had advised him on this subject during the successful attacks on communications in Sicily, Italy and France. Sir Arthur Tedder also had the advice of the intelligence departments of S.H.A.E.F., G.2 and S.H.A.E.F. (Air). Though these to some extent shared his outlook, they were also much influenced by the wishes of the army and air commanders. The meetings of these commanders in France, though naturally Sir Arthur Tedder played an important part in them, had an influence on the targets chosen, all the more so since General Spaatz and Sir Arthur Harris were often present.

This influence was due to the fact that an attack on communications served a tactical as well as a strategic end, and the tactical air forces took part in it as well as the strategic air forces. In every plan that was made both these ends had to be taken into account. Sir Arthur Tedder was no doubt right when he insisted that this was the only target system on which all the different air forces, both strategic and tactical, could concentrate. But that very fact caused such a diverse number of targets to be selected that concentration for strategic purposes was not obtained until four months had elapsed. This diversification of targets would not, however, have been so extensive if General Eisenhower had not thought it necessary to attack on a broad front, one, indeed, extending from the mouth of the Scheldt to the Swiss frontier.

The selection of the targets was also influenced to some extent by the desire that a plan should be made to finish the war by the end of 1944, which, as has been seen, was first expressed by General Marshall towards the end of October. The excessive optimism of early September had by now diminished, but it was still thought in some quarters that the German front in the West could be crumpled up by a special effort of the allied forces. This optimism was, how-

ever, turned into a pessimism equally extreme by the Ardennes offensive of the German armies which also had an immediate and permanent effect on the selection of the targets. The controversies between the intelligence organisations were heightened by these two emergencies and new criteria had to be applied in their appreciations. So far did the pessimism go that the allied strategic air forces were diverted to some extent to an attack on the communications in the east of Germany rather than in the west, to assist the Russian advance rather than that of their own armies.

The existence of these differences of opinion as to what targets should be attacked caused differences of opinion as to the results of the attacks that had been made. The assessment of the strategic, as distinct from the tactical, results of an attack on communications is in the best circumstances a very difficult problem. Each intelligence organisation tended to stress in the multifarious and often inaccurate intelligence about what had been accomplished those parts which seemed to justify its own view of what targets should be attacked.

But, if a concentrated attack was not achieved until a late stage of the offensive, there were in the meantime big results from the attacks that were made. Some considerable concentration on the Ruhr was obtained through the attacks on the other target systems which were competing with that on communications. There is no doubt that the results were of great importance. It can be demonstrated that the attack on communications played a major role in the final collapse of Germany. It is more difficult to ascertain at what period the attack became decisive and to isolate its effects from the other factors operating at the same time.

It can be seen, therefore, that, when the newly formed Working Committee on communications was called upon to make a plan and draw up a list of the targets to be attacked, it had an intractable problem to solve. There was available for its guidance the experience of the successful attack on communications in France and Belgium. But this had been made for tactical purposes. Both the strategic and tactical air forces had taken part in it, the latter having played an important role in the later stages, when targets nearer the invasion area could be attacked. The strategic air forces had been the main instrument in producing what was sometimes called attrition, by which was meant the destruction of railway centres and marshalling yards, which not only hindered immediate operations but destroyed the facilities for rapid repair. Both the strategic and the tactical air forces could then be used with greater effect for what was termed interdiction, to cut railway lines, destroy bridges and attack locomotives and rolling stock in motion. All this was done with great skill in a comprehensive plan, but at the end of it there was still

much controversy as to whether the attrition or the interdiction had contributed most to the successful result of the attack.¹

There had also in the years before the invasion been much bombing of communications with a strategic end in view. But this had not been done as part of a scientific or comprehensive plan. Communication targets had been used by both British and United States strategic air forces as an aiming point in what was really area bombing, or as last resort targets, when the weather or other causes had prevented crews from reaching their primary objectives.

At the same time it had long been recognised that the best results could be obtained by an attack on the communications of a selected area rather than by distributing attacks over the whole railway system of western Germany. The key to a successful strategic attack on communications lay in the importance of the hard coal of the Ruhr, which supplied not only the industry situated in the region itself, but many of the plants of northern, central and southern Germany. Though there were many lines of communication between the Ruhr and other parts of Germany, a large proportion of its coal was carried by one or two main-line routes and by the canal system of north-west Germany. It was thus, perhaps, possible by a concentration on these to seal off the Ruhr from the rest of Germany and deprive the latter of one of the main means of production. This fact had long been apparent to those studying the communications target system in London, but other considerations prevented them from advocating a plan drawn up for this purpose. They were preoccupied with the idea that the plan had to serve a tactical purpose in forwarding the advance of the armies. It had, therefore, to deal with an area contiguous with the military front. Targets had also to be found within the plan for the Fifteenth Air Force. It was, therefore, difficult to devise any very considerable concentration of effort. The fact that neither the Working Committee nor the C.S.T.C. believed that important strategic results could be obtained in a short period also influenced their choice of targets. On the other hand, Sir Arthur Tedder and some of his advisers, though not all of the intelligence departments of S.H.A.E.F., were convinced that the offensive could have an immediate and, perhaps, decisive strategic effect.

There thus arose the rather curious situation that the advisers on strategic attack in London were inclined to lay emphasis on the tactical aspect of the offensive, while some of the tactical planners at S.H.A.E.F. were much concerned with the strategic aspect. At the same time these latter were also influenced by the demands of the army staffs, who naturally were most interested in the immediate

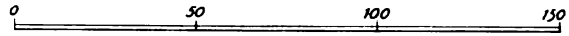
¹ See, for example, *B.B.S.U. The Effects of Air Attack on Inland Communications*, p. 71. The dispute is summarised in *The Army Air Forces in World War II*, Vol. III, pp. 160-161.



Plan of Attack on German Communications

7th November 1944

Scale of Miles



Legend

Zones of Attack ①

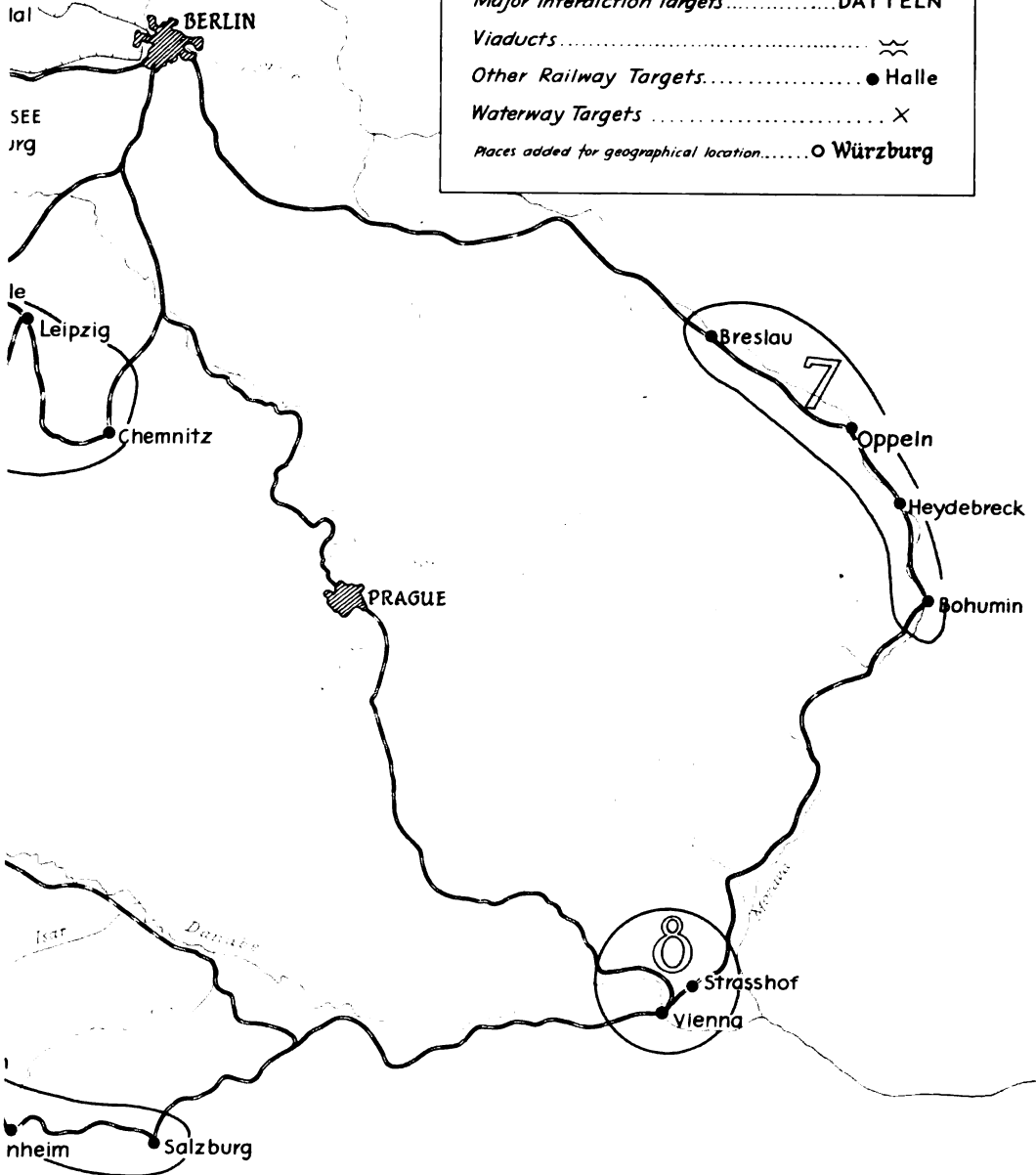
Major Interdiction Targets DATTELN

Viaducts ⚡

Other Railway Targets ● Halle

Waterway Targets ✕

Places added for geographical location ○ Würzburg



CEK

assistance which could be given to their own offensive. The inevitable compromises produced a wide distribution of the targets.

The plan¹ of the Working Committee, on which S.H.A.E.F. was represented, was approved by Sir Arthur Tedder before it was presented to the C.S.T.C. on 8th November. The first two objectives were tactical, to provide the maximum assistance to the military operations on the Western front and also to assist as far as possible those on the Italian and Eastern fronts. The strategic objective was placed third, to exert the greatest possible pressure on the enemy's war production.

The plan was based on a number of important assumptions. In the first place the opportunity for successful interdiction, such as had been so successfully employed in Belgium and northern France, was thought to be much less in Germany itself because of its highly developed railway system. Secondly, it was thought that the planned all-out attack in the Ruhr, known as *Hurricane I*, and the continuous attacks on the oil plants in that area would contribute to the attack on communications, though not specifically aimed at them. Thirdly, investigations in France had shown, it was claimed, that repair and recovery could be rapidly accomplished unless an attack was continuously maintained on the railway centres and marshalling yards. Finally, since the waterways carried so large a proportion of the traffic, they must also be included in the target system.

In order to produce the necessary tactical effect the attack was to be delivered on the area between the whole length of the Rhine and 10 degrees East, a line running through Hamburg–Hanover–Würzburg–Ulm. This was a very large area so that it had to be divided into zones in each of which the tactical air forces should proceed to carry out a plan of interdiction while the strategic air forces attacked the main railway centres and marshalling yards. Nine zones were laid out, and it was added that 'the priority of attacks between zones should be determined by current military requirements and by their relative importance in war production.' Obviously these criteria might or might not coincide. But in addition it was suggested that five major interdiction targets should be subjected to attack by the strategic air forces. Three of these were key points in the Dortmund–Ems and Mittelland canals and two others, the Bielefeld viaduct and, almost as important, one of the viaducts on the Soest–Hildesheim main line, the most important connection between the Ruhr and central Germany.²

¹ Review of Working Committee (Communications) C.S.T.C., Oct. 1944–May 1945 dated 14th June 1945. The plan was dated 7th November 1944.

² The zones were (1) North-eastern approaches to the Ruhr, (2) Frankfurt–Mannheim, (3) Cologne–Coblenz, (4) Kassel, (5) Karlsruhe–Stuttgart, (6) Magdeburg–Leipzig, (7) Upper Silesia, (8) Vienna, (9) Bavaria. The last four zones were designed for the Fifteenth Air Force and, it was said, would fit in with the oil offensive. See map 9.

The targets were thus distributed over a vast area, but it was also laid down that it was the business of the Working Committee to recommend priorities among the targets to be attacked by the strategic air forces. The C.S.T.C. had insisted on this, largely, it would appear, so that they might safeguard the priority of the oil offensive. But it was for S.H.A.E.F. and the Army Commanders to decide where the tactical air forces should be used while the Deputy Supreme Commander had also the right on tactical grounds to call on the strategic air forces to assist them. The list of targets drawn up by the Working Committee for the strategic air forces were sixty-nine in number, mostly marshalling yards and main junctions, some of which had already been subjected to attack on many occasions. Those which were adjacent to built-up areas and thus specially suitable for attack by Bomber Command were designated as such.¹

Such concentration as there was in this plan was provided in the special priority targets, the Dortmund-Ems and Mittelland canals and the viaducts on the main lines to the East, all of which were directed to isolating the Ruhr. This concentration might be increased if the Working Committee was able to ensure that its recommendations were carried out. But this did not in fact occur. The most successful part of the offensive was that on the canals. The Dortmund-Ems Canal had, as has been noted, already been hit by Bomber Command in September and October. No sooner was it repaired than it was cut again on 21st November and another successful attack was made on 1st January. The Upper Rhine had also been blocked to a considerable extent before the offensive began by the accidental destruction of the Cologne-Mülheim bridge on 14th October during an area attack on Cologne. Traffic both on the canals and the Rhine itself had been reduced to a small percentage of that normally carried.²

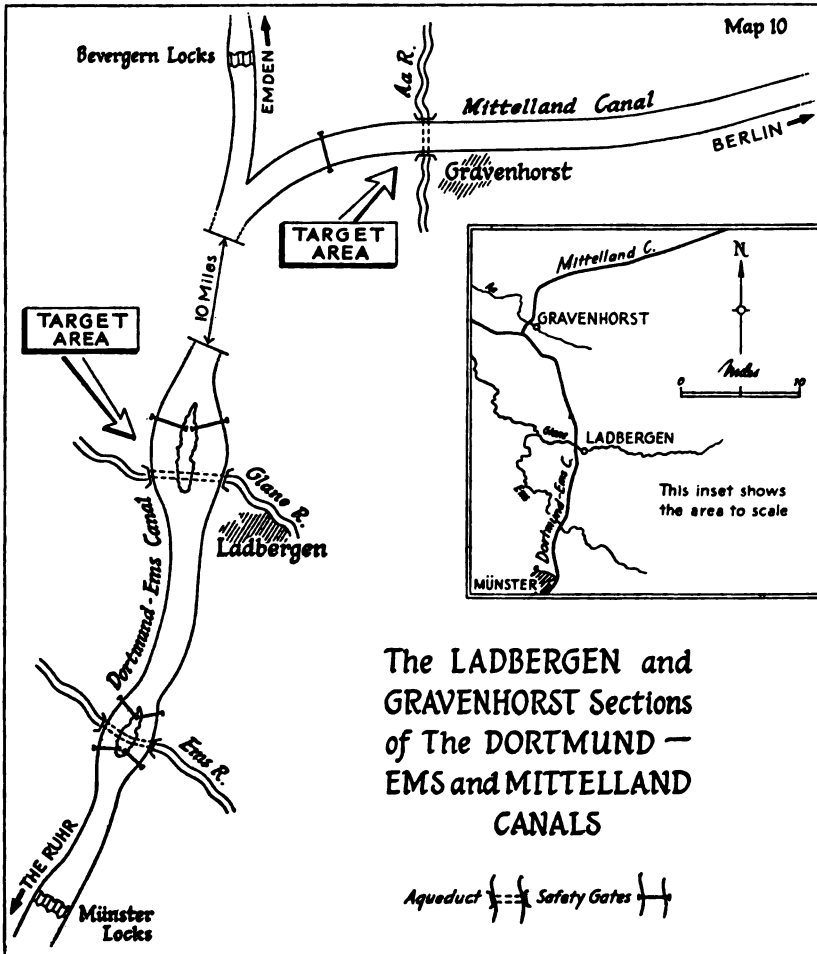
But though a hundred and twenty other attacks were made on communications before the Ardennes offensive they were widely distributed and the viaducts of the main lines were not cut. The autumn weather not only made the attacks more difficult, but prevented the results from being known in many cases. Thus, the main sources of information were not the reconnaissance photographs, but more general intelligence which was unreliable and difficult to assess.

It is not surprising, therefore, that there was no general agreement as to how the attack was progressing when it was interrupted by the Ardennes offensive. That offensive showed at any rate that the attack

¹ Review of Working Committee (Communications). It had been agreed at the meeting at S.H.A.E.F. on 26th October that Bomber Command should continue to attack built-up areas, but that marshalling yards and railway centres should be chosen as aiming points as far as possible.

² The details are given in App. 49 (xlv).

on communications had not prevented the enemy from bringing a heavy concentration of troops and armour into the valley of the Eifel. Nor did the Working Committee think that the attack on communications had produced much effect on the supply of armaments. Only bulky raw materials, such as coal, would be affected by it and their loss would not interfere with the production of armaments for



some months to come. They also strongly disagreed with S.H.A.E.F.'s opinion that the attacks on locomotives had had a serious effect on transportation. It was agreed that there had been a considerable decline in the efficiency of the railways, but in London this was thought to be as much due to the wear and tear of exceptionally heavy traffic over the last five years and the additional strain placed

on them by the dispersal of industries, as to the recent attacks on communications.¹

At S.H.A.E.F., on the other hand, a much more optimistic view prevailed.² The plan had been closely watched there. S.H.A.E.F. demanded a weekly report on results from the Working Committee, but in addition it began to issue one of its own which was much more favourable. In its meetings in December the C.S.T.C. strongly supported its Working Committee when the latter insisted, through its new Chairman, Mr. Wood, that the strategic results could not be ascertained. There was, indeed, some difference of opinion on the subject in the C.S.T.C. But the prevailing tone was sceptical. Air Commodore Bufton refused to believe that any such effect could have been produced as was suggested at S.H.A.E.F. by the comparatively small weight of bombs distributed over so wide an area. Mr. Lawrence said 'that the C.S.T.C. had been compelled to adopt the attack of communications targets as an act of faith.' No assessment had, therefore, been made, as had been done in the case of other target systems, of the weight of bombs necessary to produce the desired effect. It was not possible, he said, to estimate the results from the information available.³

Thus, by the time the Ardennes offensive had expended itself there was acute controversy as to what had been accomplished and what the future targets of the communications offensive should be. It had been pointed out that there was a conflict between the tactical and strategic objectives, but it was not thought that this made much difference to the result.⁴ The difference of opinion went deeper than this. The C.S.T.C. and its Working Committee were always afraid that the oil offensive would suffer, while Sir Arthur Tedder believed that, apart from tactical results, the targets of the communications offensive could be so chosen as to impair the German ability to resist by destroying their means of production of armaments of all kinds.

In actual fact, as post-war records reveal, the optimism of Sir Arthur Tedder was nearer the truth than the more sceptical attitude held in London. A considerable effect had already been produced on the communications of the Ruhr and the left bank of the Rhine though less on the rest of the area attacked. Much of this effect had

¹ Review of Working Cttee. (Communications). The Committee made a special examination of the locomotive position and showed, as indeed was the case, that there was no serious shortage.

² S.H.A.E.F. Paper, 5th Dec. 1944.

³ Mins. of the 9th, 10th and 11th Mtgs. of the C.S.T.C., 13th, 22nd and 27th Dec. 1944. Mr. Lawrence said that some 20,000 commercial intercepts were received a week. No analysis of them was likely to be particularly instructive on this problem.

⁴ Mins. of 9th Mtg. of the C.S.T.C., 13th Dec. 1944. Colonel Gardiner said that the choice of area nearly always depended on the weather.

been produced in the months preceding the planned attack on communications by that which had taken place for military reasons on many of the traffic centres in western Germany. The Saar, for example, had been devastated as was shown by a decline of nearly four-fifths in the 5,000 wagons allotted to the Saar coal trade. By October the number of wagons allotted to the western railway divisions had fallen by one-half.

The decline was not so rapid during the next two months, thus to some extent confirming the judgment of the London Committees. Nevertheless the cumulative effect of all the bombing on communications was already considerable, both on those inside the Ruhr and the Rhineland and on those connecting them with the areas north and south which depended on its coal. The most important result had been produced by the attack on the canals. Though repairs, camouflage and a rapid rush through of traffic at night had enabled some increase of tonnage to be obtained in December beyond the mere five per cent of normal which had been able to pass through in November, the attack at the end of that month had again completely blocked most of the canal. Though the rail connections with the Ruhr had not been so severely damaged, there had been considerable concentration on the Ruhr itself by Bomber Command in its area attacks and in the oil offensive. The internal as well as the external communications of the Ruhr had been injured more than was suspected in London.¹ Thus, the supply of coal to the rest of Germany was already seriously reduced, nor could the Ruhr itself be supplied with the same tonnage of ore. Steel production had fallen sharply. Ten railway stations were unusable and fifty others seriously injured. Outside the Ruhr coal stocks were rapidly falling including those of the *Reichsbahn* itself which needed hard coal for its engines. By the first week of December more than half of the railway divisions had no more than four days' reserve and priority had, therefore, to be given to its coal before all other demands.²

Speer had begun to be preoccupied with the situation in the Ruhr almost as much as with the supply of oil. Though transport was outside his sphere, he began to take action in an endeavour to improve conditions which were becoming impossible. He tried by interviews and special reports to make Hitler realise the serious nature of the

1	Western German Reichsbahndirektionen		Wagons allotted	
	Nov. 1943	Oct. 1944	Nov. 1944	Dec. 1944
(a) For all purposes:				
Western R.B.D.s combined	1,131,732	641,769	549,228	394,802
(b) For coal:				
Daily average	16,700	8,000	7,700	8,200

B.B.S.U. The Effects of Air Attack on Inland Communications, p. 182.

For the effect on transport by water, see App. 49 (xliv).

¹ See App. 36, and below, p. 257.

crisis. He informed Keitel also and asked him to provide greater anti-aircraft defence of vital points in the canals and important railway centres, since the *Luftwaffe* seemed unable to protect them.¹ He obtained Bormann's co-operation to rouse the Party to assist in the work of reconstruction. In a speech to the Central Planning Organisation on 8th November he used the phrase often since quoted: 'It is transport that governs all of us'. This was because production depended on the ability to transport the coal to the factories. The Ruhr was thus the key to the continuation of the manufacture of armaments. 'The battle of the Ruhr is a battle for the existence of the Reich, and the battle of the Ruhr has got to be won'.²

The Ruhr itself was being devastated by the area attack as is shown in the next section. Speer himself took energetic action. 4,500 specialists, mainly electricians, were brought into the area to assist the repair of telecommunications and other indispensable installations. To facilitate transport inside the Ruhr he made a special allotment of 5,000 tons of oil fuel as well as 300 anthracite coke generators so that tractors could be used for short hauls of coal to keep the gas and electricity works and essential industries in production. For production had almost ceased in some parts of the area and this could not be borne. 'It is clear,' he told Hitler, 'from Germany's overall economic structure that in the long run the loss of the industrial area of the Rhineland-Westphalia would be a mortal blow to German economy and to the conduct of the war.'³

There were, however, some consolations. As in the case of the oil offensive, Speer placed some hope on the autumn weather and the enemy's lack of perseverance in the attack. There were large stocks of raw materials and components in the hands of the manufacturers. The coal available had to be used for the most important industries. It could be brought from the Silesian coal fields, provided always that the railways could function and they must have overriding priority. In the second half of December Speer made an inspection of the Western front and made a number of recommendations for the better use of army transport. One of the most serious difficulties was the almost complete destruction of the railway telecommunications service and he suggested that some improvised system should be set up with the aid of the Party Organisation, which should also provide local labour for the repair of railway lines and facilities. At the same time he insisted that the supply of weapons was still adequate and that their quality was improving. What was nullifying the Ardennes offensive was the total lack of movement in daytime, a

¹ Report Speer to Keitel, 7th Nov. 1944.

² Speech by Speer, 8th Nov. 1944, Speer Docs. (Hamburg Series).

³ Letter Speer to Hitler, 11th Nov. 1944, see App. 35. It seems, however, that but little extra motor transport actually reached the Ruhr.

condition which the army seemed to accept without sufficient effort to overcome it.¹

This situation was certainly not understood in London. The Working Committee and the C.S.T.C. were so far right that a period must elapse before the injury to communications affected the production of weapons. But they did not realise the serious effect of the shortage of coal on all the activities of the Reich. They were still afraid that increased attention to communications would jeopardise the attack on oil, which, they thought, would produce a much more rapid and direct effect on the fighting capacity of the German armies.²

These controversies had been produced by the attempt of the Working Committee to review the effects of the strategic offensive in order to provide the basis of a new plan. It was now working very closely with S.H.A.E.F., where the tactical aspects of the plan could be considered with fuller information and experience. But there was still the controversy between London and S.H.A.E.F. as to the strategic effects that had already been produced and were likely to be produced by further attacks. The consequence was that it was nearly two months before a plan was finally adopted and the isolation of the Ruhr made the main object of the attack. Meanwhile, under the current directives and as a result of the decisions of the army and air commanders, much had already been done by the attack on communications to disrupt the economy of the Reich.

In the review made by the Working Committee it was agreed that the attacks on the communications, both road and rail, during the Battle of the Ardennes had been very successful and so far as rail transport was concerned had practically sealed off the battle area. But this effect had been produced by a concentration of all the air forces on a limited area in which every kind of target had been subjected to attack. They could not expect to produce any strategic results of a similar nature since the attack would still have to be distributed along a broad front. For, though General Eisenhower had agreed that an attack by the armies north and south of the Ruhr should be the main offensive, he was still concerned to push the rest of the enemy front back from the Siegfried line to the Rhine. How soon the main attacks could be mounted was also a matter of doubt. It was not, therefore, considered possible to concentrate on the approaches to the Ruhr and the plan again divided the area to be attacked into zones, though only five in all on this occasion. Concentration on any one of these could be obtained, it was suggested, if it fitted into the tactical object. The whole plan in fact

¹ Report by Speer, undated.

² Mins. of 14th Mtg. of C.S.T.C., 17th Jan. 1945.

was still based on tactical and not on strategic grounds. In addition it was thought that the strategic air forces should be concentrated on areas where, as a result of the Ardennes offensive, great damage had already been done. Thus, the north-eastern approaches to the Ruhr were only placed fourth in the list of priorities.¹

When this plan was submitted to the C.S.T.C. it met with considerable criticism. That Committee hoped to resume the oil offensive at full intensity now that the immediate threat to the allied armies had been removed. They were under the impression that these would not resume their offensive for two or three months, in which case there would be little tactical result from the plan. The Committee was divided as to whether important strategic results could be obtained in a limited time. It was admitted that a shortage of coal had been produced in the northern ports and elsewhere and that the destruction of the Bielefeld and Paderborn viaducts would greatly increase it. But, it was suggested, quicker results would be obtained by direct attacks on oil and weapons. Strategic results could at any rate only be obtained if the attack was concentrated on a limited area. Oil, it was pointed out, affected enemy resistance everywhere, while an attack on communications was limited to a small area.²

Naturally this point of view was not accepted by S.H.A.E.F. and the advance of the Russian armies into Silesia converted Mr. Wood, the Chairman of the Working Committee, to the view that the reduction of the coal still available from the Ruhr would now have immediate results on the German capacity to produce and transport armaments and, indeed, on the whole economy of the Reich.³ This same fact also emphasised the necessity of concentrating on the Ruhr communications, while at the same time this fitted in to a large extent with the land attacks now planned to the north and south of it. Thus, on 10th February a new plan was produced, which subsequently became known as the 'Ruhr Plan'.

In this plan it was pointed out that the canal system had now been neutralised and considerable damage done to the three main railway lines leading out of the Ruhr. The strategic air forces should, therefore, concentrate on cutting these main routes. A number of other routes would, however, still remain open, though these were more circuitous and not capable of carrying as much traffic as the main ones. Accordingly the Working Committee strongly recommended a plan devised by the Ninth Tactical Air Force for com-

¹ Summary of the plan of 10th Jan. 1945 in Review of Working Cttee. (Communications). See map 11 where the five zones are shown.

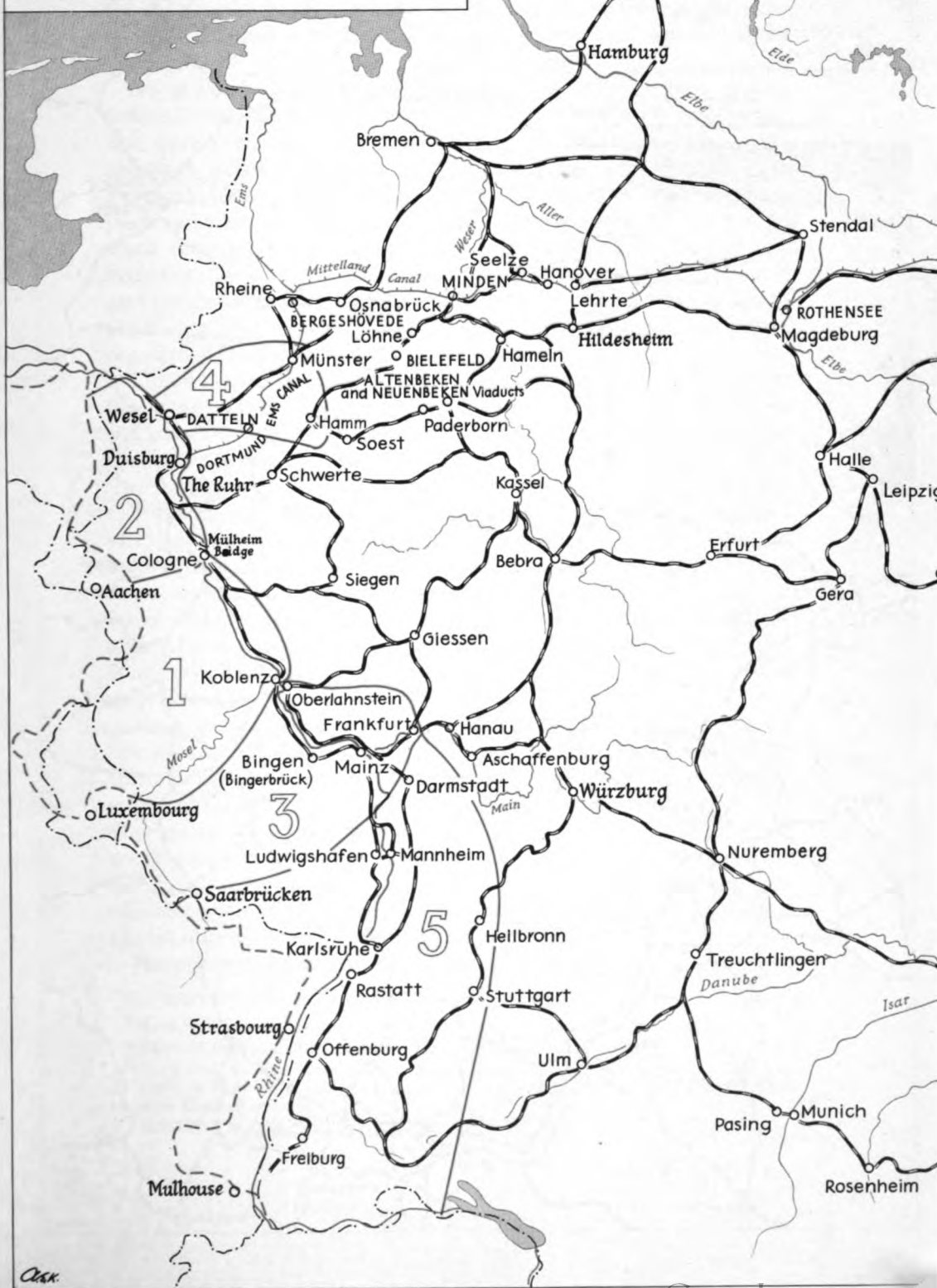
² Mins. of 14th Mtg. of C.S.T.C., 17th Jan. 1945. A meeting had also been held on 12th January, for which no minutes were kept or, at any rate, circulated.

³ Mins. of 16th Mtg. of C.S.T.C., 2nd Feb. 1945.

The Five Zones Recommended for Attack

10th January 1945

Front line as at 13th January 1945 — — — — —



OSK.

THE RUHR PLAN

28th February 1945

Legend

- The Sixteen Bridges and Viaducts.....●
- Other Targets.....□
- Front Line as at 24th February 1945.....- - -

Scale of Miles



Map 12



pleting the interdiction of the Ruhr by the destruction of sixteen bridges in the rest of the perimeter that surrounded it. Targets in the other areas would only be regarded as filler targets when the weather or other circumstances prevented the carrying on of the main attack.¹

No objection was raised by the C.S.T.C. to this plan which, indeed, made no greater demands on the strategic air forces than they were already undertaking. The Air Commanders, however, had also to be consulted and their approval was not obtained until 18th February.² The attack was to some extent diverted from its main purpose by the large-scale operation known as *Clarion*, an attack on small centres all over western and even central Germany with the hope that this would much intensify the demoralisation of the people and the disintegration of the German economy. This plan, in which the British intelligence services had placed little faith, did not in fact accomplish very much.³

But the more concentrated attack on the Ruhr approaches then began. It was, comments the British survey, 'the first railway offensive that was carried out with the full support of all the planning bodies concerned. . . .'⁴ It had immediate success. On 22nd February three arches in the Bielefeld viaduct were destroyed by Bomber Command, and though its destruction was not finally completed until 14th March but little traffic got through in the meantime. On 19th March the Arnsberg viaduct was also destroyed and all three main routes had been made unusable. Meanwhile the tactical air forces had steadily pursued their programme of interdiction and by 24th March the Ruhr was completely sealed off from the rest of Germany. This was no more than a week before the land forces surrounded it.

Nevertheless, even before the Ruhr was cut off the attack on communications had had devastating effect on the whole of the German economy. Little coal had got out of the Ruhr and everywhere industry was demanding coal from central Germany and the Sudetenland and from such stocks as still existed. This condition was made progressively worse in March and completed in April by the tactical air forces, which ranged over Germany without meeting any effective opposition and made movement both by rail and road almost impossible in large areas.

No methods have been found to measure precisely the effect of

¹ Review of Working Cttee. (Communications), and Plan, 10th Feb. 1945.

² Mins. of 16th and 18th Mtgs. of C.S.T.C., 2nd and 14th Feb. 1945.

³ Review of Working Cttee. (Communications). An account of it is given in *The Army Air Forces in World War II*, Vol. III, pp. 731-735, which confirms the estimate of the Working Committee.

⁴ *B.B.S.U. The Strategic Air War*, p. 132.

this devastating strategic offensive on the production of armaments and the means of resistance of the German armies. Full statistics do not exist and those that do exist have obviously been compiled under conditions which must make them more inaccurate than those of previous periods. The destruction of telephone and telegraph wires and many of the administrative offices of the *Reichsbahn* made it impossible to compile overall statistics of the whole system. 'Hence', the United States survey concludes, 'the degree of chaos prevailing in the first quarter of 1945 cannot be reduced to systematic measurement at all.'¹ It is possible, however, from the records of some of the divisions of the *Reichsbahn* and from that of industrial firms to form a fairly complete picture of the kind of effect that was being produced on industry during this period. But, even then, it has to be remembered that the decline in production was due to a number of causes of which the strategic attack on communications was only one, if a major one. Such attempts as have been made to estimate how much of the decline should be attributed to it have not been very satisfactory.

Since no comprehensive statistics exist for this period the United States team limited itself to demonstrating the decline in the transport of the coal of the Ruhr and the effect of this on a limited area and in particular industries, for which detailed statistics have been found. They show, for example, that while coal production in the Ruhr dropped from about ten million tons in August to little more than five million in November, December and January and even less in February, the stocks of coal at the pits increased from 415,000 tons in August to two and three-quarter million tons in February. There was always a large seasonal increase, but this was altogether abnormal and more than three times the usual amount. It must, therefore, in their opinion, have been caused by the inability to transport the coal that was mined. This is, no doubt, true, though some of the increase must have been due to the decline in the consumption of coal in the Ruhr itself. There was, for example, no production at the Krupp works in Essen after October 1944. An even more direct proof of the decline in the transport of coal from the Ruhr is shown by the statistics of the wagons used for that purpose which declined by fifty per cent. At the same time transport of coal by the canals had virtually ceased.²

The kind of effect produced by this lack of Ruhr coal is shown by two sets of statistics. The stock of coal in most of the eight southern divisions of the *Reichsbahn* was practically exhausted by the end of the period and they were using the inferior brown coal from the mines

¹ U.S.S.B.S. *The Effects of Strategic Bombing on German Transportation* (No. 200), p. 79.

² See the tables, App. 49 (xliv) and (xlvi).

in Czechoslovakia.¹ The effect on production was also shown by an examination of the iron and steel industry. It was thus demonstrated that the precipitate fall in production was due to the loss of suitable coking coal and not to a deficiency in the supply of ore, of which ample stocks existed. This fact was further proved by statistics which showed that in the plants of a steel organisation in central Germany the decline in production was greatest in those farthest from any supply of coal.² It is to be noted, however, that the decline in production of steel in the Ruhr itself, which was even greater, was obviously not due to this cause. It was caused by the disruption of its interior communications and direct attacks on its towns which were only to a small extent the result of the attack on communications.

To these illustrations many more could be added from other sources. A highly secret report of the German Railway Administration has been found, for example, which discloses that 2,000 trains were blocked in transit in the months of January and February, that the supply of wagons was rapidly decreasing and that, in the opinion of its authors, industry was already short of 200,000 tons of coal a day.³ The truth of this last statement is confirmed in many of the reports on particular industries or firms, though the position naturally varied considerably from area to area and the availability of stocks in the various plants examined. In nearly all the interrogations of Speer and his colleagues the fact that the decline in production was in this period mainly due to this cause is explicitly stated, though in some cases the answers may have been elicited by the method employed in questioning them.

At the same time there were many other causes for the decline in production. That in the Ruhr itself was largely due to other forms

¹ The figures are as follows:

Coal for national railroad, southern region, number of days' supply based on month-end stock

Division	1943		Aug. 1944	Sept. 1944	Oct. 1944	Nov. 1944	Dec. 1944	Jan. 1945	Feb. 1945
	High	Low							
Augsburg	17	2	26·4	12·2	6·1	7·2	0·5	0·6	1·6
Frankfurt	18	6	25·6	18·1	9·2	1·7	5·3	6·2	8·2
Karlsruhe	22	8	18·6	18·3	16·9	3·9	2·2	5·7	7·8
Mainz	24	9	19·4	18·0	16·4	5·3	2·0	4·4	1·3
Munich	28	5	28·4	22·1	4·8	0·7	0·2	0·2	1·7
Nuremberg	21	7	22·1	16·8	13·9	0·5	0·7	1·4	1·6
Regensburg	22	4	18·7	18·8	8·8	4·4	0·8	0·4	4·6
Stuttgart	29	10	24·5	23·1	12·5	1·5	0·5	0·5	1·0

U.S.S.B.S. Effects of Bombing on German Transportation (No. 200), p. 83.

² *U.S.S.B.S. German Transportation* (No. 200), pp. 86-89.

³ A.D.I.(K) Report based on memoranda prepared by *Reichsverkehrsministerium*. June 1944 to March 1945. This is a résumé and commentary on the original documents.

of bombing. It was demonstrated there that production could be drastically reduced by the destruction of short-haul communications, an effect largely produced by area bombing or the spill over from direct attacks on oil and weapons. This shows also the effect of there being so little motor transport for such short hauls when other means had been destroyed. The loss of the Silesian coal at the end of January deprived Germany of more hard coal than was then being produced in the Ruhr. And the complete isolation of the Ruhr, though a tremendous feat, was accomplished only a short period before the allied armies closed round it. As has been seen, the transport of its coal to the rest of Germany had long been drastically reduced. Nevertheless, the facts already given show clearly enough that the destruction of the communications of the Reich was from the last months of 1944, and possibly earlier, the most important factor in the precipitate decline of production that then occurred, though not on that of oil and ammunition, which was mainly due to the direct attack on the oil industry itself.

But, though this is true, the decline in production was not immediately, except in a few respects, translated into a shortage of weapons for the German fighting forces. In some cases there was a shortage, as in the supply of tanks, since so many had been lost in battle that those fresh from the factory were urgently demanded. Even when they were obtained, however, there was often not sufficient oil to enable them to be used. But in the case of the majority of weapons there was still a supply in the depots. The first effect of the lack of transport was in the inability to place them in the hands of the divisions actually fighting. At the close of the war, indeed, several depots were found full of large stocks of all kinds.¹ Here, however, the effect was often mainly due to the attacks of the tactical air forces and would have occurred if the strategic offensive had not taken place.

There were other indirect effects of the strategic offensive. One of the most important was the destruction of the railway telephone and telegraph services and, as the attack gathered momentum, of the postal services as well. The effect on the administration of the railways themselves was catastrophic. In the report already referred to it is stated that 'the destruction of Reichsbahn administrative offices and the railway telephone system had caused rail zones to become cut off from one another and from the central administration for days at a time, rendering any ordered co-ordination of traffic or the implementation of urgent defence measures an impossibility'.² This chaotic situation, often reported elsewhere, also prevented the

¹ U.S.S.B.S. *Impact on German Logistics* (No. 64a), p. 128.

² A.D.I.(K) Report based on memoranda prepared by *Reichsverkehrsministerium*.

ordered movement of troops and supplies, and it is extraordinary in the circumstances that the German armies could make as much resistance as they did. For the same reason all the measures of repair and improvisation were made much more difficult and, indeed, the whole civil direction of the Reich was disrupted.¹

Until the end of January Speer and his staff exerted themselves vigorously to deal with this situation. Speer was given special powers in order to bring some order into the chaos into which the communications system was falling. The anti-aircraft artillery was concentrated round the most vulnerable centres and towns hitherto heavily defended, such as Schweinfurt, had to be left unprotected. The local population were directed to the repair of the railways and the repair gangs of the Todt organisation were used for the same purpose. Coal and raw materials were given to the most essential industries and services, while the domestic consumer and the producers of consumer goods were often left without any coal at all. It was a vain effort, all the more so because the central direction was paralysed by the failure in the means of communication and much had to be left in the hands of the local administrations.

For a time Speer continued to maintain the possibility of success, though stressing the serious nature of the emergency. As has been noted, even in January he took this attitude.² But after the loss of Upper Silesia at the end of that month he told the Fuehrer that the situation had become hopeless. Steel production, for example, would fall to half a million tons a month while ammunition alone needed 400,000 tons a month. 'The rest of the armaments, therefore,' he wrote, 'will practically cease within a measurable space of time.' Henceforward his object was to prepare for the grim future after the war rather than engage in the hopeless task of armament production.³

Some attempt has been made to ascertain more precisely what proportion of the fall in production was due to the attack on communications rather than to the other causes operating at the same time. A study made by a United States team, based on questionnaires and statistics of a number of firms, reached the conclusion that rather more than fifty per cent in December was due to transport difficulties and more than fifty-five per cent in January. But the assumptions and statistics on which this conclusion is based are of doubtful value. This was pointed out by Dr. Kehrl, head of the

¹ Bormann, for example, on 21st February 1945, after waiting all day for post from Munich, was informed at 6 p.m. that they not only did not know at Berlin what time the train would arrive, but not even where it was. Finally he learnt that it could not arrive at all and urgent post was being sent by car. *The Bormann Letters* (1954), edited by H. R. Trevor-Roper, pp. 190-191.

² See above, p. 219 fn. 2.

³ Draft Report by Speer, 29th Jan. 1945, Speer Docs. (Hamburg Series). It was only circulated to one or two high officers of O.K.W.

Planungsamt, who was in a position to survey the general trend of production so far as it could be done at all. Nevertheless, after making this point, he essayed with some other officials to form his own estimate, which is quoted with some disposition to accept it by both the United States and British surveys. 'We estimate', he wrote, 'that transportation difficulties were responsible for the following percentages of all production losses except that due to loss of territory.

	<i>Per Cent</i>
First and second quarters of 1944	10
Third quarter of 1944	25
Fourth quarter of 1944	60
First quarter of 1945	90' ¹

This is, however, a purely subjective estimate and may be far from the truth. It certainly underrates the effect of the direct attacks considered in the next section. Moreover, transport difficulties were produced by the other attacks as well as by the planned attack on communications. Nevertheless, it is clear that this attack was the greatest single cause of the decline in production by the last months of 1944.

Some difference of opinion still remains as to what was the most important part of this successful offensive. Was it the destruction of the railway centres and marshalling yards or the interdiction produced by the bombing of the bridges and waterways? Clearly the latter had produced a more immediate effect when it could be maintained. The interruption of the canal traffic alone had deprived the rest of Germany of nearly one third of the Ruhr coal. On the other hand, it has been pointed out that if the railway centres had not been destroyed and the marshalling yards prevented from functioning, repairs could have been much more quickly executed and the effects of the interdiction attacks much reduced. Even the canals might then have been more quickly repaired.

The difference of opinion was due to past disputes between those who directed the attack. The answer appears to be that both forms of attack were necessary to produce the desired result. Similarly the attack on oil was also necessary to obtain the same result in a limited period of time. If more motor transport could have been operated many difficulties would have been lessened.

It should be noted also that while all the different air services contributed to the result, the heavy bombs of Bomber Command were as important in the attack on communications as they were in the attack on oil. Without them the immensely difficult task of preventing the operation of the canals could hardly have been accomplished while the destruction of marshalling yards and viaducts

¹ *U.S.S.B.S. German Transportation* (No. 200), p. 90. *B.B.S.U. Inland Communications*, p. 188.

would have needed a greater effort and in some cases could not have been achieved.¹

Finally, what does appear more clearly than anything else is that the strategic offensive against communications was less successful and produced its results more slowly because of the manner in which it was directed. In this connection it must be remembered that it was one of the main causes of the success of the armies. This tactical aspect will be dealt with by others but it is obvious that it had to be taken into account in all the plans that were made. These were mainly devised for the assistance of the Western armies, but as has been noted, for the Italian and even the Soviet armies as well. But, even so, a more concentrated strategic attack could have been planned and executed if there had been more unity of purpose amongst the planners. It is, indeed, possible that better results would have been obtained, both in the attack on oil and in the attack on communications, if the direction of the strategic forces had remained in the hands of the Deputy Supreme Commander, as in the earlier period, simply because he might have secured greater co-operation from all the commanders concerned. It may be, however, that in such a case the army commanders would have secured an even greater use of the strategic forces for their own operations and they had little faith in that part of the offensive which did not immediately affect them.² But, whatever be thought in this respect, the impression still remains that the immense power of the strategic forces was not used in the attack on communications in such a manner as to produce the most rapid end to the resistance of the enemy.

¹ One estimate of the weight of bombs dropped on communications targets by the Western air forces is as follows:

<i>Effective Sorties</i>		<i>Tons dropped</i>
R.A.F. Bomber Command . . .	3,748	17,621
U.S. Eighth Air Force . . .	3,168	7,733
U.S. Ninth Air Force . . .	2,429	4,391
R.A.F. 2nd Tactical Air Force . . .	1,153	1,888
	10,498	31,633

Thus, Bomber Command with little more than one-third of the sorties dropped more than half the weight of bombs. The figures are not necessarily accurate but may be taken as an indication of the position. Lewis H. Brereton, Lieut.-General, U.S.A.: *The Brereton Diaries*, (New York, 1946), p. 403.

² 'General Schlatter gave his opinion that the American victory at St. Lo in July was not so much due to the carpet bombing as to the denial of supplies to the Germans by the earlier strategic offensive. General Eisenhower agreed, but said that it was impossible to convince the Army that the battle of St. Lo had not been won as a result of the direct support given by the 8th Air Force.' Notes of mtg. held at S.H.A.E.F., 5th Dec. 1944.

4. The direct attack

If the attack on oil produced the most immediate effect on the German armies and air force and the attack on communications was a major cause of the decline in production, a greater weight of bombs was dropped during this period on other target systems. Some of this was to give direct assistance to the allied armies in their own offensive on the Western front and their repulse of the German offensive in the Ardennes. So far as Bomber Command was concerned, area bombing absorbed the greater part of the rest. Some of the attacks of the Eighth Air Force, though ostensibly aimed at marshalling yards or factories, were, in effect, area attacks. But there were also, as has been seen, attacks on the aircraft industry, on factories producing tanks and motor vehicles, on ordnance depots and on the submarine yards. It is no easier to estimate the results of these direct attacks than to appraise those of the attacks on the other two target systems already considered. Nevertheless there is much evidence to show that they did make a substantial contribution to the final result.

The area attack is the most difficult of all to assess. The estimates of the post-war surveys are almost worthless for this period. They base their results on analogies with the earlier periods without any direct enquiry into the nature of the damage produced. But the area bombing of Bomber Command assumed a rather different character in this period. Not only were more H.E. bombs more accurately dropped on its targets but a greater proportion of them were 4,000 pounders. The extra weight together with the much greater accuracy produced new kinds of effects. The area which was most affected was the Ruhr. Bomber Command certainly won what was a third battle of the Ruhr, the importance of which, as has already been noted, Speer was the first to recognise. These area attacks produced results which were altogether different from those of the attack on communications, though this attack and that on oil contributed to them.

The highly industrialised complex of the Ruhr depended for its production on its internal transport and the gas and electricity grids which served large portions of it. These were so greatly injured by the increased area attack that production in many plants was completely stopped. The Ruhr had plenty of coal, in most cases near the factories, but the light railways and other means of transporting it were continually being cut. The gas grid was reduced to a quarter of its normal production and many plants that depended on it, including the steel plants, suffered accordingly. A similar, if not quite so serious, effect was produced on the electricity grid. Thus, production in the

Ruhr had been reduced to a fraction before its external communications were cut or it was surrounded by the allied armies. Much the greater part of all attacks in the Ruhr was made by Bomber Command. It was considered to be specially a British target and the Eighth Air Force seldom went there.

It is true that the injuries inflicted on many of the marshalling yards, bombed by both air forces as part of the attack on communications, contributed to the general disorganisation. But the reduction of production inside the Ruhr was due to a large extent to other causes. The gas, electricity and even water shortage, which affected production, was mainly due to the cutting of the lines and pipes by area bombing, though a number of gas works and electricity works were destroyed or seriously damaged. In addition, many factories were destroyed or severely injured and their repair was much more difficult under the conditions created by area bombing. Thus, the decline in the production of the Ruhr was larger and more rapidly produced than that in the rest of Germany and in many factories ceased altogether. This was, indeed, the kind of result that had been hoped for in 1937 and 1938 when the first air plans were made. The production of the Ruhr was drastically reduced and also that of much of the Rhineland area.

But in the rest of Germany there was not such a concentration of effort and the same effect was not obtained. Dresden alone suffered overwhelming catastrophe equal to, or even exceeding, that experienced by Hamburg in 1943. Meanwhile, production outside the Ruhr was declining, at first slowly but then at an increasingly rapid rate, for the reasons described in Section 3. There appears to be little doubt that this decline was due mainly to the attack on communications rather than to the area attacks.

The exact proportion of the loss caused by area bombing cannot be estimated either in the Ruhr or outside it. But, as in the case of the communications attack, it was possible to illustrate the kind of effect produced by enquiries into particular towns or industries and the main conclusion to be drawn seems fairly clear. In the Ruhr itself a number of towns have been investigated. Chief amongst them was Essen. Here, as already noted, all production virtually ceased in the Krupp works after the attack of October 1944. Many buildings had been destroyed or severely damaged, but these could have been repaired as had been done after previous attacks. What prevented further production was the loss of electricity and gas and the immense disruption of the internal communications of the plant. There was, indeed, little need of the further attacks on it by Bomber Command. The great steel plant at Borbeck in the north of Essen was also so injured by the area attacks of September and October that there was no further production in the rolling mills, while the rest of the

plant was severely damaged and produced but little, until it was finally put out of action by the attack of 3rd February. Similar effects were produced in many other factories in Essen. Both the British and United States teams who made the surveys of Essen and the Krupp factories were able to show that these were due much more to the direct attack than to the more remote causes produced by the attack on communications.¹

Results of the same kind were observed in some other towns in the Ruhr. On Dortmund, for example, something like 12,000 tons of bombs were dropped between September 1944 and March 1945, half of them in area bombing and half in the attacks on the synthetic oil and benzol plants, which latter not only performed their special function but contributed to the general disorganisation. The British team who surveyed this town were convinced that the decline in production to half the previous amount was caused mainly by the disruption of the gas, electricity and water services and the direct damage to the plants. To these causes, for example, was due the complete cessation of production in the great steel works there after December. In general, the direct attack acted more rapidly than the attack on communications and consequently the failure of supplies from outside added little to the result. The final raid on Dortmund on 12th March, if in the circumstances unnecessary, stopped production so effectively that it would have been many months before any substantial recovery could have occurred.²

Similar conclusions were arrived at about the decline of production in Bochum, though here a greater proportion of the loss was caused by direct damage to the factories. The great Bochumer Verein steel and munitions plant produced no more than ten to fifteen per cent of its normal amount because of these same causes. Here also it is apparent that, though the injuries to the external communications of the Ruhr would ultimately have brought about a similar loss of production, so much damage was already done that this cause was not important. The final blow was given by a huge raid of 19th/20th March, which, like the others mentioned above, was really unnecessary at this date.³ The United States survey of Solingen came to a similar conclusion.⁴

It is true that in some other cases of which we have knowledge the

¹ U.S.S.B.S. *Gusstahlfabrik Friedrich Krupp, Essen, Germany* (No. 108), and *Friedrich Krupp A.G., Borbeck Plant, Essen, Germany* (No. 73). O.R.S.(B.C.) Report.

² O.R.S.(B.C.) Report, 28th Aug. 1945.

³ do. 22nd Aug. 1945 '... the situation [of communications] became progressively worse and it is clear that if production had not in any case been cut to a fraction of its normal volume, it would have had a serious effect. In practice, however, it does not appear to have been one of the primary causes of production loss.' U.S.S.B.S. *Bochumer Verein Feuer Gusstahlfabrikation A.G., Bochum, Germany* (No. 76), confirms this judgment.

⁴ U.S.S.B.S. *A Detailed Study of the Effects of Area Bombing on Solingen, Germany* (No. 35).

conclusion is not so clear-cut. Düsseldorf, for example, seems to have suffered more from the injuries to external communications than from the damage inflicted by the heavy attacks upon it by Bomber Command. The same is possibly true of Wuppertal, while at Krefeld there was no great area attack, but similar results were produced by a number of smaller attacks by both air forces and in the later part of the period by fighter bomber attacks. In Remscheid also much of the loss of production was attributed to a failure in communications, though probably as much the local connections as the long haul ones.¹ On the whole, the evidence available suggests that in the Ruhr itself the area attacks produced the greater part of the loss of production, but a less proportion in the Rhineland area outside the Ruhr. Most of the necessary damage had been done by the end of February and the area bombing after that date was for the most part unnecessary.

But in Germany, outside the Ruhr and Rhineland, it seems clear that from September onwards the main cause of the loss of production was the deterioration in communications which deprived industry of the necessary coal, raw materials and components. The investigations at Hamburg and Berlin revealed this fact and they were confirmed by those of Hanover, Kassel and Darmstadt.² This is rather a small sample on which to base conclusions, though the towns investigated are in widely separated areas. But they were in the main confirmed by the investigations of the separate industries discussed later in this chapter, as well as by the reasoning already developed in the last section on communications. In the case of oil and, in the final months, on submarine construction, direct attacks were as important as the attack on communications. But generally conditions in the rest of Germany were different from those in the Ruhr. Though on occasion great damage was done by an area attack, there was not the same concentration as in the Ruhr nor was there the same destruction of gas and electricity. Thus, the direct damage was not caused sufficiently rapidly to forestall the much greater loss caused by the failure in communications. This effect was only slow in the autumn period, but became catastrophic in the first three months of 1945, and especially when it was augmented by the loss of the Silesian coal. It should be noted also that the devastation of Dresden was, like that of Hamburg in 1943, of such a character that these general considerations did not apply to it. Because Dresden after the war was in the Russian zone no survey was made of it, so that the amount of the lost

¹ U.S.S.B.S. *A Detailed Study of the Effects of Area Bombing on Düsseldorf* (No. 34), on *Wuppertal* (No. 33), on *Remscheid* (No. 36). O.R.S.(B.C.) Reports, 27th Sept. 1945, 31st Aug. 1945.

² 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), *A Detailed Study of the Effects of Area Bombing on Darmstadt* (No. 37), on *Hamburg* (No. 32). O.R.S.(B.C.) Reports, 1st Nov. 1945, 21st Nov. 1945, 21st Oct. 1945 and on *Hamburg* (date unknown).

production is not known. It must have been immense, though there is evidence that some industries there recovered somewhat before the end. The results of the other area attacks in the Eastern zone, for example that on Chemnitz, have never been investigated. But it is probable that the attack on communications, especially after the loss of Silesia, would in any case have produced an almost equal decline in production. Whether, and how far, these attacks contributed to the Soviet advance in the East is not known.¹

Finally, in all these cases we have been considering the effect on total production. The effect on the production of armaments was exerted more slowly because the factories making essentials were in some cases enabled to go on at the expense of less important industries. They obtained the lion's share of the coal and electric power available and priority in such transport as could be obtained. The decline in their production was, therefore, slower than in the other industries sacrificed to them. This is true inside the Ruhr as well as outside it.²

In addition to the area bombing of industrial towns, there were direct attacks on three target systems during this period, one for each of the armed services, tanks, motor vehicles and ordnance depots for the armies, aircraft and aircraft engines for the air forces and U-boat construction for the navies. In these, again, it is impossible to distinguish the precise effect of the direct attacks from that of those on the communications target system. Moreover, area bombing in these, as in other target systems, was sometimes more effective in reducing production than the attacks aimed at specific industries. It is, however, possible, as before, to distinguish from the records which we possess the effect in some particular area or period of time from the general effect. On the whole, though with some differences, the pattern which emerges is similar to that produced by the area bombing attack.

¹ Such evidence as we possess is conflicting. *U.S.S.B.S. Impact on German Logistics* (No. 64a), p. 61.

² The decline in armament production may be illustrated by a table compiled by Wagenfuhr. The later figures can only be considered as an approximation but are made by an independent observer with an exceptional knowledge of the overall situation.

Armament production July 1944–March 1945

<i>Month</i>	<i>Total in Billions of Reichsmarks</i>	<i>Index (Jan.– Feb. 1942 = 100)</i>
July	2·99	322
August	2·76	297
September	2·80	301
October	2·54	273
November	2·49	268
December	2·45	263
January	2·11	227
February	1·62	175
March	1·34	145

Dr. Rolf Wagenfuhr: *Rise and Fall of German War Economy 1939–1945.*

The attack on the production of army weapons was divided into two well-defined periods. In the months of August and September it was given a place in the directives, if a subordinate one, and a number of attacks were made. The tank target system had a diverse number of targets well distributed over Germany. There were the factories assembling complete tanks and other factories which made their bodies, engines, gears and other components. These were for the most part known, but the United States survey has criticised the intelligence teams for not perceiving in 1943 the importance of bottlenecks in engine construction and transmission gears. In this period, however, the components were widely dispersed. The industry was thus more vulnerable to an attack on communications than to a direct attack against itself.

The most profitable targets left for direct attack were the tank assembly plants and the main tank engine plants. Forty attacks were made on the industry in the earlier part of this period. The Maybach works lost fifty per cent of its production after a raid on it in September 1944, but tank engines were now being produced in a number of other plants. The greatest effect on the industry was produced by an attack on the Heinkel works at Kassel, but it has been calculated that the total loss caused by all these attacks did not reduce production by more than one-fifth and this figure, based on an estimate of the potential and actual production, is probably too large a one.¹

When, after the Ardennes offensive, it was realised how much had yet to be done to overcome German resistance, the armies insisted on further attacks being made on tank construction. Some notable successes were achieved and the Siegmar plant in Chemnitz which made engines was completely wiped out by Bomber Command's area attack on Chemnitz on 5th March. Even in the C.S.T.C. there were some who now thought that a direct attack on weapons would produce results more rapidly than the attack on communications.² It seems clear, however, that the United States investigating team were right in thinking that in this later period the indirect attack was the greatest factor in producing the precipitate decline of production that then ensued.³ At the same time the shortage of oil, as has been seen in

¹ *U.S.S.B.S. Tank Industry Report* (No. 78), pp. 19-20. Only two plants made the engines in 1943. One of these, the Maybach Motor works at Friedrichshafen, was hit in that year but not seriously damaged.

² Mins. of 17th and 18th Mtgs. C.S.T.C., 7th and 14th Feb. 1945. At the Vice-Chiefs of Staff Meetings on 1st February 1945 the Vice-Chief of the Air Staff asserted that, if Panzer production were given first priority, the Russians would be able to get to Berlin!

³ *U.S.S.B.S. Tank Industry Report* (No. 78), p. 21. 'Plant officials were unanimous in declaring that operations at dispersed plants were practically impossible and operations at main plants were greatly hindered by transportation difficulties during this period. This is the chief reason for the final decline in tank production in the first months of 1945.' The information about the Siegmar plant was obtained from documents, not from investigations in the plant itself.

Section 2, prevented the tanks that existed from being used effectively and a larger number might not then have contributed very materially to the resistance of the German armies.

Throughout this period tanks had a position of first priority in the German scale of production. The enormous losses in the battles and retreats had reduced reserves so that tanks were sometimes sent direct from the factories to the fighting line. Thus, the reduction in the number of tanks by direct attack in the last six months of 1944 made a contribution to the weakening of the German defence, though, even then, the attack on communications had, perhaps, begun to exert a more important effect.¹

A second element in the demands of the armies was for an attack on the motor vehicle industry. This was one of the least successfully planned of all Speer's projects and too much reliance had been placed on production in France and other places outside Germany which was now lost. There was a shortage of vehicles of all kinds. The assembly plants were also very vulnerable to bombing, according to Speer, because they had been more intensively rationalised than other industries. At any rate the direct attacks in the summer and autumn of 1944 were highly successful. In the six months to December 1944 there was a loss of 23,000 motor vehicles, about a third of the total production. Then there was a precipitate decline which was mainly due to the attack on communications. The lack of motor vehicles certainly reduced the mobility of the German divisions and especially of the Panzer divisions. But here again the lack of oil would in the later stages in any case have produced the same effect even if more motor vehicles had been available.²

The third element in the targets demanded by the armies was the ordnance depots. Concerning these, however, there are no statistics and the total loss cannot be even approximately calculated. Much trouble and labour were caused by the dispersal of stocks of armaments among a number of smaller buildings. But the conclusion of the investigation is that the greater part of such loss as was caused was due to the failure of communications, especially as this often prevented the removal of stocks in dumps near the front when retreats had to be made. This effect was, however, produced more by the tactical than the strategic air forces. But the chaos in communications in the closing months did often make it impossible to deliver weapons and supplies of all kinds into the hands of the troops. Thus,

¹ For the diversion of weapon production and the electro-technical industry to anti-aircraft defence in this period, see above, Vol. II, p. 296, fn. 3, and App. 37 (ii).

² *U.S.S.B.S. German Motor Vehicles Industry Report* (No. 77), p. 21. Parts of these plants were producing aircraft engines and components of V1 weapons and other components and some of the attacks were aimed at these weapons rather than at motor vehicle production. It should be noted also that the investigations hardly substantiated Speer's view of the industry, for the machine tools generally were not seriously injured.

though the allied army commanders refused to believe it, the enemy supply of weapons was reduced to a far greater degree by the attack on communications than by direct attacks on the factories producing them or the places in which they were stored.¹

The attack on the aircraft and aero-engine industry which had been so successful in the early months of 1944 was pursued in the earlier part of this period and for a long time persistent attempts were made to complete the destruction of the ball-bearings industry as has already been related in Chapter XI. A number of attacks were also made on the aero-engine industry in the summer. Then the attack was suspended until the United States air forces, and particularly General Spaatz himself, were stimulated to resume it by the appearance of the new jet aircraft. It was made almost entirely by the Eighth and Fifteenth Air Forces, and Bomber Command had little to do with it. This was not only due to the nature of the target system, now so dispersed that only special precision daylight attacks could inflict damage on it, but also because British intelligence services did not consider the threat important. In October, Air Commodore Bufton expressed the view that the *Luftwaffe* had already more aircraft than it could use and that the attack on oil was the best method of destroying its effectiveness completely.² In this judgment post-war investigations show that there was a great deal of truth. The United States investigators came to the conclusion that the direct bombing of the industry after June 1944 was unnecessary.³

Nor was the direct attack on the aircraft industry very successful. Much of the aircraft production, including nearly all that of jet aircraft, was underground or hidden in woods. Some of this was discovered and the approaches bombed, but not sufficiently to make any great difference to the number of aircraft produced. There was a reduction in the number of aero-engines owing to the bombing of the early part of this period, but, as construction was concentrated on single-engine fighters, less were needed. Aircraft production continued to increase until September 1944 when a larger number was handed over to the *Luftwaffe* than had ever before been given to it in a single month. Then a big decline began, though even in February 1945, 2,000 fighters were accepted. But this decline was due almost entirely to the attack on communications. The dispersal of the industry into 300 separate plants, if it had made direct bombing unremunerative, had enormously increased the effect of this form of

¹ U.S.S.B.S. *Impact on German Logistics* (No. 64a), Chap. VII.

² Mins. of 1st Mtg. C.S.T.C., 18th Oct. 1944. Later, after the Jockey Committee called for the jet engine plants to be bombed, he expressed the view that the threat from jet aircraft had been exaggerated. 12th and 17th Mtgs., 3rd Jan. and 7th Feb. 1945.

³ U.S.S.B.S. *Effects of Strategic Bombing* (No. 3), p. 162.

attack.¹ This was the real advantage obtained by the great attacks of February 1944.

To estimate the total effect of the direct and indirect attacks of the strategic air forces on the production of aircraft is a difficult problem and there is a wide difference of opinion amongst those who have studied the subject. The British post-war survey of the aircraft industry concluded that 7,500 combat aircraft were lost to the Germans through various forms of bombing during the period July 1943 to the end of 1944. Of these, 2,000 were lost in 1943, 2,500 in the first half of 1944 and 3,000 in the second half of 1944. The United States study of the aircraft industry considered that the total loss for the same period was more than double the British figure, 15,523 combat aircraft.² Neither of these figures can, however, be considered as more than an indication of the kind of effect produced. They are based on comparisons between the programmes and potential production of the aircraft industry and the actual number of aircraft accepted by the *Luftwaffe*. Even this last figure, though based on authentic records, is disputable. The figure for 1945 cannot be ascertained even approximately, but thousands of aircraft must have been destroyed on the ground while production was being rapidly reduced.

Since the total number of combat aircraft produced in 1944 was reported as 36,000, the loss in that year was not in any case of decisive importance. The most important effect was exerted at the time of the invasion, when more German aircraft would have been available, if the attacks in the earlier part of the year had not taken place, though only at the expense of using up more aviation spirit, thus leaving less to be used in subsequent months.

But, as has been indicated, the increase in production in 1944 did not produce a corresponding increase in the *Luftwaffe* front line. The losses reported by the *Luftwaffe* did not account for the discrepancy between the number of aircraft accepted by them and the number available for service, which amounted to nearly 10,000 aircraft. Various reasons have been given for it. Speer himself said that there was no problem and that the allied air forces destroyed the aircraft in the air or on the ground as fast as they were made. Large numbers were, indeed, destroyed by the bombing of the airfields and the losses never reported in the official lists. This explanation seems to have been accepted by the post-war surveys and it is, perhaps, the true one, though no great confidence can be placed in the figures for the second half of 1944.³ What seems quite clear is that large numbers of aircraft

¹ Saur Interrogation, 10th June 1945. See map 14.

² B.B.S.U. Report of the German Aircraft Industry Panel, pp. 23-24. U.S.S.B.S. Aircraft Division Industry Report (No. 4), p. 82.

³ B.B.S.U. German Aircraft Industry, pp. 24-27. This opinion is endorsed by the British general survey (*The Strategic Air War*, p. 109). The discrepancy is shown in the table,

Dispersal of German Aero-Engine Factories

Scale

0 50 100 150 200 MILES



1944.



Legend

- Bayerische Motoren Werke (BMW)*.....
- Henschel*..... ●
- Junkers*..... ○
- Büssing*..... ●
- Daimler Benz (D.B.)*..... ●

CASE

were produced during the closing stage of the war, but that large numbers of them were destroyed by one means or another. The controversy has in fact little point, for even if more had been produced or remained undamaged, it seems evident that the shortage of aviation spirit would have prevented any great extension of the operational strength of the *Luftwaffe*.

At the same time bombing in its various forms did have some important results. A number of new machines were in process of development and the failure to produce these in sufficient quantity or not at all was undoubtedly partly due to the strategic air offensive. Much of the futility and waste in these new developments was, it is true, due to the faulty direction of the industry. Speer and Saur were concerned more about quantity than quality, and decisions were taken by the *Luftwaffe* command which showed little sense or consistency. The He.277, for example, which would have replaced the ill-fated 177, was abandoned just as it became ready for mass production. Even more important was the refusal to proceed with the He.219, which might have been a very effective night fighter if it had been allowed to develop.¹ But there were also losses directly due to bombing. Thus, the Ta.154, a new machine made of wood which was designed to cope with the Mosquito, had to be abandoned partly because the plant which made tegofilm, the special glue which bound together its plywood, was destroyed in an attack. Even more important, perhaps, was the prevention by attacks in March and April 1944 of any large numbers being produced of the new Dornier 335, which, the Germans claimed, was the most original and fastest propeller-driven aircraft produced during the war and the Ta.152, the best conventional fighter aircraft designed for the *Luftwaffe*.²

Most important of all were the new jet aircraft whose performance, when they first appeared, seemed to make such a serious threat to allied air supremacy. That they did not do so was largely due to the faulty direction of those controlling the industry. They gave little encouragement or help to the firms which were developing jet aircraft until too late to enable them to be mass produced in large quantities. It is unnecessary, however, to survey the details of their development, which finally resulted in the adoption of the twin-engine Me.262 of the Messerschmitt firm rather than the He.280 of

App. 49 (xxvii). The United States general survey (*Effects of Strategic Bombing*) agrees with the British general survey that the losses on the airfields were the fundamental cause of the discrepancy. Amongst other causes suggested were destruction by unskilled ferrying, reporting repaired aircraft twice as new aircraft, loss of aircraft in the retreat from France and Belgium and deliberate falsification of figures. But the officials interrogated do not seem to have perceived that any problem existed until it was pointed out to them by the allied investigators.

¹ Ernst Heinkel: *He 1000* (1956), pp. 234-235, 266-268. These judgments are those of the manufacturer himself and only present his view.

² Frydag Interrogation, June 1945. *B.B.S.U. German Aircraft Industry*, p. 22.

the Heinkel firm, for good reasons according to Petersen, the official who had much influence on the decision, but in the view of Heinkel himself for less defensible motives.¹

The Me.262 was flown as early as June 1943 and made its first attack on a Mosquito on 25th July 1944. General Galland and others had high hopes that it might completely alter the balance of force in the air. It was much faster than any allied fighter and heavily armed. There is a consensus of opinion that it was Hitler's obstinate insistence that it should be used as a bomber that delayed its mass production as a fighter.² But when in November that decision was revised the fact that it was so long before the Me.262 made any significant contribution to fighter defence would appear to show that there were other causes at work. There were in fact all the inherent difficulties of developing a new type of this kind and of training the pilots to employ it effectively, difficulties much increased by the condition into which the lack of oil had reduced their training. At any rate it was not until 1945 that they seemed to become any very serious threat to the United States air force.

In this later period Hitler began to express the greatest interest in their performance and himself suggested that they would transform the situation. Hitherto he had insisted that flak was the best means of defence and given it, in spite of protests, priority over aircraft construction.³ But now it was hoped to produce 1,000 Me.262s a month. In fact, the total number produced was between 1,200 and 1,600; but many were destroyed in ferrying or training and others were short of essential components.⁴ This reduction in numbers was undoubtedly due mainly to the attack on communications, though area bombing had a share in the result and the bombing of aerodromes in the last stages of the war also played a part. But it still remains true that those that were operational failed to achieve the success which had been anticipated and this was largely due to the oil offensive.

Two other jet planes were planned. Of these the Arado 234 became

¹ Petersen Interrogation, 20th July 1945. Petersen was head of the testing establishment at Rechlin. A.D.I.(K) Report. *He 1000*, p. 266.

² General Koller stated: 'The Fuehrer's attitude to this whole business was inconceivably obstinate and he heaped curses upon the heads of those who stood in his way.' Goering himself, Generals Christian and Below as well as Speer and General Galland were treated in the same way when they protested. Koller Interrogation, 29th May 1945.

³ Letter Kehl to Speer, 16th Aug. 1944. Memo. Speer to Military District Commissioners, Works Commissioners and Managers, Flak Cttees., 12th Nov. 1944. Mins. of Saur's Conf. with Hitler, 22nd March 1945. In March 1945 Hitler, 'delighted with reports of the successes of the Me.262 against allied bombers, said that it was making "the decisive contribution" in the whole course of the war'. Speer Docs. (Hamburg Series).

⁴ Petersen Interrogation, 20th July 1945. A.D.I.(K) Report. Saur Interrogation, July 1945; he said 1,308 were built and regarded this total as a triumph over difficulties. The programme could not be fulfilled owing 'to shortage of both building and aircraft constructional material and small components and the calculated delay in getting them to the place where they would be needed'. do. 10th June 1945. Thus, the decline was due to a continuation of area bombing as well as to the attack on communications.

successfully operational and a number of reconnaissance flights were made over Britain from September onwards. But its development was not pursued with the same energy as the Me.262, and since it was made in the East its production was stopped by the advance of the Russians after 200 had been handed over to the *Luftwaffe*. The He.162 was developed very rapidly by Heinkel to meet the demand for what was called the 'people's fighter', a rapidly climbing aircraft of small dimensions which could take off from aerodromes near the threatened plants and attack the oncoming bombers. Mass production was begun in Vienna in December before the prototype had been fully tested, but the chaos in communications prevented any being produced before the advance of the allied armies made removal necessary. It may be doubted whether such a plane could have had much success if it had become operational.¹

Thus, if the general attack on aircraft production and aero-engines was not of great importance, the allied bombing of communications assisted by the difficulties produced by area bombing did much to prevent the new German aircraft from becoming a serious menace at the end of the war. A similar effect could be traced in the progress of the new U-boats. The direct attack on U-boat construction was made at the urgent request of the allied navies. The threat to their supremacy on the sea was, indeed, a serious one. Not only were the older types of U-boats made more effective by the use of the new *Schnorkel* device, but a large fleet of a new type was designed in 1943 which, speedier under water than their predecessors, would have been capable of inflicting great losses on the allied merchant navies. That this threat did not mature was in great part due to the operations of the strategic air forces.²

The most dangerous part of the new fleet was the new type XXI U-boats which were constructed by prefabricated methods. They were built in sections by a number of firms in different parts of Germany. The sections were then sent to eight assembly yards in the northern ports to be fitted up and then they were finally put together in three main yards at Hamburg, Bremen and Danzig. This new system was devised by Speer, Saur and Merker and the last named was placed in charge of it, replacing Rudolf Blohm, the head of the Main Committee on Shipbuilding, who did not approve of the new plan. It was hoped to produce about 550 boats by February 1945 and

¹ Saur gives the number produced of the Ar.234. Saur Interrogation, 7th June 1945. *He 1000*, pp. 268-270. Another aircraft, the Me.163, had the same purpose as the He.162, but it was not a success. Rocket-assisted aircraft were never sufficiently developed to become important.

² The subject has been surveyed in detail in *B.B.S.U. The Effects of Strategic Bombing on the Production of German U-Boats and U.S.S.B.S. German Submarine Industry Report* (No. 92). They are not in entire agreement with one another. In this brief account we have been much assisted by the meticulous analysis of the whole problem in the fifth volume of the Narrative *The R.A.F. in the Maritime War*.

that many of these would have become operational in the second half of 1944. Another new type XXIII U-boat, much smaller in size, was designed for use in the Mediterranean and was meant to be constructed in shipyards on that sea. This became impossible but production of this type was continued in two German yards.¹ New U-boats of the older types were not laid down but the considerable numbers under construction were completed.

This ambitious programme never came to fruition. It was from the first much delayed by various complications, one being the lack of sufficient steel. The plan had been too hastily made and construction too hastily begun. The programme had to be drastically revised and the projected number cut down to a half. All kinds of teething troubles arose and, as 1944 went on, Doenitz had continually to explain to Hitler why he had not yet been able to begin the new submarine offensive from which so much was hoped. By the middle of 1944 delivery of type XXI U-boats to the Navy began, but the programme had again to be drastically revised because of the strategic air attack on German industry and communications.

Meanwhile, the allied navies had got news of the new threat and began to press for direct bombing of the assembly yards. Some of the section assembly yards were under concrete but others and the final assembly yards were less protected.² It took considerable time and pressure before the navies obtained the weight of attack which they thought necessary. But bombing of the assembly yards began in a small way in November and December and in 1945 was much increased until in March and April devastating raids were made on Hamburg and Bremen.

Thus, the final result of all the planning and effort extending over two years was that only eighty type XXI U-boats were delivered to the German navy in 1944 and no more than thirty-nine in 1945. Only one of these became operational and that did no damage. The less ambitious programme for the type XXIII U-boats fared rather better. Sixty-three were delivered to the Navy and six became operational, doing some damage in the closing stage of the war.³ This

¹ These types were developed from a new design by Professor Walther, type XVII, which was to be powered by a new kind of engine. Though a few of this type were constructed they did not become operational. A number of midget submarines were also built, but their contribution was a small one.

² Much work was done on a huge bunker, called Valentin, at Farge, where most of the assembly was to be carried out, but it was not finished before the war came to an end. An enormous amount of labour and material was thus employed to no purpose. *B.B.S.U. German U-Boats*, p. 7.

³ Of type XXI U-boats, forty-six were assembled at Blohm and Voss, Hamburg, forty-three at Deschimag, Bremen, and twenty-six at Schichau, Danzig. Of type XXIII, forty-nine were assembled at Deutsche Werft, Hamburg, and fourteen at Germania Werft, Kiel. Others were to be produced at Toulon, Genoa, Monfalcone, Nikolajev and Linz. *B.B.S.U. German U-Boats*, Tables 7 and 8, pp. 15, 17. The total for type XXI U-boats is, however, probably 119 and not 115 as given in the above figures.

failure was due partly to the difficulties already described but also to the various attacks of the strategic air forces during this period. Two important components were affected by attacks on the towns where they were made. The accumulator batteries, of which a larger number were needed for the new U-boats, were produced in four plants, at which one, at Posen, was but a small one, while that in Vienna was destroyed on a date not exactly known, but probably by an attack of the Fifteenth Air Force in July 1944. One of the two remaining in Hagen was damaged by area bombing of Bomber Command in October 1943 and completely destroyed in the same way in December 1944. The other, near Hanover, which produced most of the batteries in 1944, was never attacked, but its production was reduced by shortage of gas and electric current due to area attacks on Hanover in November 1944. By 1945 there was a shortage of batteries and consequent limitation of production but probably not very much beyond that due to other causes.¹

The area bombing of Berlin in 1943-44, which, as was noted, caused the dispersal of the electrical industry there and a successful attack by the Eighth Air Force on another works at Mannheim on 14th August 1944, caused a shortage in another vital component, electric motors. This apparently caused but little delay for there were almost enough to meet the needs of the revised programme.² One of the main causes of this revision was the bombing of the canals which reduced the number of sections sent to the assembly plants by ten of the twenty-two firms making them. While the average number of sections passing through Münster lock had been 106, it fell to thirty in October, eighteen in November and seventeen in December.³ Thus, all the different forms of bombing were producing effects, area and precision attacks as well as the attack on communications, which was, however, the main reason for the delay in the programme. Then, in addition, came the attack on the yards which, as 1945 went on, became so overwhelming that before the end of April production had virtually ceased, though there were still some uninjured U-boats on the slipways. In this bombing the 4,000-lb. bombs of Bomber Command dropped by Mosquitoes showed themselves to be specially effective.⁴

Clearly it is difficult to estimate the proportion of the loss caused

¹ *B.B.S.U. German U-Boats*, p. 23. *U.S.S.B.S. German Submarine Industry*, p. 32. It was suggested by Speer in an interrogation that a precision attack on the works near Hanover would have stopped the production of the new U-boats altogether. The operations of the conventional U-boats were also affected by this shortage.

² *B.B.S.U. German U-Boats*, p. 23.

³ *B.B.S.U. The Strategic Air War*, p. 157. A plan was made to cut the sections into smaller pieces so that they could be transported by train. *U.S.S.B.S. German Submarine Industry*, p. 34.

⁴ *U.S.S.B.S. German Submarine Industry*, p. 33.

by each kind of attack. The most important reason for the great reduction in the programme of the type XXI U-boats was the difficulty of construction, though this had been overcome by the end of 1944. It may well be that Rudolf Blohm was right in thinking that better results could have been obtained by using the conventional methods of construction. The investigators have concluded that half the production loss in 1944 was due to this cause, and that the strategic air attack caused the loss of thirty U-boats in 1944 and a similar number in 1945. This total of sixty boats was considered to be equally divided between the indirect effects of other bombing and the direct effect of the attacks on the ports. In addition, fifteen were sunk after commission by allied bombing attacks. The direct effect was, however, to a large extent produced in 1945 when there was not time for such boats to become operational. Only if the war had lasted longer would the destruction of the U-boats in the assembly yards have been of great importance.¹

The production of the conventional U-boats was also reduced by allied bombing during this period. Twenty-two were sunk in the ports, but of these seventeen were destroyed in 1945.² These boats began to operate with the new device, the *Schnorkel*, in June 1944. But this threat, which also seemed serious at one time, was reduced by another form of attack of Bomber Command which also had an important effect on the operations of the new type U-boats.

For, in spite of all difficulties, over a hundred type XXI U-boats were delivered to the German navy, forty-three of them six months or more before the end of the war. Had even a limited number become

¹ These are the estimates of the British team, *B.B.S.U. German U-Boats*, pp. 21-22. It must be emphasised that these figures are only approximately correct, being based on a number of assumptions some of them quite arbitrary. The survey concluded that the total was correct to within plus or minus fifteen U-boats. A more accurate estimate may be seen in the following table given in the narrative of Captain D. V. Peyton-Ward, R.N., already cited:

	<i>Type XXI</i>	<i>Type XXIII</i>
PRODUCTION		
Number scheduled for delivery in original programme	381	95
Number not produced because of organisation troubles, faulty design and bad workmanship	202	13
Estimated number denied by delays and damage caused by allied bombing attacks	60	19
The actual number delivered to the German navy	119	63
AFTER COMMISSION		
The number sunk by allied bombing attacks	15	2
The number still training on acceptance trials or fitting out at end of the war	91	38
The number at or on passage to operational bases in Norway but not yet fully operational	12	17
The number fully operational at the end of the war	1	6

² *B.B.S.U. German U-Boats*, p. 24.

fully operational by January 1945 a serious situation would almost certainly have arisen, as naval intelligence had predicted. That this did not happen was due to one of Bomber Command's most important contributions to naval defence. For the mining of the Baltic by its aircraft was certainly one of the main causes which prevented the XXI type U-boats from becoming operational even in limited numbers.

The mining of the Baltic and other coastal areas had made, and especially throughout the latter part of the war, a considerable contribution both to naval defence and to the reduction of German production. Since March 1942 it had been carried out entirely by Bomber Command. It now became of great importance. The main area for the acceptance trials of the U-boats and the training of their crews was in Danzig bay because its compact expanse of deep water was admirably suited for that purpose. In the high summer months Bomber Command could not lay mines there but it had done so when the nights were long enough both in 1942-43 and 1943-44. In neither case, however, had the Germans suffered much inconvenience since they had plenty of mine-sweepers, and the only result was the destruction of one U-boat.

But in August 1944 a new minelaying season began with more ingeniously detonated mines and the Germans found these much harder to eliminate. Admiral Friedeberg, who was in command of all U-boat trials and training, had to close the area, though only one U-boat had actually been blown up. No sooner had training restarted than Bomber Command laid more mines and the area had again to be closed. This process continued until finally, early in January, the Germans were forced to abandon the area altogether for their important trials and training. The value attached to it by the German Admiralty may be seen by the fact that Doenitz had continually put pressure on Hitler to defend Danzig in order that he might retain his training establishment there. But the trials and training had now to be transferred to four other areas, Oslo fjord being chosen for the deep diving trials and *Schnorkel* training. Though the Danzig area was only shut down completely for seven weeks in 1944, restrictions and partial prohibition had to be enforced during the rest of the time and the final dispersal affected adversely both the standard and duration of the pre-operational training.¹

The exact effect of all this delay cannot be exactly estimated. But it seems probable that as many as twenty of the new type XXI U-boats might have become fully operational at the end of 1944 or early in 1945 had it not occurred. The allied navies managed to curtail the

¹ These facts were discovered by Captain Peyton-Ward, R.N., upon an examination of the papers of Admiral Friedeberg. For the attitude of Doenitz, see Chester Wilmot: *The Struggle for Europe*, (1952), pp. 619-620.

attacks of the older types of U-boats fitted with the *Schnorkel*. But an attack in the Atlantic at the same time by the new U-boats might have been more difficult to counter and might have inflicted considerable loss on the allied merchant navies with serious effects on the supply lines already dangerously stretched. That this attack did not take place was largely due to Bomber Command.

The naval staffs, while urging more attacks on the construction yards, hardly realised the great importance of the mining operations or how much they had accomplished. Indeed, it was long before research in the German records revealed what had been done. But the mining of the Baltic played a similar role in the final months of the war at sea to that of the attack on oil in the war on land and in the air.

The mining operations also continued to reduce the sea traffic in the Baltic and were one of the reasons why Sweden withdrew her ships from that sea. It should be recalled that this process had been going on from 1942 onwards. The U-boat operations from French ports were hindered by it and a sensible, if minor, reduction in German production was produced by it. The cumulative effect, though it cannot be calculated, must have been a real contribution both to the war at sea and to the weakening of the German economy.¹ Another contribution of the strategic air forces in the later part of this period was to the virtual destruction of the German high seas fleet. That of the *Tirpitz* was only important in that it removed a threat in the minds of the allied naval staffs. Nor were the other warships any longer a serious menace when they were sunk or damaged beyond repair by the onslaught of Bomber Command.

Finally, it should be pointed out that the weapons and ammunition produced in this period were diverted even more than before to defence against the allied air forces. The number of anti-aircraft weapons was much increased and, though there was never sufficient ammunition for them, they absorbed a good share of the all too

¹ The following table shows the amount of effort and the results for 1944 and 1945.

1944	A/c sorties	Mines laid	Vessels sunk	Tonnage	Vessels damaged	Tonnage	A/c losses
Jan.-May	3,221	9,637	79	61,541	15	28,134	48
June-Dec.	1,910	7,863	125	74,545	66	100,915	36
Totals	5,131	17,500	204	136,086	81	129,049	84
1945							
Jan.-May	991	4,582	86	164,330	39	117,951	23

Roskill: *The War at Sea*, Vol. III, p. 289, and Narrative *The R.A.F. in the Maritime War*, Vol. V.

limited supplies. Similarly they used much electrical equipment which was also in short supply. All this must have detracted from the efficiency of the German armies.¹

This was in addition to the fact that the *Luftwaffe* was now engaged almost exclusively in defence. The importance of this fact during the invasion has already been pointed out. It continued to operate during this period. Such efforts as Hitler made to assign aircraft production to bombers and galvanise the *Luftwaffe* into aggressive action were of no avail. Only once, in the attack on the allied aerodromes on 1st January 1945, did the *Luftwaffe* have any real success, but this incident showed how much might have been done under different circumstances. As it was, so many German pilots were lost that the attack did more harm to the *Luftwaffe* than the allied air forces.

Of course the allies had established air supremacy in daylight, and such attacks could have been no more than forays. But, if the Germans had possessed an effective bombing force for night operations, something could still have been done to injure the allied ports and landing bases. Moreover, the laying of mines by the bombers of the *Luftwaffe* in the Scheldt estuary and approaches under cover of darkness could have had serious results on the main sea supply of the allied armies to Antwerp from November 1944 onwards. German U-boats and E-boats were already attempting to do this. The constant possibility of this addition to the menace was a nightmare to the naval commanders both at Chatham and S.H.A.E.F. In conducting their offensive the allied armies had no such obstacles to overcome and they owed their immunity, at least in part, to the strategy forced on the German air force by the strategic air offensive.

One further observation is needed in view of the judgments which we have made concerning unnecessary bombing. Some of the bombing in this period was unnecessary, either because the targets had already been adequately destroyed, or because of the advance of the allied armies or because Germany capitulated before the effects could make themselves felt. One of the problems of the strategic offensive was to calculate the time and extent to which it should be tapered off. It is easy now to criticise such calculations because we now know that the armies were able to advance and that Germany did surrender in May 1945. But had the allied armies been checked or Germany resisted for a longer period, the criticism might well have been applied in the opposite sense.

¹ See Vol. I, p. 491, fn. 2.
S.A.O.—VOL. III, Pt. 5—T

Concluding survey

CHAPTER XV

THE STRATEGIC AIR OFFENSIVE

'Three fourths of mankind sets about necessary things only when they feel the need of them; but then it is too late.'

NAPOLEON, 1793

'A man may so overdo it in looking too far before him, that he may stumble more for it.'

THE MARQUESS OF HALIFAX

The strategic air offensive

WHEN victory over Germany was celebrated but little was said of the part played in it by the strategic air offensive. The Prime Minister did, it is true, pay a tribute to Bomber Command in a special message to Sir Arthur Harris, in which he spoke of their 'decisive contribution to Germany's final defeat' and praised the 'fiery gallant spirit' of their crews.¹ But no tribute was paid to that campaign in the Prime Minister's victory broadcast of 13th May except for a cryptic reference to the attack on V-weapons, and no campaign medal was struck to distinguish those who took part in the strategic air offensive. The Prime Minister and others in authority seemed to turn away from the subject as though it were distasteful to them and as though they had forgotten their own recent efforts to initiate and maintain the offensive.

Sir Arthur Harris was not allowed to issue his Despatch on one of the greatest campaigns of the war. His conclusions did not reflect the views of the Air Staff and, no doubt, some of the facts which he included could not have been published at that time. Nor did the Air Staff, to whose decision this was due, make any authoritative pronouncement of their own. Sir Arthur Harris' personal account in his book *Bomber Offensive* was no substitute for the Despatch since it could not include the statistics and scientific analysis. For this and other reasons much of it has necessarily remained unconvincing. Neither the general nor the particular reports of the British Bombing Survey Unit were published. The official history of the United States Army Air Forces, which began to appear in 1948, produced an authoritative account of the American contribution to the offensive, but it included only spasmodic references to the work of Bomber Command. The short official history of the Royal Air Force, which was published under the auspices of the Air Ministry, has done much to inform the general public, but it had not sufficient space and did not rest on a sufficient background of research to go very deeply into the problems of the strategic air offensive, and on this subject there is surprisingly little in Sir Winston Churchill's war memoirs.

Thus, in the absence of any authoritative or highly informed account, myth and misconception have grown and been unassailed. Some of that, it may be hoped, has been corrected in this work. But no one would claim that the field is yet fully explored. In the West we still know relatively little from Russian sources of the great events on the Russian front which at times affected Bomber Command and

¹ *The Times*, 17th May 1945.

which Bomber Command at times was intended to affect. Further investigation is needed of many of Bomber Command's supporting services such as aircraft design and production, technical and aircrew training and the organisation of the force. Some questions about the German air defences and how they were overcome are still uncertain, and there may be scope for further research in the mass of German economic and industrial material. There are, in addition, some broad problems arising from the relationship of the strategic air offensive to other campaigns and, notably, the Battle of the Atlantic and the invasion of Normandy, which have not yet been fully resolved. Even so, the main facts of the Bomber Command part in the strategic air offensive seem to be established, though further research and analysis may well have some effect upon the conclusions drawn.

Bomber Command entered the war quite unprepared for the task before it and deficient in nearly everything except the spirit of its crews, the conviction of the Air Staff that an offensive was necessary to victory, the knowledge that bigger and better aircraft would eventually appear and the guarantee of reinforcement which was provided by the creation of the Empire Air Training Scheme.

The penalty of unpreparedness was a severe and a prolonged one. The aircraft of Bomber Command and their crews had not the means of defending themselves against the enemy fighters in daylight nor of finding and hitting their targets with anything like the expected degree of precision in darkness. The bombs which they carried were less efficient than their German counterparts. Several of the aircraft were incapable of long-range operations and others were unsuited to that role. The appreciation of the operational capacities of the force was greatly over-optimistic as also was that of the vulnerability of the German war economy to the attacks which could be brought to bear against it.

Thus, with means far less effective than expected, Bomber Command had to undertake a task far more formidable than expected. It took more than four years to realise and to close the gap.

The stages of this development are well defined. Initially, even before the real offensive had begun, the plan for daylight precision bombing against selected key targets had to be abandoned because of the strength of the German air defences. Then in the course of 1940 and 1941 the same attempt at night had to be abandoned because of the inaccuracy of night bombing. This led in the course of 1941 to the gradual adoption of the policy of general area attack upon the largest German towns and, in 1942, to the introduction of new equipment, a larger proportion of incendiary bombs and specialised tactics to make that form of attack efficient.

The circumstances of this process were often discouraging. Many disappointments and mounting casualties were suffered. The force

was repeatedly diverted to other tasks at which it was even less proficient. But the offensive was maintained. By 1943 it had been reinforced by thousands of new crews from Britain, Canada, Australia, New Zealand and from many other parts of the Commonwealth as well as from some of the allied countries which had fallen under the German yoke. It had received much new equipment in the shape of radar aids, better bombs and superior aircraft including the Lancaster and Mosquito. It had devised far more efficient tactical methods which to a great extent had derived from the creation of the Pathfinder Force and, since February 1942, it had been led by a great Commander-in-Chief, Sir Arthur Harris. From March 1943 until March 1944 a truly formidable and ever-increasing weight of attack was brought to bear upon Germany in the area offensive. Immense destruction was caused and Bomber Command appeared to be reaching a hard-won maturity.

Throughout this time, however, the strategic idea of selective attack had not been abandoned nor had the operational one of precision bombing. On the basis of experiments and inventions both scientific and tactical, which were often imaginative and daring, Bomber Command carried out in the spring and summer of 1944 a highly precise night, and latterly also a day, offensive in France and elsewhere in preparation for and in support of the allied invasion of the Continent. Almost immediately, corresponding techniques and tactics were applied to the strategic air offensive against Germany and in the last year of the war to the greatly increased power of area attack by Bomber Command was added a high capacity for precision bombing both in daylight and in darkness. The gap between strategic desirability and operational capacity was almost closed and Bomber Command was at last able to fulfil the tasks for which it had originally been designed.

In the pursuit of this great achievement, Bomber Command fought the war constantly from start to finish. Naturally the scale of the offensive varied as also did the hazards encountered by the crews, but the whole front line was always involved. Regularly, and sometimes several times within a week, the Commander-in-Chief committed practically the whole of his front line to the uncertain battle and occasionally he committed almost the entire reserve as well. On each occasion he had to take a calculated risk not only with the enemy defences but also with the weather. On each occasion he might have suffered an irretrievable disaster. The enduring courage, determination and conviction of Sir Arthur Harris, who bore the responsibility for more than three years, deserves to be commemorated. So too does that of his deputy, Sir Robert Saundby, who shared it with him and his predecessors for nearly five years.

The cost in life and limb was grievous. Some 55,888 officers and



25. A Halifax of Bomber Command which did not return. *German photograph.*



26. A Lancaster of Bomber Command which did not return. *German photograph.*



27. A Wireless Operator in a Lancaster.



28. A Flight Engineer in a Lancaster.



29. A Navigator in a Lancaster.

other ranks were killed in action or on active service and a further 1,255 died while serving in Bomber Command. The number of those wounded in action or on active service was 9,162. Most of these casualties were sustained by the relatively small force of aircrews and many of them have no known grave. Of the dead, 47,268 were killed on Bomber Command operations, 8,090 were killed while undertaking non-operational duties and 530 belonged to the ground staff. Of the wounded, 4,200 sustained their injuries on operations, 4,203 while on non-operational duties and 759 while serving in the ground staff. The contribution of the British Commonwealth and the allies was a great one. Of those killed in action or on active service, 38,792 were serving in the Royal Air Force, 9,913 in the Royal Canadian Air Force, 4,037 in the Royal Australian Air Force, 1,676 in the Royal New Zealand Air Force and twenty-seven in the South African Air Force. Thirty-four belonged to other parts of the British Commonwealth, 928 were Poles and 481 were from other allied countries.¹

The material cost, though much harder to measure, was less substantial than is sometimes supposed. There are many ways in which it can be expressed but, because bombers cannot be precisely compared to tanks or to battleships and because bombers performed many functions other than those connected with the strategic air offensive, none is exact. But, one calculation was 'that the British strategic air offensive over Western Europe cost, on an average, 7 per cent of the manpower effort directly absorbed by the fighting services during the war.'²

This contribution to victory was, indeed, a great one, though, in direct terms at least, it was long delayed. The initial attacks of Bomber Command up to the spring of 1942 scarcely caused the Germans much inconvenience, though it cannot be doubted that they contributed powerfully to the maintenance of British morale in a period when no other directly offensive blows could be struck at Germany. Indirectly, however, even in the early phases, when Bomber Command was at its weakest, two notable results were produced. First, in the summer and autumn of 1940, the very existence of Bomber Command was part of the deterrent to the execution of the German plan for the invasion of Britain as well as causing damage and dislocation to barge concentrations, and it was one of the reasons for which the *Luftwaffe* was compelled to engage Fighter Command in the Battle of Britain as a preliminary and never completed task. Secondly, the persistent offensive of Bomber Command gradually transferred the main air battle from Britain to Germany and helped

¹ These are the best obtainable figures. They cannot be regarded as absolutely precise. Nor are the categories entirely clear. Not all the Australians in Bomber Command, for example, served in the R.A.A.F. See App. 41.

² *B.B.S.U. The Strategic Air War*, p. 39.

to initiate a fatal preoccupation of the *Luftwaffe* with the means of defence at the cost of those of offence.

Thereafter, in 1942 and still more in 1943, these gains were further consolidated and extended. In addition, huge numbers of Germans and slave labourers were employed in repairing the havoc wrought in the great area attacks. More and more effort was devoted to the extension of the night fighter force, the provision of anti-aircraft guns and searchlights. And, though many other causes also contributed to this, the German bomber force declined to almost negligible proportions. Bomber superiority, initially achieved by Bomber Command and now reinforced by the United States Eighth Air Force, made it less and less probable that the Germans would ever dare to initiate gas or bacteriological warfare. In addition, Bomber Command was growing not only into a much more powerful force but also, on the basis of its operational experience, into a much more efficient one.

But the great area offensive of March 1943 to March 1944 did not produce direct results commensurate with the hopes once entertained and at times, indeed, feared by the Germans themselves. Huge areas in many great towns all over Germany were severely stricken and some were devastated, but the will of the German people was not broken nor even significantly impaired and the effect on war production was remarkably small. It was not only that the damage could be repaired more readily than had been supposed. The German war economy was more resilient than estimated and the German people calmer, more stoical and much more determined than anticipated.

No one can say what Germany might have achieved or attempted had there been no area offensive in this period. All that can be said is that in spite of the prolonged and latterly heavy pressure of it, German war production increased and increased again, that the German people remained loyal and obedient and that the German armed forces continued to fight with great bravery and with no less efficiency than before. Nor did the selective and, in so far as they succeeded, the precision attacks both of Bomber Command and, on a larger scale, of the Eighth Air Force, achieve any better results. In combination, the various elements of the offensive sapped some of the reserve within the German war economy and enforced some measures of dispersal notably in the aircraft industry. Both results made Germany more vulnerable to later and more efficient strategic air attack.

These achievements were meagre and disappointing but they were the prelude to something far greater. In the last year of the war Bomber Command played a major part in the almost complete destruction of whole vital segments of German oil production, in the virtual dislocation of her communications system and in the elimination of other important activities. Moreover, the continuing area

offensive, apart from assuming almost unmanageable proportions in many towns, contributed important by-products to the achievement of the main plans for oil and transport. These direct results had a decisive effect upon the outcome of the war and there were also continuing and accelerating indirect results which were scarcely less important. Moreover, this was achieved in spite of massive diversions of force to the direct support of the armies and of the navies. It would not have been possible had it not been for the long years of apparently frustrated endeavour.

Success was won by the utilisation of new scientific aids and weapons, the production of new aircraft and the development of new operational techniques. But these would have been of no value had not the courage of the Bomber Command crews endured. Nor would many of the developments ever have been tested in action had it not been for the efforts of a few brilliant, intrepid and devoted men among them.

Nor could it, in any case, have been achieved by Bomber Command alone. Though for long the Combined Bomber Offensive was combined only in name, the exploits of the United States Eighth and Fifteenth Air Forces played an important part in paving the way not only for their own ultimate triumphs but also for those of Bomber Command. Nor could any of these Commands have done what they did if the armies had not made the successful invasion of June 1944, which brought them in so short a space of time to the German frontier, or if the sea lanes between Europe and the United States had not been kept open throughout the Battle of the Atlantic. On the other hand, the victory in the Battle of the Atlantic owed something to the assistance given by the strategic air forces, and without the even greater assistance which they gave to the armies, the invasion of the Continent could hardly have been attempted at all.

Thus, the victory was due not only to the combination of allies but also to a combination of all the different forms of attack which could be brought to bear against the enemy by sea, land and air. To this obvious truth all the highest allied Commanders subscribed. The differences between them were differences not of basic principle but of the emphasis which should be accorded in the grand strategy of the war to the various elements of attack and, no less, of the extent to which and the time at which it was possible to concentrate on the offensive at the expense of the defensive. It was inevitable that the various commanders and Chiefs of Staff should wish to see their own commands or services play the greatest possible parts in victory. In spite, therefore, of the general agreement that the war could be won only by offensive action and only by a combination of sea, land and air power, there was much controversy about how this unified effort should be achieved.

These controversies about the priorities of the various types of warfare, the ways in which they should be related to one another and the theatres in which they should be exercised belonged to the realm of what is generally described as grand strategy. The decisions could only be taken at the highest level of political direction, because they depended upon the international relations of the allies and were to a great extent governed by the aims which the war was intended to achieve. But they were also influenced by what they were intended to determine, namely, the various and often alternative strategies to which the components of naval, military and air power could be devoted. In the case of strategic air power, the alternatives, at least in theory, were numerous and, perhaps, more numerous than in the case of any other kind of armed force. For this very reason the strategy of the bombing offensive was normally a controversial issue. A reasonably convincing argument could generally be advanced for attempting something other than what was being done. One of the major problems of the bombing offensive was, therefore, the achievement of a strategic concentration or, in other words, the establishment of a main aim which was compatible with the scale of attack available.

This problem persisted throughout the war and was never wholly resolved. At the outset it was emphasised by the difficulty of applying precise appreciations to what, on a major scale, was an entirely new method of warfare and, in the closing stages, it was emphasised again by the great variety of tasks which were demonstrably within the capacity of long-range bombers. Thus, throughout the war Bomber Command and, when they came into action, the United States Strategic Air Forces also were beset by a multiplicity of tasks which often did violence to the principle of concentration of effort.

Even in the middle period of the war from the beginning of 1942 to the beginning of 1944 when, for Bomber Command, because many of its operational limitations had been revealed and much of its later versatility had not yet been developed, the conditions for strategic concentration were at their best, there were still formidable difficulties in achieving it. The great issue of that time; the issue which the Casablanca Conference failed to settle, was between general and selective attack—between, on the one hand, the aim of attempting to cause some dislocation to as much as possible and on the other, that of seeking to cause a higher degree of dislocation in a smaller, but especially vital segment of the enemy war machine.

This issue was not primarily concerned with methods of attack such as precise or area bombing, but with the aims to which it should be applied and to a great extent it turned upon the question of intelligence and its interpretation. The whole conception of selective bombing, whether by precision or area attack, depended upon the assumption that vital segments in the enemy war economy could

be detected. Much of the argument in favour of general bombing depended upon the belief that this was impossible, that there really were no absolutely vital segments in the enemy war machine, or, as Sir Arthur Harris called them, 'panaceas'.

Thus, even after the abandonment of the highly selective plans for the destruction of electricity, gas and oil production, for the dislocation of communications and for the direct attack on armament factories with which Bomber Command had entered the war, there was still the difficulty of determining whether the area offensive should be devoted to as many as possible of the largest cities in Germany or to that of only those associated with some vital activity such as ball-bearings, oil or aircraft production.

But this was not only a question of intelligence and its interpretation. It also involved a basic principle of war which, as far as armies and navies were concerned, had been long established, but which, as far as air forces were concerned, was still highly uncertain in application. This principle concerned the question of the extent to which it was necessary to grapple with the opposing armed forces as a concomitant of or a preliminary to the achievement of ulterior strategic aims. The idea of selective attack upon German aircraft production and of ancillary production such as that of ball-bearings or of oil, was central to this question and raised what was undoubtedly the most important strategic problem of the bombing offensive.

Naval doctrine, based upon long naval history and notably upon the brilliant analysis of the foremost naval historian, Admiral Mahan, clearly established that the principal maritime aim in war must be the achievement of the command of the sea. This was a primary aim in the sense that its fulfilment was an indispensable prerequisite to the achievement of ulterior maritime aims such as the enforcement of blockade, the transport of troops and the protection of trade. Moreover, the same experience showed that the principal means of achieving this aim lay in the destruction or neutralisation of the enemy fleet. The policy of attempting ulterior strategic aims while evading the enemy fleet—the policy of the *guerre de course*—could be demonstrated never to have achieved decisive results. The introduction of submarines, torpedoes and mines had changed the nature of fleets and the rise of air power had qualified the means of commanding the sea, but the basic principle held good.

In military terms, the same principle had an even more obvious application for the whole tradition of armies lay in their direct battles with each other. Thus, in spite of the apparent variations offered by the naval *guerre de course* and its military equivalents, the primary aims of navies and armies were clearly established as the destruction in battle of the enemy armies and navies. Only thus could the strategic objects of naval and military warfare be obtained against

resolute first-class powers. This well-established doctrine depended upon a simple fact. Ships were a defence against ships and armies were a defence against armies.

Air power seemed to offer a somewhat different prospect which grew from the belief that the aeroplane was not a defence against the aeroplane. If this was so, air superiority was likely to be established, not as a result of air battles between aircraft, but by the assertion of an air offensive which was superior to that of the enemy counter-offensive. But unless one side or the other could strike an initial knock-out blow an extended air campaign was likely to develop. Its issues, it seemed, might well be decided by the effect of the bombing offensive upon the potential of the enemy's bombing offensive. Thus, in the pre-war plans of Bomber Command, there was provision for a strategic offensive against the sources of German air power which was designed to reduce the scale of the German bombing offensive, and this was one of the cardinal objects of Bomber Command's strategy in 1940.

Even so, provision had also been made for a different means of reducing the scale of the German air offensive. This took the form of the development of Fighter Command as a direct means of defence against bombers. This was a contradiction of the theory that the aeroplane was not a defence against the aeroplane, but in the Battle of Britain the contradiction was sustained. The first major air battle in history resulted in a decisive victory for the fighters over the bombers, and a cardinal revision of bombing strategy was made necessary by it.

The subsequent experience of Bomber Command and no less of the United States Strategic Air Forces confirmed the lesson that the principal obstacle between the bombing offensive and the attainment of its strategic object was the defending enemy fighter force, and it became clear that one of the great factors in the achievement of air superiority was the neutralisation of that fighter force.

Moreover, air superiority was not simply a question of being able to use the air for the purposes of the strategic bombing offensive. It was also a question of being able to use it for all other necessary purposes, including those of air support to the armies and navies, and of being able to deny the enemy any decisive use of it. In fact, for as long as the German fighter force was in effective operational being the *Luftwaffe* was able to deny the allies the air superiority which they sought as a prerequisite not only to the strategic bombing offensive but also to the invasion of the Continent. The ulterior aim of the strategic air offensive was to damage the sources of German power to such an extent that her armed forces would be unable to resist the allied military invasion, but an inevitable concomitant of this aim was seen to be that of reducing the strength of the German fighter force.

This was a formidable proposition. Neither the night bombers of Bomber Command nor the day bombers of the United States Eighth Air Force were able to engage the German fighters in equal combat in the air nor, as the Germans improved their air defences, were they able even to protect themselves adequately from fighter interception. Neither the Royal Air Force nor the United States Army Air Forces had equipped themselves with long-range fighters capable of redressing this adverse balance and, in consequence, the only way of dealing with it seemed to be by concentrating a heavy and selective attack against the industrial sources upon which the German fighter force depended for its production and operation.

In this way the whole question of air superiority came to be associated with the policy of selective as opposed to general bombing. Thus, a major part of the strategy of the Combined Bomber Offensive came to be devoted to the aim of destroying the German fighter force in being. This was the position which had been reached by the middle of 1943 when the famous *Pointblank* directive was issued.

But the policy of a combined, concentrated and selective attack upon the sources of the German fighter force was not achieved. Nor was it even clearly expressed in the directive which had to meet with a wider measure of agreement than was forthcoming for the policy it was intended to proclaim. Sir Arthur Harris was as unconvinced by the merits of a selective attack upon the German aircraft industry as he was by those of any other selective policy. His force, in addition, was not able to make massive precision attacks on individual factories but only area attacks on towns associated with them. Nor was the Eighth Air Force much better placed. The need for a reduction of German fighter strength was clear enough, for in daylight the American bombers had much less scope for evasion than did the British bombers at night, but the means of achieving it could not be found and, because of the strength of the German fighter force in being, often could not even be attempted.

Such were the negative factors which led towards the crisis of *Pointblank* at the end of 1943. There was also a positive factor which was produced by the apparently successful course of the Bomber Command general area offensive. To those, and especially to Sir Arthur Harris, who believed that the aims of the strategic air offensive could be realised by an intensification of the general area offensive, the idea of a selective attack upon the aircraft industry appeared to be no less diversionary than an attack upon the submarine industry. This point of view, however, had become less convincing by the end of 1943, and especially by the spring of 1944, when it became apparent that Germany was surviving the onslaught and that the Bomber Command casualties were approaching an unbearable rate.

Carryover of 21.4.44 / conclusions re:
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If a wider measure of agreement and, in some respects, a higher degree of operational flexibility could have been obtained, a greater concentration of effort could have been devoted either to the general or the selective application of bombing policy. But the inherent inconsistency of the attempt to achieve air superiority by bombing alone would have remained. In fact, the attempt to proceed directly with the prosecution of a strategic offensive without taking adequate steps to defeat the German fighter force in being ended in virtual defeat which, for the Eighth Air Force, was signalled by the Schweinfurt operation in October 1943 and, for Bomber Command, by the Nuremberg operation in March 1944.

Thus, it became clear that, if prohibitive casualties were to be avoided, the bombing could not be pressed to the degree which was necessary to achieve decisive results, and it had long been clear that the main cause of casualties was the German fighter force. It was also evident that the German fighter industry, which was no easier and in many respects more difficult to knock out than other industries, could not be adequately destroyed by bombing while the German fighter force continued to be in effective operational being. In order to secure the protection afforded by evasion and ruse, Bomber Command was denied the ability to achieve the necessary concentration and accuracy, and in order to achieve the necessary concentration and accuracy, the Eighth Air Force was denied the protection given by evasion and ruse. It became clear, in other words, that the problem of air superiority hinged upon some means of direct and effective attack upon the Luftwaffe in being.

The British Air Staff was slow to accept this conclusion and, indeed, never entirely admitted it. The United States Air Staff had always had it more in mind, but they too were slow to give expression to the necessary measures. Thus, for a long period, the strategic air offensive was placed in the circumstance of a vicious circle in which it scarcely mattered whether the bombing policy was general or selective. For that reason, it cannot be established that, in their dispute with Sir Arthur Harris on this issue, the Air Staff was right and he was wrong. On the contrary, whatever the theoretical merits of the argument may have been, it was Sir Arthur Harris who showed the more realistic appreciation of the possibilities.

When, however, first the German day fighter and then the night fighter force began to collapse as a result of a highly complicated combination of direct and indirect and premeditated and fortuitous pressures, this situation was entirely changed and, in fact, almost reversed. With the opportunities afforded by increasing air superiority and the greatly increased scale and efficiency of attack which had also occurred, the strategic air offensive at last possessed the power of achieving decisive results, and for that reason the issue of

bombing policy became one of decisive importance. The principle of concentration deserved the greatest emphasis.

But this was not easily done. The struggle between the ideas of general area bombing, which was still consistently advocated by Sir Arthur Harris, and selective bombing, which was now more or less constantly supported by the Air Staff, continued and was never conclusively settled. Moreover, within the conception of selective bombing, there were vigorous and powerfully supported competitions between the advocates of the various target systems which could be attacked. The result was that the strategy of the offensive was not clearly expressed and the force of the attack was blunted. Even so this failure to resolve the strategic issues of the campaign was to a great extent compensated by the remarkable efficiency with which the operations were carried out.

These difficulties arising from the alternatives of bombing policy and the need for air superiority were not, however, the only strategic problems with which the Air Staff had to grapple. There was, in addition, the major task of maintaining the offensive at all. In this the Air Staff showed greater courage, more unanimity and longer endurance, but the struggle was not, for that reason, less severe. The opposition to the constant maintenance and development of the offensive was based upon three principal and distinctive grounds. Throughout the war, and particularly as the offensive became more effective, there were those who objected to it on moral grounds, but the arguments put forward were sometimes lacking in clarity and were often based upon an inaccurate appraisal of what was being done and what it was possible to do. They did not receive any substantial authoritative support, but if they had been more fully answered at the time it is possible that some misconceptions would not have arisen after the war when a wide range of moral arguments enjoyed a considerable vogue.

A quite different kind of objection was raised and was often authoritatively supported by those who at various stages of the war extending up to January 1945 believed that a greater proportion of the bomber effort should be devoted to the defensive and less to the offensive. Thus, at the outset of the campaign Bomber Command was called upon to direct its attacks towards a reduction in the scale of the German bomber offensive. Later it was directed to give high priority to the reduction of the German submarine campaign. Vast efforts were devoted to the attack on V-weapon production and operation and many other similarly defensive commitments had to be met, though often it was obvious that the result would not be commensurate with the effort expended and always the offensive effort was correspondingly reduced.

Finally, there was the constant demand, which also was often

effective, for the diversion of the force to the auxiliary purposes of strategic and tactical support of the armies and navies, which not only changed the pattern of Bomber Command operations but often retarded the expansion of and sometimes even reduced the front line strength of the force.

Some of these diversions for defensive and auxiliary purposes produced profitable results. The German V-weapon campaign, for example, was retarded and its eventual scale was somewhat reduced by bomber action. The great diversion in preparation for and in support of *Overlord* produced indispensable military advantages for the invading armies, but whether successful or not, these and other less justifiable diversions did seriously impede the development of the offensive and, had it not been for the convinced persistence of the Air Staff and the Commander-in-Chief, might have subdued it altogether.

All strategy depends on whether it is operationally possible. If it is seen that the operations in use are not effective for their purpose the decision has to be made whether to proceed with the strategy and find new and more successful operational methods or change the strategy to conform with what is operationally possible. It has been seen how Bomber Command was made almost impotent by its operational limitation in the early years of the war. The result was that its strategy of selective bombing by precise attack was changed into general area bombing on production and morale. The Eighth Air Force, on the other hand, persisted in its strategy and by the development of the long-range fighter found the eventual means to carry it out successfully. Bomber Command also in the years 1943-44 found the means to carry out all the strategic aims which had been laid down in its pre-war plans, and, though it did not abandon general area bombing as its main offensive, it was this mastery of a new technique which enabled it to make its greatest contribution to victory in the final stages of the war.

The process was a complicated one and its description and analysis have occupied a large portion of these volumes. It has been necessary to show how it depended on the production of new radar devices, bombs, markers and other material aids to target finding and bomb aiming as well as on the new methods employed by the crews in using these aids. At the same time, in order to concentrate a sufficient weight of bombs on the target and restrict the casualties to a bearable proportion of the force engaged in destroying it, many new kinds of tactics were devised. All depended on the skill, discipline, courage and endurance of the crews; for the material aids were often inadequate and in any case had to be employed under difficult and dangerous conditions against an enemy who was also resourceful, courageous and persistent. Those directing operations and the scientists who were assisting them had constantly to be on the alert

to discover and apply new methods of attack and new methods of defence against enemy attack.

Thus, the direction of bombing operations, and especially night operations on which each crew from take-off to landing was largely a self-determining unit, was a very complicated business. In their formidable task of adjusting their strategy and translating the means of carrying it out into operational orders capable of execution, the Air Staff was slow to achieve success. No doubt a true appreciation of operational capacity can only be made under fighting conditions, but in the case of Bomber Command, the initial realms of doubt extended far beyond those which were made inevitable by the difference between peace and war. Nor can the lack of remedial action be attributed wholly to the difference between peace-time and war-time service budgets.

Before the war, the navigational means by which bombers would find their targets were hardly ever tested in practice and scarcely even considered in theory. The aiming methods by which bombs could find their targets was studied in an inadequate and unnecessarily unrealistic manner. The reliability and destructive effect of the bombs available was examined too little and, by practical methods, hardly at all. Even the simple facts about what could be seen at night in the various conditions of darkness and from varying heights was not discovered. Complex aircraft such as the Wellington and the Whitley were introduced without the corresponding measures to prepare the crews to operate them, and the operational plans of the force were made without apparent regard to the revolutionary change in the prospects of fighter interception which were produced by the invention of radar and the development of high-performance aircraft such as the Hurricane, the Spitfire and the Messerschmitt 109. Yet these prospects were revealed by the development of Fighter Command in which, since 1938, the principal hope of resisting a German bombing offensive had resided.

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Obviously, the handicap to Bomber Command of going to war under such conditions was a severe one and obviously it was more severe than it need have been. The result was that, in daylight, operations could not be sustained without prohibitive casualties and that, in darkness, the targets could seldom be found let alone hit. There was also the deplorable fact that crews habitually found themselves above the oxygen height without oxygen supplies, in the freezing zone without de-icing equipment on the wings or heating within the cockpits and with their vital but dangerous petrol loads at the mercy of a single bullet. In addition, their bombs, which in relation to their German equivalents were of inefficient destructive power, all too often did not detonate at all.

Nor were these and other omissions rapidly repaired once the war

had begun. On the contrary, the limitations of the force were only gradually discovered, and for more than two years Bomber Command, in spite of a few remarkable successes, was to a great extent lost in the dark, the haze and the searchlight glare. But the frustrating experience of those two years did at last produce remedies, and in the course of 1942 a series of radical advances took place ranging from the introduction of radar as an aid to navigation and bomb aiming, to the creation of the Pathfinder Force and the reorganisation of the aircrew with a single pilot and a separate navigator and bomb aimer. In addition, the front line was increasingly equipped with new aircraft among which were included the Lancaster and the Mosquito. Not less important was the appointment in February 1942 of Air Marshal Harris as Commander-in-Chief.

In consequence, the whole prospect of the offensive began to change. Most of the more ambitious kinds of precision attack were abandoned though, from time to time, some were still attempted and the energies of Bomber Command were devoted to making night area attack operationally effective. Thus, the operational aim was reduced and the means of achieving it were increased. But the gap between the two was considerable. The essence of success in area bombing was heavy and concentrated attack. The majority of the aircrews in Bomber Command had not the necessary navigational skill to achieve the requisite concentration and the front line of the force was not nearly large enough to develop a sufficiently heavy scale of attack.

The solution, some thought at the time and others have argued since, was to devote a major effort to training and so, throughout Bomber Command, to increase the skill of the force. Meanwhile, with the production of the new aircraft getting into its stride, the front line could gradually be increased to the necessary dimensions. Thus, by some stage of 1943, or perhaps 1944, a very highly trained and very much enlarged Bomber Command would have come into being. In the meantime, however, the offensive itself would have been subordinated to this aim. This, as others and notably Sir Arthur Harris recognised, might well have been fatal, for in order to attract a reasonable proportion of the national war effort, Bomber Command required the advertisement, not of more promises about the future, but of actual, immediate and notable achievements.

The result was that, early in 1942, the decision was taken to press the offensive forward with the utmost vigour at once. This meant making continued use of the relatively inefficient and under-trained crews and of reinforcing them with recruits who were hardly better trained and who were even more inexperienced. The consequence, of course, was that many gallant men and good machines were lost in action and in flying accidents which might otherwise have been

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avoided, but, if the offensive was to be maintained and increased, this was inevitable. Moreover, since the hand of fate was often turned indifferently against those with great experience and those with little, it was a consequence which has, perhaps, been exaggerated in some estimates.¹ There is also the undoubted consideration that the best form of operational training is operational experience and it is not necessarily true that the large numbers of crews who were lost in the course of their first three or four operations would not have been lost if they had done an extra fifty or a hundred flying hours at operational training units.

Even so the operational standards of the Bomber Command crews varied considerably. Some, through long runs of good luck, had acquired the skills of experience. Some were intrinsically of exceptional quality and some had special aptitudes such as unusually good night vision and some, of course, had greater courage than others. If such specially good crews were merely mixed with the others in general attacks their achievement could hardly be detected, but if some means could be found of enabling them to lead the attacks, the whole result might be changed and the problem of the relative inefficiency of the ordinary crews might be largely solved. The problem was one of bringing the best crews into the lead and of enabling them to communicate their own standards to their less able comrades. The solution, after much controversy and considerable delay, was found in the creation of the Pathfinder Force and in the introduction of marker bombs and, in due course, of the Very High Frequency Radio Telephone.

The advantages of the Pathfinder Force method were numerous. The selected crews were concentrated in a separate force which eventually achieved the status of a Group and were, therefore, able to develop their own tactics and techniques which often were not appropriate to the requirements or the skills of the main force. Moreover, it was possible to give this relatively small force equipment such as *H2S* before it had been produced on a sufficient scale for main force use or a device like *Oboe* which could only be used by a few aircraft at one time. Thus, in theory at least, the greatest skill and the best equipment were united and concentrated in the Pathfinder Force and devoted to the primary purpose not of bombing the target but of finding it and indicating its position to the main force.

The establishment of the Pathfinder Force and its proper equipment, which was a slow process, was, however, less than the whole

¹ In this connection it is interesting to note that Air Vice-Marshal Bennett, in the course of a short operational career, was shot down and that Group Captain Cheshire, in the course of a very long one, was not. Air Vice-Marshal Bennett was, perhaps, the greatest flying expert in Bomber Command. Technically, Group Captain Cheshire was not by comparison an outstanding pilot.

of the solution to the problem of area bombing. Even if a greatly increased concentration of bombing could be achieved it was still necessary to make the attacks with the most efficient bombs and, above all, to make them heavy enough to produce worthwhile results.

Part of this necessity was at least to a considerable extent answered by borrowing from German precepts and adopting primarily incendiary tactics by a great increase in the proportion of incendiary bombs dropped. The other part of the necessity was more complicated and depended ultimately upon the success of the Empire Air Training Scheme and the resources of the British aircraft industry. But in launching the thousand bomber attacks in 1942 Sir Arthur Harris not only performed a feat of astonishing courage but also, in the case of the attack on Cologne, gave a practical demonstration of what might be regularly achieved if the front line could have a thousand bombers placed in it.

1942, then, was the turning point in the operational development of Bomber Command. The incendiary technique was demonstrated against Lübeck in March. The thousand bomber attacks occurred in May and June. The Pathfinder Force was created in August. On this basis was founded the great area offensive of 1943 to 1944 which embraced the major battles of the Ruhr, of Hamburg and of Berlin.

In the circumstances of 1942 the decision to concentrate mainly on area bombing was operationally inevitable, and throughout 1943 the continued practice of it was also largely inevitable. In the conditions of those times precision bombing, save under wholly exceptional circumstances, was impossible. Daylight operations of deep penetration and on a sustained scale were equally impossible, and for Bomber Command it was a question of a night area offensive or of no significant offensive at all. This was not everywhere appreciated and, perhaps, is still not adequately understood.

There are, for example, those who believe that if the effort which was, in fact, devoted to making area bombing operationally effective had been devoted to the development of precision bombing, a different result might have been obtained. Such a view does not take account of all the facts. The phases of development for the two kinds of attack were after all basically and initially the same. The one was simply a further refinement of the other. The task of the Pathfinder Force in making area bombing effective was to lay markers at the target with the greatest possible accuracy and the task of the main force was to aim at those markers with the greatest possible degree of precision. The task of the marking and bombing forces in the case of night precision attacks was not different. It was only more important that it should be more precisely fulfilled. That this could not be achieved against German targets was not due to

a lack of effort, of courage or of scientific devices in the Pathfinder Force in 1943. Nor was it due to corresponding defects in the main force. It was due to the fact that no device, radar or otherwise, proved to be an adequate substitute in the case of really precise attack for visual identification of the target. Thus, the constant effort to improve the efficiency of area attack was also a contribution to the eventual capacity for precision attack.

Nor did the area offensive delay the development of techniques outside the Pathfinder Force which eventually made an even greater contribution to this achievement. While the area offensive was a main preoccupation, a special squadron was formed for the specific purpose of breaching the Ruhr dams and while the Battle of the Ruhr was at its height, 617 Squadron went into action. From its initial precise bombing achievement an almost equally precise marking capacity was eventually evolved and this, by the adoption of Pathfinder Force methods, was in time made available to considerable elements of the main force.

Thus, by stages, through the development of area bombing techniques and through other kinds of experiment, Bomber Command developed the operational capacity for highly effective area attacks and highly accurate precision attacks at night. Nor, when the German day fighter force became ineffective, was much modification of tactics required to make excellent daylight bombing possible.

In view of the circumstances under which Bomber Command entered the war, in view of the slowness with which its initial defects were recognised and in view of the strength of the German defences, it is surprising that this operational versatility was achieved, not so late in the war, but that it was achieved at all. The success was due to a combination of ingenious tactics, some of them stemming from the Pathfinder Force, to the provision of remarkable target finding devices such as *Gee*, *H2S* and *Oboe*, to the introduction of effective pyrotechnic bombs and of much improved destructive ones such as the incendiary clusters, the heavy high-explosive bombs and later the special Wallis weapons. It was also due to the development of first-class aircraft, among which the Lancaster and the Mosquito were outstanding. But this conjunction of tactical scientific and engineering genius would have been of little avail had it not been for the inspired leadership of Sir Arthur Harris and the enduring courage both of the good and of the less-good crews.

In addition to early neglect, there was, however, another major factor which greatly delayed the operational success of Bomber Command. This was the German air defence. The German air defences made daylight bombing impossible for Bomber Command for the greater part of the war and they contributed powerfully to the inaccuracy of night attack for much of it. The latter effect was due

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not only to the very heavy casualties which were inflicted and the loss of efficiency caused by them. It was also due to the severity of the conditions under which even the best and the most fortunate crews habitually had to attack. Searchlight dazzle enormously complicated the problem of night vision and, at low level, could cause disaster. Flak and balloon barrages made low-level operations extremely hazardous and, in the course of 1942, the night fighter force began to develop into the greatest danger of all. A great part of the tactical and scientific ingenuity at the disposal of Bomber Command had to be devoted to the attempt to reduce this danger by measures of evasion and of deception, but, as was shown by the Battle of Berlin, this was a struggle in which the Germans enjoyed an advantage and which Bomber Command alone could not win. To the bomber crews, a heavy flak barrage was often taken as the welcome sign that night fighters were not in the area.

As operational versatility increased, the limitations imposed upon strategy by operational considerations grew less and the consideration of what ought to be done became more important. The determining factors in this were intelligence of the German war economy and the appreciation of what result the strategic air offensive had achieved against it.

The Chiefs of Staff, the Air Staff and Bomber Command were supplied with economic, industrial and technical information about the potential targets by a number of agencies, amongst which the Ministry of Economic Warfare had the foremost place. Often the criticism which it received from Bomber Command was due less to the faults of the intelligence than to the failure of the bombers to inflict the expected degree of damage. Closer relations between the Ministry of Economic Warfare and Bomber Command, which would have enabled intelligence to be considered more in the context of operational capacities, might have obviated some of the grounds of mistrust which made that co-operation difficult. One of the defects of Sir Arthur Harris' great qualities was his profound mistrust of the advice of experts. Even so, though not always in the expected way, this mistrust was sometimes justified by events.

The cardinal error of intelligence was the description of the German economy as tightly stretched and in decline when it was, in reality, resilient, cushioned and increasingly productive, and of the German people as exhausted, disaffected and liable to panic and revolt when, in reality, and on the whole, they were vigorous, calm, stoical and loyal. In the former case, the Ministry of Economic Warfare had a heavy responsibility, and in the latter it was widely shared but especially due to the Foreign Office, which had a basically unsound but highly influential view of German morale. These errors enabled an entirely false argument to be used in favour of general

area bombing. Nor, until the war was over, was it realised that the cities and towns listed for general area attack contained a smaller proportion of important industry than had been estimated by the Ministry of Economic Warfare. Thus, even while area bombing was operationally inevitable, the argument for making it selective was weakened and that in favour of making it general was strengthened for erroneous reasons.

On the other hand, the more detailed intelligence about the structure and contents of individual cities and the nature of the principal industries and their contribution to the German war production tended to be much more accurate. In estimating many of the target systems, the Ministry of Economic Warfare achieved an informed realism which increased as the war went on and culminated in the detailed estimates of the German oil position—a triumph which was due to the Ministry of Economic Warfare and to other agencies.

From 1943 onwards the co-operation of the British and American economic intelligence experts grew continually closer until in the second half of 1944 they were fused together in the Combined Strategic Targets Committee. In addition, the operational and intelligence staffs of the two air forces were also associated with the same joint committee. This machinery was meant to produce a greater concentration of strategic purpose and of operational effort, but this result was to some extent frustrated by the existence of a rival intelligence organisation at Supreme Headquarters Allied Expeditionary Force and by the fact that the Deputy Supreme Commander, Sir Arthur Tedder, the Commander-in-Chief, Bomber Command, Sir Arthur Harris, and the Commanding General of the United States Strategic Air Forces, General Spaatz, were not always prepared to accept the advice of the Committee as authoritative. So far as the oil intelligence was concerned, there was little dispute as to the facts but much as to the various interpretations which could be placed upon them. But in the case of communications there were substantial differences of opinion as to the nature of the target system itself which resulted in delay and confusion. It cannot be doubted, however, in the light of information gathered after the war, that the allied estimates of the condition of the German oil industry in its latter stages were remarkably accurate.

The earlier estimates of the German ball-bearings industry which were also agreed between the British and American experts, on the other hand, were to a major extent in error, but the errors were hardly surprising, especially as even the Germans themselves were unaware of the real facts.

Another respect in which intelligence estimates were often vitiated was in the errors which were made in the appreciations of the consequences of the bombing. The estimate of the actual damage inflicted

was, after the initial period of wholly absurd and grossly optimistic reasoning, often extremely accurate. This was in large measure due to the great efficiency of the Photographic Reconnaissance Unit and the great skill developed by the interpreters of the photographs. But the extent to which and the speed at which the Germans could recover from the attacks or in other ways minimise their effects was often considerably underestimated. This, for a large part of the war, tended to produce under-bombing, though eventually the lesson was observed and some cases of over-bombing occurred.

In considering the errors of intelligence, which admittedly had some profoundly misleading effects upon the strategy of the offensive, it is necessary to remember that the nature of the intelligence upon which the strategic air offensive depended was more complicated than that for any other kind of warfare including even naval blockade and that the reservations which were sometimes written into the original appreciations did not always reappear in the operative summaries of them.

The general tendency towards the dispersal of the strategic air offensive and the dilution of its aims was due not merely to the differences of opinion which existed about what should be done, or about what could be done, but more particularly to the almost equal authority of those differences of opinion. As Sir Arthur Harris put it, there were too many fingers in the bomber pie.

The system of command and direction under which Bomber Command functioned was, in addition to being complicated and diffuse, significantly changed on several occasions during the war. Indeed, almost the only constant lay in the position of the Commander-in-Chief himself. But, at least in theory, the Commander-in-Chief had severely restricted powers. He was responsible for the handling of the force and the operational decision was his. The strategic responsibility lay elsewhere. Moreover, Bomber Command consisted almost exclusively of bombers. The Commander-in-Chief had no authority to give orders to fighter, maritime, or tactical squadrons which, in the metropolitan air force, were each under separate command. In no other theatre was a similar distinction made between the various components of the same thing. In the metropolitan air force the two principal concomitants of air power, the fighters and the bombers, were not given a unified command and seldom achieved unity in operations. The reasons given were that these concomitants were too diffuse and complicated for such unification and that in any case, the Chief of the Air Staff had his office in London.

But neither of these somewhat contradictory reasons can be accepted as wholly convincing. Equally diffuse and complicated commands in other theatres and in other kinds of armed force were, in fact, successfully discharged during the war. General Spaatz com-

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manded the United States Strategic Air Forces in Europe. They were based at points which ranged from Cambridge in England to Foggia in Italy and embraced heavy bombers and single-engined fighters. Sir Arthur Tedder commanded long-range bombers, tactical bombers and fighters in the Middle East. Nor was the presence in London of the Chief of the Air Staff a substitute for a Commander-in-Chief. The functions of a Chief of Staff and a Commander-in-Chief are different things.

The Chief of the Air Staff, of course, was not, and had not the time to be, directly concerned with the command of forces. He was concerned with their higher direction, with the strategic, as opposed to the operational, decision. In this capacity his position varied considerably. At the outset, bombing policy was determined by the Defence Committee of the Cabinet on the advice of the Chiefs of Staff of which the Chief of the Air Staff was a member. This system, which was not always strictly observed, persisted until January 1943 when, because of the readiness for action of the United States Eighth Air Force, a new situation arose.

At the Casablanca Conference it was decided that the policy of the Combined Bomber Offensive should be determined by the Combined Chiefs of Staff and that Sir Charles Portal should be their agent for issuing the directives to Sir Arthur Harris and General Eaker. In practice, however, this arrangement made no substantial difference. The Combined Chiefs of Staff seldom considered bombing policy except in the most general terms and it was tacitly understood that Sir Charles Portal would not issue directives which interfered with the respective and obviously different policies adopted for Bomber Command and the Eighth Air Force. The Defence Committee still had occasional opportunities for considering aspects of bombing policy but the Prime Minister, who presided over the Defence Committee, seldom used it for that purpose. Most of the great decisions of British bombing policy were, therefore, determined, if sometimes rather vaguely, by the Chiefs of Staff, and the directives continued to be issued on behalf of the Chief of the Air Staff.

In April 1944, the functions of Sir Charles Portal in these respects were theoretically transferred to General Eisenhower and, in practice, to his deputy, Sir Arthur Tedder. In the following September they were restored to Sir Charles Portal, but this time were jointly vested in him and General Arnold, Commanding General of the United States Army Air Forces. These two continued to be ultimately responsible to the Combined Chiefs of Staff and they acted through their respective subordinates, Sir Norman Bottomley and General Spaatz, who were, however, in no sense opposite numbers.

In practice, with greater or lesser effect, nearly all the bombing directives from 1941 to 1945 were written by Sir Norman Bottomley

and in view of the varying authority which they reflected it is hardly surprising that some of them lacked clarity.

The distinction between the strategic and the operational decision was, in fact, never clearly defined. Sir Charles Portal's staff, and notably the Directorate of Bomber Operations, frequently gave advice which resulted in operational decisions which were enforced by the Chief of the Air Staff against the advice of the Commander-in-Chief. Thus were reached, amongst others, the decisions to adopt primarily incendiary tactics at the beginning of 1942, to bring into existence the Pathfinder Force later in the same year and to adopt massive daylight bombing in the late summer of 1944. In such cases, members of the Air Staff in London often had direct consultations with Sir Arthur Harris' subordinate commanders.

On the other hand, Sir Charles Portal often suffered long delay in persuading Sir Arthur Harris of the desirability of strategic policies with which the latter disagreed.

The problems of control within Bomber Command itself were naturally somewhat less and, especially after the Headquarters at High Wycombe came into service with their marvellous system of communications, were brilliantly surmounted. At the peak was the Commander-in-Chief and his Headquarters Staff, from which the chain of command extended downwards through the Group Headquarters and, after 1944, the Bases to the Squadrons. When it is remembered that for each attack each single member of the bomber crew required individual briefing, that each crew required collective briefing and that each squadron required squadron briefing, it will be recognised that the feat of organisation in repeatedly laying on major operations was a considerable one. No commander in previous history committed such a high proportion of his front-line strength to battle as often as Sir Arthur Harris. Moreover, the operational orders required to be broken down into a vast number of individual units of application.

At the end of the war, the front line of Bomber Command was equipped with Lancasters, Halifaxes and Mosquitoes. The Halifax, though much improved in its later version, was never an entirely satisfactory aircraft, but the Lancaster and the Mosquito were without equal in their classes and in their day. Both had been in operational service with Bomber Command since 1942 and both were the product of somewhat unexpected circumstances. The Lancaster was undoubtedly the most effective heavy bomber of the Second World War in Europe and in many respects it bore favourable comparison with the American B.29 which was designed later and played a part in the war against Japan. The Lancaster had the range to reach virtually any target in Germany from British bases. With relatively minor modification, it was able to lift the 22,000-lb. *Grand Slam*

bomb. In flight it had no particular vices and in adversity it was remarkably robust.

The Mosquito was the result of a private venture by De Havilland and was only slowly recognised as a potential bomber and even more slowly made into one. This was partly due to its extraordinary versatility, which enabled it to be used as a night fighter, a vehicle of photographic reconnaissance and a bomber. As a bomber it had a remarkable performance. In its later versions it was able to carry a 4,000-lb. bomb to Berlin and then return to a British base. It carried no armament, but because of its great speed and the altitude at which it could fly, it suffered negligible battle casualties. Its ability to reach 30,000 feet and more was crucial in the use of *Oboe*, for the range of that device was dependent upon the altitude of the aircraft using it. Its manoeuvrability and speed were no less vital in the development of low-level marking techniques. Without the Mosquito, the Pathfinder Force technique of *Oboe* marking could not have been evolved nor could the 5 Group technique of visual marking have become so effective. The Lancaster was much less manoeuvrable and could not reach a remotely comparable altitude.

Indeed, and in many respects, the Lancaster bore unfavourable comparison with the Mosquito. Its relatively low speed and large size made it an easy target for German night fighters and very many Lancasters were shot down for that reason. Moreover, the loss of a Lancaster was not only much more common than the loss of a Mosquito, it was also much more serious. A Lancaster was crewed by a pilot, a navigator, a bomb aimer, a wireless operator, a flight engineer and two gunners. It was powered by four engines. A Mosquito was crewed by a pilot and a navigator and it was powered by two engines. Only in its vast weight-lifting capacity was a Lancaster superior to a Mosquito. But this was a consideration of fundamental importance. It is possible that some of the Lancaster's weight-lifting capacity was wasted through overloading which, especially on long-distance operations, sometimes forced crews to drop part of their bomb loads before reaching the target. There is, however, little evidence to suggest that this kind of jettisoning exceeded what was made necessary by special and duly recorded circumstances. Nor is there much evidence to show that overloading was a major cause of casualties.

To have achieved the weight-lifting capacity of the Lancaster force by the development of a Mosquito force would have meant the use of such a vast number of aircraft that it may be doubted whether the force could have been marshalled at the target and handled in and out from the limited number of aerodromes in and the limited air space over Britain. Moreover, it is not safe to assume that if the Mosquito element had been expanded to such dimensions,

the Germans would not have been able to devise some means of defence as they did against the Lancasters. The demand for pilots and navigators, the most skilled members of the bomber crew who needed the longest training, would also have been enormously inflated.

Such questions, however, are largely hypothetical. But it may reasonably be asserted that Bomber Command would have been ultimately stronger if the Manchester had never been produced and if the production of Stirlings and Halifaxes could have been exchanged for that of Lancasters as Sir Arthur Harris so often asked and for so long without response.

The front-line aircraft of Bomber Command were eventually equipped with a variety of remarkable devices ranging from highly complicated radar aids which made precise navigation and much improved bombing possible to the very simple metallised strips of paper known as *Window* which confused the German defences. But, in spite of the wonderful scientific inventions which were responsible for these devices and the operational research which had revealed the need for them, all this equipment had inevitable defects which were sometimes more apparent to those who used them on operations than to those who did not. It is, for example, an exaggeration to say that *H2S* enabled a bomber crew to see through cloud. It is also true that *H2S* enabled German fighters to home on bombers which were using it. Similarly, it is not true to claim that the Air Position Indicator enabled the navigator to abandon with safety the laborious and meticulous business of keeping an air plot.

Nor were these devices always as good as they might have been and sometimes their introduction was delayed beyond the necessary period required for production. The decision as to the moment at which a new device should be put into production and further modifications abandoned was, indeed, an extremely complicated one, and it is not surprising that the most advantageous result was sometimes not achieved. A different kind of decision was involved when the danger of revealing a new device such as the magnetron valve or *Window* had to be considered. All such defensive considerations, whether justified or not, were disadvantageous to Bomber Command, and in some cases it can hardly be maintained that adequate justification existed. In the case of the delay of *Window* an existing and severe threat to Bomber Command was prolonged to avoid a hypothetical and almost negligible one to the civil population and some other speculative possibilities.

Even so the record of scientific contribution to the problems of Bomber Command from 1941 to 1945 was a notable one which had decisive consequences. The efficiency of the force was increased many times over. Its versatility was vastly expanded and its casual-

ties, heavy as they were, were considerably diminished. In fact these sustained and brilliant endeavours enabled the force to achieve more than its original aims upon which, with moderate aircraft, such as the Wellington and Whitley, inadequate ones, such as the Hampden and Blenheim, and the totally inadequate Battle it had embarked with scarcely any of the necessary equipment in 1939. This enormous improvement in the aircraft and its devices was matched by a not less necessary, and in some cases hardly less remarkable improvement in its bombs, flares and target markers.

But in the means of active defence, the same progress was not made. The Mosquito needed no armament, but the Lancaster did. Yet like the Wellingtons and Whitleys of 1939, the Lancasters carried nothing better than .303 machine guns which were little more than a mild deterrent to the much more powerfully armed German fighters.

Some conclusions emerge with comparative clarity. The initial handicaps of Bomber Command as regards both its efficiency and its size were very severe and had prolonged effects. They were due to a combination of dilatoriness, financial stringency and the fact that air warfare was a new conception. The crippling effects of this were unnecessarily prolonged as far as efficiency was concerned by a parallel dilatoriness in establishing the means of measuring operational capacity and acting on the lessons learned. The expansion of the force and its qualitative improvement was also delayed by the pressure of other war requirements, the failure of the Manchester and the partial failures of the Stirling and the Halifax as well as by the slowness with which the bomber potential of the Mosquito was recognised. Bomber Command, in consequence, was long denied any significant success.

Moreover the task of achieving success was a much greater one than had initially been expected and long continued to be believed. Germany was a nation of far stronger morale and greater industrial strength and ingenuity than had been anticipated. In addition, the possibilities both of active and passive defence against bombing proved to be far more effective than supposed. The cardinal failure of British air strategy and operational doctrine was the failure to devise adequate means of overcoming the enemy air force and creating the conditions of air superiority, and, until this defect was at last repaired, the policy of reducing German air power by attacking its sources of production proved to be no more profitable and in some ways less so than other aspects of the strategic air offensive.

The force of the offensive was also blunted by the failure to achieve a proper concentration of effort. Diversions, both necessary and unnecessary, were on an immense scale, there were profound and enduring differences of opinion about what the main aim should be

and the system of higher direction was in many respects inadequate. Even so, it may be doubted whether a greater application of selective area bombing up to the time of the invasion of France in June 1944 would have produced better results than flowed from the general offensive. The restraining factors were due less to the differences of opinion than to the high casualty rate and the impossibility of achieving precise attacks. In the Battle of Berlin, Bomber Command endangered its morale by pressing the attacks to the point at which the results achieved did not compensate for the losses sustained.

In certain hypothetical circumstances, the capacity for night precision bombing in Germany might have been achieved earlier. If the aim had been to produce a much smaller and far more highly trained force the conditions, in that respect, might have been somewhat more favourable, but no completely adequate substitute for visual marking was ever discovered and visual marking in the face of effective defences called not only for training but also for a degree of dedicated courage which was inevitably rare. The high-level radar tactics of the Pathfinder Force brought about a dramatic improvement in area bombing but, over most targets, they did not make precision bombing possible. The greatest feat of night precision bombing ever achieved—the breaching of the Möhne and Eder dams—resulted in a completely unacceptable casualty rate. Sustained daylight bombing of deep penetration by heavy aircraft without comprehensive fighter cover proved to be not a feasible operation of war. The principal cause of the delay in achieving the possibility of effective daylight operations was the delay in introducing an effective long-range fighter. The responsibility for this latter delay, as also for the eventual and triumphant success in overcoming it, was jointly British and American.

In the final phase of the war, when air superiority had been achieved, the potential of the strategic air offensive was greater than its achievement. This was primarily due to the difficulty of obtaining a unified and concentrated policy through the channels of divided command and in the conditions of divided opinion. The striking force was stronger and more precise than the organisation which directed it. Even so, both cumulatively in largely indirect ways and eventually in a more immediate and direct manner, strategic bombing and, also in other roles strategic bombers, made a contribution to victory which was decisive. Those who claim that the Bomber Command contribution to the war was less than this are factually in error. Those who claim that its contribution under different circumstances might have been yet more effective disagree with one another and often overlook basic facts.

The achievement was basically due to a combination of conviction, leadership, invention and courage. The Air Staff persisted through-

out in the belief that the offensive was necessary to victory. They were undeterred by the severe disappointments and vigorous opposition which they encountered. Sir Arthur Harris gave Bomber Command leadership which infused the force with a sense of purpose when cold reason might have suggested a lack of it. The scientists, technicians and designers provided the equipment and devices without which the courage of the aircrews would have been futile. Yet without that response, which demanded of the ordinary crews that they should face the ordeal of major battle alone and in the darkness thirty times, conviction, leadership and invention would not have availed.

It is, of course, easy for historians to criticise the Air Staff of the Second World War and before for failing to learn the lessons of history. Hind-sight contributes powerfully to wisdom. To detect the lessons of the history of the strategic air offensive for the future is more difficult. The dangers of preparing for the last war rather than the next have, however, been reduced by the obvious magnitude of the changes brought about by the harnessing of nuclear energy, the development of high-speed flight and the creation of new delivery systems.



Principal Staff and Command Appointments

March 1944—May 1945

SECRETARY OF STATE FOR AIR

Sir Archibald Sinclair

CHIEF OF THE AIR STAFF

Marshal of the Royal Air Force Sir Charles Portal

VICE-CHIEF OF THE AIR STAFF

Air Chief Marshal Sir Douglas Evill

DEPUTY CHIEF OF THE AIR STAFF

Air Marshal Sir Norman Bottomley

ASSISTANT CHIEFS OF THE AIR STAFF (OPERATIONS)

Air Vice-Marshal W. A. Coryton

Air Vice-Marshal T. M. Williams From 1st August 1944

ASSISTANT CHIEFS OF THE AIR STAFF (POLICY)

Air Vice-Marshal D. Colyer

Air Vice-Marshal W. F. Dickson From 21st December 1944

ASSISTANT CHIEF OF THE AIR STAFF (INTELLIGENCE)

Air Vice-Marshal F. F. Inglis

DIRECTOR OF PLANS

Air Commodore W. L. Dawson

DIRECTOR OF BOMBER OPERATIONS

Air Commodore S. O. Bufton

BOMBER COMMAND

AIR OFFICER COMMANDING-IN-CHIEF

Air Chief Marshal Sir Arthur Harris

DEPUTY AIR OFFICER COMMANDING-IN-CHIEF

Air Marshal Sir Robert Saundby

SENIOR AIR STAFF OFFICER

Air Vice-Marshal H. S. P. Walmsley

AIR OFFICERS COMMANDING 1 GROUP

Air Vice-Marshal E. A. B. Rice

Air Vice-Marshal R. S. Blucke From 5th February 1945

AIR OFFICER COMMANDING 3 GROUP

Air Vice-Marshal R. Harrison

AIR OFFICERS COMMANDING 4 GROUP

Air Vice-Marshal C. R. Carr

Air Vice-Marshal J. R. Whitley From 12th February 1945

AIR OFFICERS COMMANDING 5 GROUP

Air Vice-Marshal The Hon. R. A. Cochrane

Air Vice-Marshal H. A. Constantine From 16th January 1945

AIR OFFICER COMMANDING 6 GROUP (R.C.A.F.)

Air Vice-Marshal C. M. McEwen

AIR OFFICER COMMANDING 8 GROUP (PATHFINDER FORCE)

Air Vice-Marshal D. C. T. Bennett

HEAD OF THE ROYAL AIR FORCE DELEGATION WASHINGTON

Air Marshal W. L. Welsh

Abbreviations

A.C.A.S. (Ops.)	Assistant Chief of the Air Staff (Operations)
A.C.I.U.	Allied Central Interpretation Unit
A.D.G.B.	Air Defence of Great Britain Command
A.D.I.(K)	Assistant Directorate of Intelligence (Department K)
A.E.A.F.	Allied Expeditionary Air Force
A.F.V.	Armoured Fighting Vehicle
A.G.L.(T)	Automatic Gun Laying (Turret)
A.H.B.	Air Historical Branch
A.I.	Air Intelligence or Air Interception (airborne radar apparatus for intercepting aircraft)
A.M.W.R.	Air Ministry War Room
A.O.C.-in-C.	Air Officer Commanding-in-Chief
B.B.R.M.	British Bombing Research Mission
B.B.S.U.	British Bombing Survey Unit
C.A.S.	Chief of the Air Staff
C.B.O.	Combined Bomber Offensive
C.C.S.	Combined Chiefs of Staff
C.G.	Commanding General
Cmd.	Command
C.O.S.	Chiefs of Staff
C.S.T.C.	Combined Strategic Targets Committee
D.C.A.S.	Deputy Chief of the Air Staff
E.A.B.	Economic Advisory Branch, Foreign Office
F.R.C.	Federal Record Center (U.S.A.)
G.A.F.	German Air Force
G.C.I.	Ground Controlled Interception
G.P.	General Purpose Bomb
He.	Heinkel
H.C.	High Capacity
H.E.	High Explosive
J.C.S.	Joint Chiefs of Staff (U.S.A.)
J.I.C.	Joint Intelligence Committee
J.O.T.C.	Joint Oil Targets Committee
J.P.S.	Joint Planning Staff
J.S.M.	Joint Staff Mission

M.A.A.F.	Mediterranean Allied Air Forces
M.C.	Medium Charge
Me.	Messerschmitt
M.E.W.	Ministry of Economic Warfare
M.T.	Motor Transport
<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)
P.F.F.	Pathfinder Force
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.H.A.E.F.	Supreme Headquarters, Allied Expeditionary Force
U.S.S.A.F.E., U.S.St.A.F.E. or U.S.S.T.A.F.	United States Strategic Air Forces in Europe
U.S.S.B.S.	United States Strategic Bombing Survey
V.C.O.S.	Vice-Chiefs of Staff

Code Names

<i>Album Leaf</i>	Improved kind of <i>Oboe</i>
<i>Bodyline</i>	The attack on the production of V-weapons
<i>Bugle</i>	Allied air attack against communications in the Ruhr
<i>Cigar</i>	The jamming of German V.H.F. radio telephonic communication 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>Clarion</i>	The American plan to disrupt German communications and morale by widespread bombing attacks
<i>Crossbow</i>	The attack on V-weapon launching sites
<i>Eee</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>H2X</i>	American version of <i>H2S</i>
<i>Hurricane I</i>	Plan for concentrated air attack on the Ruhr
<i>Johnny Walker</i>	Anti-shipping bomb
<i>Mandrel</i>	Radio swamping of the German early warning system
<i>Musical Newhaven</i>	Method of ground marking a target by flares or target indicators dropped blindly on <i>Oboe</i> , followed, if possible, by visual 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>Naxos</i>	German radar device enabling fighters to home on <i>H2S</i> transmissions of bombers
<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>Octagon</i>	The second Quebec Conference, September 1944
<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

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<i>Quadrant</i>	The first Quebec Conference, August 1943
<i>Rankin</i>	The plan for an occupation of Europe in the event of a German collapse
<i>Serrate</i>	Radar device enabling fighters to home on the radar transmission of enemy aircraft
<i>Tallboy</i>	12,000-lb. penetrating (earthquake) bomb
<i>Thunderclap</i>	Plan to deliver a sudden, catastrophic blow by bombing Berlin with a view to bringing about surrender
<i>Torch</i>	Allied invasion of French North Africa in 1942
<i>Window</i>	Tinfoil strips designed to confuse German radar

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