



R.A.F. WAR PLANS AND BRITISH FOREIGN POLICY: 1935-1940

by

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## ABSTRACT

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Submitted to the Department of Political Science on May 13, 1966, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

After Hitler came to power in Germany in 1933 the Royal Air Force of Great Britain produced a series of reports in which they evaluated the threat of enemy air attack. By 1938 they had reached the conclusion that the country was vulnerable to a "knock-out blow" which might result in defeat after a few weeks of bombing. The British Government was repeatedly warned by the Air Staff that the country was not prepared for war because of its vulnerability to air attack. In September 1938 Mr. Neville Chamberlain, the Prime Minister, met Hitler at Munich and was able to avert war through an agreement on the secession of Czechoslovak territory to Germany. In September 1939 Britain decided to go to war despite the "knock-out blow" which was still expected.

Germany did not bomb Britain at the beginning of war as had been predicted for so long. When bombing did begin it was much less effective than had been expected. In fact German bombing during the entire war resulted in the same number of casualties as the British Air Staff had expected in the first twenty-four hours. In the absence of German attacks, the R.A.F. changed its war plans in order to maintain the constraints on bombing which were thought to be to British advantage. Circumstances changed so drastically in 1940 with the growing danger of an invasion as well as the declining estimates of bombardment, however, that by the fall of 1940 the British preferred to see raids on their cities to continued attacks on the R.A.F. which would have weakened the defence against invasion.

With the use of many unpublished documentary sources as well as other more readily available material, it has been possible to analyze the calculations and to see the reasons why both the scale of attack and technical efficiency of the delivery systems required for a decisive blow were so considerably underestimated. The influence of the calculations on the British Government is considered and the reasons why Britain went to war in spite of a fear of the "knock-out blow" are analyzed.

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## BIOGRAPHICAL NOTE

Gordon S. Smith attended Lower Canada College in Montreal until 1958 when he entered McGill University. He graduated from McGill in 1962 with a B.A. In the academic year 1962-1963 he attended the University of Chicago where he received a University financial award. Since 1963 he has been at M.I.T. During 1964-1965 he received a fellowship from the Center for International Studies and during 1965-1966 he was granted fellowships from the Canada Council, the Province of Quebec, as well as from the Center. In August 1964 when working for the Systems Analysis Group of the Defence Research Board, he published A Selected Bibliography on International Peace-Keeping (Department of National Defence: Ottawa, Canada; SAG Memorandum 64/M.2).

## PREFACE

While spending six months in England in the fall and winter of 1965 I was privileged to interview many of the R.A.F. officers who held senior posts before and during World War II. Not once was I denied an interview and I always received both the cooperation and kind hospitality of those I met. The names of those I interviewed are listed in the bibliography. This experience of talking to those actually involved in the problems about which I was writing was invaluable as was the assistance I received from many more who answered my queries by letter.

I was privileged to be able to see a number of Royal Air Force documents and for this I am very grateful to Mr. L. A. Jacketts, Chief of the Air Historical Branch. Without his assistance I would have been restricted to published sources. In accordance with the practice of the British Ministry of Defence I have not quoted directly from these documents. The files which were used are listed in the bibliography and footnotes.

It has been my good fortune to have many people read and comment upon the text. In particular I would like to thank my thesis supervisor, Professor William W. Kaufmann, for his unflagging encouragement and assistance. Others

who have read and commented on all or part of the manuscript and to whom I am deeply grateful include Professor Fred Charles Iklé, Air Vice-Marshal E. J. Kingston McCloughry, Harold Larnder, Professor Lucian W. Pye, G. Meredith Smith, and Dr. R. J. Sutherland. Ann Smith has simultaneously combined the roles of typist, editor and wife in a manner which could not be excelled.

I would also like to acknowledge my gratitude for the support provided by the Canada Council, the Center for International Studies at M.I.T., and the Province of Quebec. Needless to say, I alone am responsible for the contents and conclusions of this thesis.

Gordon S. Smith

Cambridge, Massachusetts  
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## INTRODUCTION

In only a few wars throughout history has the initial blow been decisive. There has usually been sufficient time after war has begun to correct any faulty preparations by manufacturing more or different weapons, by putting additional men into uniform, and by formulating new strategic plans if these are required. Today the possible use of nuclear weapons makes it no longer feasible for a nation to delay until it is attacked decisions on the selection and procurement of weapons, on the build-up and deployment of forces, and on the manner in which they are to be used. The narrow margin of survival will depend on the quality of the decisions which have been taken in peace-time.

Planning in peace-time is made particularly difficult by a number of factors. The time, place, and circumstances of crises which might require the use of military force are uncertain. Considerable technological advances may have taken place since many of the weapons systems were last used in combat and this inevitably leads to uncertainties about performance under battlefield conditions. These and other uncertainties complicate the calculations which must be made and upon which our security depends.

Calculations are increasingly becoming a more important part of the decision-making process. The tendency to quantify where appropriate greatly facilitates choices in a manner not possible when more qualitative methods are used.

We live in a world in which all decisions must be made under the threat of nuclear war. The military and technological environment has a powerful effect on decision-making by acting as a constraint on certain areas of choice as well as by creating new types of options. We have not had sufficient experience in a world where there is always a possibility that an enemy might destroy our civilization to know the precise relation of this threat to policy making.

It has sometimes been asserted that lessons of previous wars do not offer reliable or even relevant information for those concerned with today's national security problems.<sup>1</sup> It would seem, however, that this conclusion is not based on a careful examination of the facts. In a number of areas there are important precedents for current problems.<sup>2</sup> For example, in the planning between 1919 and 1939 the Royal Air Force of Great Britain was

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<sup>1</sup>E. S. Quade, Analysis for Military Decisions (Chicago: Rand McNally & Co., 1964), p. 2.

<sup>2</sup>A number of such precedents are brought out by George Quester, Deterrence Before Hiroshima (New York: John Wiley & Sons, Inc., 1966).



involved in a situation which is in many ways similar to that which exists today.

The R.A.F. was engaged in peace-time planning when many advances had been made in military technology since the last general war. The R.A.F. had to face a situation in which changes, although much less revolutionary than those of today, had been made in the development of aircraft used for both bombing and defence. Planning factors were derived from a previous war which had only limited relevance and from peace-time exercises and tests. Today we use a variety of experimental tests, exercises and so-called paper wars to deal with this problem. The British Air Staff made a number of serious miscalculations overestimating the effectiveness of bombing; as a result of a fortunate set of circumstances, however, the R.A.F. had time to modify drastically their plans after the start of war but before it was necessary to put them into effect. It is improbable in a general nuclear war situation that this will ever be possible again; hence the increased importance of good peace-time plans.

Since it was widely assumed the initial blow of war would be decisive, we may analyze the behaviour of a nation under circumstances remarkably similar to those which we know prevail today. The fact that the British greatly exaggerated the threat of German air attack does not mean that an analysis of the impact of these estimates on policy is of any less relevance.

During the period before 1939 the British were unwilling to take even moderate risks of war with Germany, believing the Luftwaffe might be able to defeat Britain through air attacks. In this context it is particularly interesting to re-examine the policy of appeasement in September 1938 at the time of Chamberlain's meetings with Hitler at Munich.

In 1939 Britain went to war despite the threat of the "knock-out blow", as a decisive enemy air attack was known. Calculations still indicated that German bombing would cause extremely high levels of casualties and destruction. Whether Britain could survive an attack was regarded as uncertain. In other words it might be said that Britain went to war believing the circumstances were not unlike those in which a major nation would go into a nuclear war today.

Britain nevertheless decided to go to war but changed her war plans which had called for the strategic bombing of Germany. Important limitations were present in the preliminary stages of the air war between Germany and Britain. Changed calculations in Britain, however, had an important effect on the enlarging or escalation of the air war. By September of 1940 the fear of the "knock-out blow" had entirely disappeared.

How real were these fears of enemy air attack? What influence did such fears have on policy? What happened after Munich that Britain decided to go to war in 1939?

How did changing calculations affect the escalating air war? These are some of the major questions to be answered. We shall see that an examination of the British Air Staff calculations on which their own plans for an offensive against Germany were made gives many clues as to why the effects of bombing were so exaggerated.

Because we are now in an age when we know that any major war would bring into doubt our survival, it is important to examine the behaviour of the British in both 1938 and 1939 when they felt that they were in a similar situation to that which we know we are in today. The premises concerning the threat of enemy attack upon which the British Government acted are very similar to those upon which contemporary governments must make decisions. With the obviously great advantages of hindsight it is possible to analyze the reasons for, as well as the consequences of, the calculations which predicted results of bombing which only now exist. The results of the analysis will hopefully point both to some of the attributes as well as to the importance of good calculations.

## CHAPTER I

### APPRECIATION OF THE DANGER OF AIR ATTACK: 1919-1932

#### Origins in World War I

The British Air Staff found the basis for their strategic doctrine of offensive bombing as well as the data upon which to make their plans in the years preceding World War II in the experience of World War I. Flying was only in its earliest stages at the outbreak of hostilities in 1914 and consequently the pilots in that war were pioneers in a new form of warfare. Attitudes towards the use of air power were on the whole pragmatic rather than doctrinaire and there was a search for the most effective manner in which to use this new development in the science of war.

The war ended in 1918 before any convincing proof had been given of the offensive power of aircraft. Experience showed that bombers could penetrate the existing enemy defences up to the limit of their radius of action but owing to weather conditions and other factors, it had proved impossible "to achieve the concentrated and sustained attacks that could have been decisive."<sup>1</sup>

It was widely thought, however, that air bombardment

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<sup>1</sup>Air Marshal Sir Robert Saundby, Air Bombardment (London: Chatto and Windus, 1961), p. 23.

had shown its great potential, although there was little disagreement about the fact that it had not yet proved to be very effective. Reasons for the lack of success thus far could be offered; allied bombing had not been sufficiently concentrated or unsuitable targets were selected. A few officers concentrated primarily in the newly formed Royal Air Force were particularly impressed with the possibilities of air power even though the "plain fact was that air bombardment had never, on any occasion, produced a decisive attack."<sup>1</sup>

German airship<sup>2</sup> and airplane raids on Britain between 1914 and 1918 caused 1,414 deaths and a total of 4,830 casualties. The raids on London caused 670 deaths and 2,630 casualties.<sup>3</sup> The weight of attack required to inflict this casualty level was 269 tons of high explosive bombs on the entire country whereas in London itself a total of 55 tons was dropped.<sup>4</sup>

Of the 543 tons dropped by the British on Germany, 220 were dropped on German airfields. Seventy-six per cent of the bombers originally sent out dropped bombs somewhere

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<sup>1</sup>Ibid.

<sup>2</sup>Motor-driven dirigibles.

<sup>3</sup>H. A. Jones, The War in the Air, History of the Great War Series, Committee of Imperial Defence Historical Section (Oxford: The Clarendon Press, 1922 etc.), Vol. 3, App. I and Vol. 5, App. I.

<sup>4</sup>The measurement is in long tons which equal 2,240 pounds. Unless otherwise noted, all tonnages will be in long tons.

in Germany, and fifty-five per cent of these were believed to have been dropped on the primary or alternative targets given to them; the rest had no very specific objective. Fourteen per cent turned back without reaching Germany because of engine trouble or the weather.<sup>1</sup>

Although it is always difficult to measure the effects of bombing on morale and social organization, the most detailed survey of bombing during the 1914-1918 war does not indicate that the consequences were ever grave. Neither was there any evidence of serious industrial dislocation. According to the Official British Air Historian, H. A. Jones, although there were isolated instances of panic, the raids "led for the most part to a stiffening of the national temper."<sup>2</sup> Winston Churchill correctly wrote in October 1917 "we have seen the combative spirit of the people roused and not quelled by the German air raids."<sup>3</sup>

The size of these raids was, however, comparatively small when the Air Staff examined what they expected in a future war. In World War I a total of 269 tons had been dropped on Britain and 543 tons on Germany; in a future war there was no doubt that the raids would be much larger as well as being more concentrated in time. Many members

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<sup>1</sup>Jones, Vol. VI, pp. 158, 163 n.

<sup>2</sup>Jones, Vol. V, p. 153 et passim.

<sup>3</sup>Ibid., Appendices, p. 19.

of the Air Staff were therefore very concerned about the impact of heavy bombing on the civil population.

Among those who were particularly impressed by bombing during World War I was the South African General, Jan Smuts. Charged with making recommendations on the future of air power in Great Britain, he headed a Committee which produced its report in 1917. This contained a strong argument for the establishment of an independent bomber force. The primary reason that a separate service was said to be desirable was that since the mission of the force would be bombing independent of the action of the land and sea forces, the organization of the force should be in the form of a separate branch of the armed forces. It was felt that the unique power of aircraft lay in their capability to inflict damage in areas far beyond the front line and that this power should be exploited as fully as possible.

Smuts adopted the doctrine, already introduced in the Royal Flying Corps by Major-General Hugh Trenchard, that a counter-offensive was the best form of defence. In his report he proposed substantial increases in the size of the air force and the creation of a large strategic bombing force. The report recommended the establishment of a separate service for the air force, independent of both the Navy and the Army. The Royal Flying Corps as then constituted was a branch of the Army. The Cabinet

accepted the report in spite of strong opposition from the other services and on April 1, 1918, the Royal Air Force came into existence. Its birth as a separate entity was thus closely associated with the strategic bombing offensive. This was the basis on which the claim that it was desirable to have an independent air force was made and this important association was maintained throughout the 1920's when the R.A.F. was still fighting for its existence as a separate service.

#### Trenchard and the British Doctrine of Air Power

Major-General Trenchard was made the first Chief of Staff of the R.A.F. and, with one short period excepted, continued in that position until 1929.<sup>1</sup> It is therefore not surprising that R.A.F. strategy can be so closely identified with his name.

Trenchard believed that the development of air power had revolutionized warfare. He observed that in the past battles had been won or lost on land or on sea but now a war could be won or lost in the air in a few weeks or at most months regardless of the outcome of the land and sea battles. As Trenchard said:

It is not necessary for an air force, in order to defeat the enemy nation, to defeat the armed forces first. Air power can dispense with that intermediate step, can pass over the enemy

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<sup>1</sup>Trenchard resigned after an altercation with Viscount Rothermere, the Secretary of State for Air, but returned after a settlement had been reached.



navies and armies, and penetrate the air defences and attack direct the centres of production, transportation and communication from which the enemy war effort is maintained.<sup>1</sup>

The unique feature of an Air Force, according to Wing Commander A. G. R. Garrod, was that it "can . . . exert direct pressure on the morale and resisting power of the enemy by attacking his whole organization of communications and means of production."<sup>2</sup>

The only means of defence against an enemy who launched a massive air attack was thought to be a bomber counter-offensive. The counter-offensive should begin immediately and would have to be of such a magnitude that the enemy would be forced to desist from attack. Any war would necessarily be over quickly for no country could take for long periods the constant hammering of massive air attacks. The winner would be the side which delivered the decisive blow first. If a large bomber force was established before war began, this might act as a deterrent because an opponent would not feel tempted to attack if he knew that he would suffer an unacceptable level of damage in the form of a counter-offensive as a consequence. Trenchard spent

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<sup>1</sup>Memorandum by the Chief of the Air Staff for the Chiefs of Staff Sub-Committee on The War Object of an Air Force, May 2, 1928, quoted in Sir Charles Webster and Noble Frankland, The Strategic Air Offensive Against Germany 1939-1945, History of the Second World War, United Kingdom Military Series (London: Her Majesty's Stationery Office, 1961), Vol. IV, p. 72.

<sup>2</sup>Wing Commander A. G. R. Garrod, "Air Strategy" in the Royal Air Force Quarterly, Vol. I No. 1 (January 1930), p. 30.

much of his career as Chief of the Air Staff arguing for a much larger bomber force so that Britain would have such a deterrent.

General P. R. C. Groves, Director of Flying Operations during World War I and a British delegate at Versailles participating in discussions on German aerial disarmament stated: "The most effective form of protection against air attack is in the counter-offensive against the enemy's territory, and the greatest deterrent to aerial aggression is the possession of a powerful striking force patently able at once to inflict reprisals in kind."<sup>1</sup> The primary fear of the Air Staff during the interwar years of first a French and then, much more seriously, a German attempt at delivering a "knock-out blow" or a quick but paralyzing air attack was that they did not have an adequate deterrent.

Trenchard believed, as did most of the Air Staff, that the next war would without doubt begin with a massive surprise air attack.<sup>2</sup> Since Britain never had any plans to attack first, whether the attack be preventive or even pre-emptive, it must be assumed that she would suffer the first blow.<sup>3</sup> Since it was believed that there would not

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<sup>1</sup>General P. R. C. Groves, Our Future in the Air (London: George C. Harrop & Co. Ltd., 1935), p. 72.

<sup>2</sup>See for example Air Vice-Marshal E. L. Gossage, The Royal Air Force (London: William Hodge & Co. Ltd., 1937), p. 45. There was no question in his mind that the next war would begin with an intense struggle in the air.

<sup>3</sup>A pre-emptive attack is one in which a country, certain that it is about to be attacked, itself begins

be sufficient time to procure more bombers the war would have to be fought with the forces in being at the outbreak of the war. Trenchard argued that it would be folly to believe it possible to postpone rearmament until war had actually begun. This would be too late for the force to act as a deterrent and the war would be lost before there was time to effect the required build-up to cause the enemy to desist from attack.

The struggle for the command of the air during war would, according to Trenchard, take a different form from that usually imagined. Fighting would not take the form of a battle

between the opposing air forces to gain supremacy as a first step before the victor proceeds to the attack of other objectives. . . . The stronger side, by developing the more powerful offensive, will provoke in his weaker enemy increasingly insistent calls for the protective employment of aircraft. In this way he will throw the enemy on to the defensive and it will be in this manner that air superiority will be obtained, and not by direct destruction of air forces. The gaining of air superiority will be incidental to this main offensive upon the enemy's vital centres and simultaneous with it.<sup>1</sup>

In an official Air Ministry publication it was declared that:

Air superiority is a state of moral and material superiority which enables its possessor to conduct air operations against an enemy and at

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the war. The distinction between preventive and pre-emptive attacks is one of time, the latter being delayed until much nearer to the expected time of enemy attack.

<sup>1</sup>Quoted in Andrew Boyle, Trenchard (London: Collins, 1962), pp. 72-73.

the same time deprives the enemy of the ability to interfere effectively by the use of his own air forces. . . The struggle for air superiority will begin as soon as the opposing air forces come within range of one another and will continue throughout all phases of the campaign. . . The method of obtaining air superiority which is most likely to succeed is a combination of accurate and continuous attacks on targets which are vital to the enemy with vigorous offensive action by fighters.<sup>1</sup>

It is not surprising that only a minor role was foreseen for air defence. Air Vice-Marshal Gossage wrote that air defence was "unreliable, and absolute security against air bombardment is not practicable." Gossage and many of his fellow officers seemed to reason that since absolute security was impossible, it was not worthwhile to make an effort for partial security. Thus Gossage came to his conclusion that "we must rely on the offensive as our principal means of defending ourselves."<sup>2</sup>

Fighter defence was discounted both for operational and strategic reasons. It was believed that interceptions of incoming enemy aircraft would be impossible due to the very short time that elapsed between the crossing of the coast and the moment the bomber was over its target. There was also considerable question about the capability of trained observers to report every incoming flight. Even if this could be accomplished the problems of interception appeared to be impossible of solution. To keep the

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<sup>1</sup>The Employment of Air Forces with the Army in the Field (London: Air Ministry, 1938), p. 30.

<sup>2</sup>Gossage, p. 23.

defensive fighters in the air in order to reduce the time lag required for aircraft to take off and climb to the height of the bomber would have required a vast number of fighters. To keep one squadron on air alert required a total of six on the ground. If this system was adopted, aircraft would wear out quickly due to the high number of flying hours. Such a scheme would also have required a large number of crews.

The strategic argument against fighters was based on the assumption that the only way to win the war was to go on the offensive. Conducting an air defence campaign would be at best a holding operation; it could never lead to victory. In addition Trenchard disliked the defence-mindedness that a large fighter force would involve. If the force became defence-minded its existence as a separate service might be undermined. He had absolutely no use for fighters except as they were required to meet the demands of the civil population. Their contribution to winning the war would be negligible.

Wing Commander Garrod stated the Air Staff appreciation of defence as follows:

[Since] offence is the best defence . . . it follows that as much of the available strength as possible must be allotted to the bombing squadrons and only sufficient retained in the form of fighter squadrons to provide direct protection of centres vital to the maintenance of the offensive. The only sound method of causing the enemy to weaken his air attack on us is for us to hit him still harder until he

is forced to take up a defensive attitude.<sup>1</sup>

In his discussion of the appropriate targets for air attack, Air Vice-Marshal Gossage wrote "that it may, on occasions, be necessary for the Air Force to take direct measures to defeat the enemy air force by attacking its aerodromes and bases of supply but this, it is felt, would be the exception, if our attacks calculated to undermine the enemy's power of resistance are well planned and resolutely pushed home."<sup>2</sup> Gossage added that such attacks, to be successful, should compel the enemy to assign an ever larger portion of his force to defensive duties in place of the offensive role for which they were designed. He felt that "if the clamour of the civil population for local protection is allowed to bring about this defensive attitude in the air, it will sooner or later spell defeat in the air and collapse of the national morale."<sup>3</sup>

Major-General J. F. C. Fuller wrote that in the next war "fleets of aeroplanes will attack the enemy's great industrial and governing centres. All these attacks will be made against the civil population in order to compel it to accept the will of the attacker."<sup>4</sup> Targets would accordingly be selected to fulfill these objectives. In

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<sup>1</sup>Garrod, p. 31.

<sup>2</sup>Gossage, p. 26.

<sup>3</sup>Ibid., p. 27.

<sup>4</sup>Quoted in Major-General J. F. C. Fuller, Tanks in the Great War (London: J. Murray, 1960), p. 192.

1926 Air Chief Marshal Robert Brooke Popham emphasized that air strikes should be conducted against the "nerve centres of the enemy's power." This would destroy the morale of the enemy's population.<sup>1</sup>

In 1928 in his last year as Chief of the Air Staff Trenchard wrote that the role of the air force was to:

attack directly the centres of production, transportation, and communication from which the enemy war effort is maintained. . . . The stronger side will throw the enemy on to the defensive and it will be in this manner that air superiority will be obtained, and not by direct destruction of air forces. . . . The object to be sought by air action will be to paralyze from the very outset the enemy's productive centres of munitions of war of every sort and to stop all communication and transport. . . . The aim of the Air Force is to break down the enemy's means of resistance by attacks on objectives selected as most likely to achieve this end.<sup>2</sup>

No thought was given to the possibility of executing some sort of counterforce attack.<sup>3</sup> The result of the attack which Trenchard advocated would be so great, in Marshal Foch's words, as to "impress the public opinion to a point of disarming the Government and thus becoming decisive." Trenchard believed:

once an air raid has been experienced, false alarms are incessant and a state of panic

<sup>1</sup>Lecture given at the Imperial College in 1926.

<sup>2</sup>Memo. of the Chief of the Air Staff for the Chiefs of Staff Sub-Committee on the War Object of an Air Force, May 2, 1928, quoted in Webster and Frankland, Vol. V, pp. 72-76.

<sup>3</sup>An attack aimed entirely or at least in large part at the enemy's military establishment.

remains in which work comes to a standstill. . . Each alarm by day brings the day's work to an end - while by night the mere possibility of an air raid destroys the chances of sleep for thousands.<sup>1</sup>

This view of air warfare, however, was decisively rejected by the Chief of the Imperial General Staff, Sir George F. Milne, as well as by the Chief of the Naval Staff in separate memoranda written in reply to the Trenchard note quoted above. Milne found it:

difficult to see how the paralysis of the enemy's productive centres is to be brought about. . . It is ridiculous to contend that the dropping of bombs has reached such a stage of accuracy as to ensure that the bombs would hit only the so-called military objectives.<sup>2</sup>

Milne made a strong case for his assertion that unrestricted bombing was likely to be more dangerous to Britain than any other country because of its concentration of population and industry and its proximity to the Continent. He felt limitations on strategic bombing would be very much to British advantage and that in no circumstances should Britain be the country to initiate unrestricted bombing. The Air Staff, however, were sufficiently sure that war would begin with enemy air attack that they considered any discussion of a British initiation of strategic bombing to be irrelevant.

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<sup>1</sup>Ibid., pp. 72-76. Foch is quoted by Trenchard with no reference.

<sup>2</sup>Memo. of the Chief of Imperial General Staff for the Chiefs of Staff Sub-Committee on the memorandum of the Chief of the Air Staff, May 21, 1928, quoted in Webster and Frankland, Vol. IV, pp. 76, ff.



Milne argued that to adopt Trenchard's views would be against the national interest. Furthermore he felt that "as the air menace grows," measures will be "developed to combat it." He thought that air superiority would probably be determined in much the same manner as on land or at sea.<sup>1</sup>

Both Milne and the Chief of the Naval Staff argued that there was no evidence from the 1914-1918 war to indicate that bombing might be decisive. Results of bombing in that war were described as "unpleasant" but in no case was paralysis achieved. The most noticeable result, in fact, was a hardening of the will to win. The Chief of the Naval Staff compared the arguments of the Chief of the Air Staff to those of enthusiasts of unrestricted submarine warfare. Neither, he felt, could produce decisive results and the consequences would be to stiffen rather than to break the morale of the enemy.<sup>2</sup>

It is difficult to find instances in which the Air Staff were specific about how the paralysis which they so often predicted might be achieved. Marshal of the R.A.F. Sir John Salmond speaking in 1928 when he was Air Officer Commander-in-Chief Air Defence of Great Britain believed:

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<sup>1</sup>Ibid.

<sup>2</sup>Note by the Chief of Naval Staff for the Chiefs of Staff Sub-Committee on the memorandum of the Chief of the Air Staff, May 21, 1928, quoted in Webster and Frankland, Vol. IV, pp. 81-83.

Civilized communities are today so dependent on the routine which is concomitant with modern civilization that if the routine can be upset a definite blow has been given to morale. If it can be rendered chaotic the function of the community will wither and its morale will be destroyed. . . . Victory will come to the belligerent who can first break morale. Air Forces will destroy it by a preponderating offensive against the enemy's centres of military preparation.<sup>1</sup>

This would not take long. According to Captain Liddell Hart writing in 1925 bombers would:

strike direct at the seat of the opposing will and policy. . . . There is no reason why, in a few hours, or at most days, from the commencement of hostilities the nerve system of one of the contending countries should not be paralyzed.<sup>2</sup>

One of the

One of the major strategic controversies was over the possibility of the use of gas. Most assumed that it would produce paralysis in society but there was a division over the likelihood of both sides being deterred from its use. A number of the nation's best known scientists feared that a gas attack delivered by bombers would be devastating.<sup>3</sup>

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<sup>1</sup>Quoted in John Laffin's biography of Salmond, Swifter Than Eagles (Edinburgh and London: William Blackwood & Sons Ltd., 1964), p. 204.

<sup>2</sup>Captain Basil H. Liddell Hart, The Memoirs of Captain Liddell Hart (London: Cassell, 1965), Vol. I, p. 141. The article originally appeared as "The Napoleonic Fallacy: The Moral Objective in War", The Empire Review, March 1925. In fairness to Liddell Hart, however, it should be noted that by the 1930's he was less pessimistic about the power of bombing.

<sup>3</sup>See Heinz Liepmann, Death From the Skies (London: Martin Seeker and Warburg, Ltd., 1937) and J. B. S. Haldane, A.R.P. (London: Victor Gollancz, 1938).

Writing in 1929 the Earl of Halsbury who a few years before had been Chief of the Explosives Department of the British Ministry of War stated that:

Many great powers were now in a position to put immense numbers of bombing aeroplanes into commission at very short service. Should war break out there is no doubt that these aeroplanes would be used for attacking the civilian population of other countries. The weapon which would chiefly be used would be poison gas.<sup>1</sup>

The Air Staff was prepared to use gas in its counter-offensive but only if its use had already been initiated by the enemy. The R.A.F. had supplies of gas but they were all located in one depot and Sir Edward Ellington, Chief of the Air Staff from 1933 to 1937, has said he often wondered what would happen if the Germans dropped just one bomb on the single supply depot.<sup>2</sup>

Frank Morison, a journalist writing in 1937, stated that: "It is generally the view of competent observers in all countries that one of the first acts of a belligerent power will be an attempt to strike a paralyzing blow at the most vulnerable point of the opposing war machine - the administrative heart of the country." He believed that "a few well-directed bombs on Whitehall . . . causing immense havoc and confusion would be more truly demoralizing during the critical days of mobilization than many a great battle under the old regime." He thought, however, that

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<sup>1</sup>The Times (London), February 27, 1929.

<sup>2</sup>Interview with Sir Edward Ellington, October 18, 1965.

gas would probably only be used as a "last resort" for four reasons: 1) the immorality of such warfare, 2) the indiscriminate nature of any attack with gas, 3) the likelihood that an attack with gas would receive a reply in kind, and 4) the morale of one's own troops would be endangered by the knowledge of the presence of gas.<sup>1</sup>

The argument used by those who felt certain that gas would be used is exemplified by another author, J. Thorburn Muirhead. He asserted that "modern warfare is . . . synonymous with bombardment of civilian communities by enemy aircraft involving the prolific use of high explosive bombs, poison gas bombs, incendiary bombs, gas spraying bombs, etc."<sup>2</sup> There would be little or no warning before the attack began. Muirhead put little faith in the Geneva Gas Protocol and felt it was significant that research was permitted to continue. He felt that all means available would be used to secure "the primary objective . . . a general interruption of industrial production and the undermining of morale by the creation of an all-pervading sense of insecurity."<sup>3</sup> The targets envisioned were usually the seat of government, military and intellectual centers, and the food supply. E. L. Howard

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<sup>1</sup>Frank Morison, War on Great Cities (London: Faber and Faber, 1937), pp. 8, 118, et passim.

<sup>2</sup>J. Thorburn Muirhead, Air Attack on Cities (London: George Allen and Unwin Ltd., 1938), p. 15.

<sup>3</sup>Ibid., p. 20.

Williams writing in the Royal Air Force Quarterly in 1937 estimated that about 1,000 aircraft would be needed to gas London and thus the total and simultaneous gassing of London to be quite possible.<sup>1</sup>

Gas, however, was certainly not seen by most people as the only manner in which paralysis might be achieved. According to Major-General H. Rowan Robinson, the principal aim of air attack is "the spread of panic among the population," and on the basis of what had happened in World War I the Air Staff expected that high explosive bombing would produce this widespread panic among the population in a period of a few weeks at most.<sup>2</sup> On the other hand Winston Churchill, writing shortly after World War I, refused to believe "that any terrorization of the civil population which could be achieved by air attack would compel the Government of a great nation to surrender."<sup>3</sup> This view was rejected by the Air Staff, however, who expected that although the actual damage caused by bombing would be considerable, the decisive factor in war would be the breakdown of civilian morale. Trenchard emphasized

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<sup>1</sup>E. L. Howard Williams, "Air Strategy: Being a Brief Analysis of the Book on Air Strategy by General N. N. Golovine", Royal Air Force Quarterly Vol. VIII No. 3, (July 1937), p. 247.

<sup>2</sup>Major-General H. Rowan Robinson, "Some Aspects of Air Raid Precautions (A.R.P.)", Royal Air Force Quarterly Vol. IX No. 2, (April 1938), p. 116.

<sup>3</sup>Reference not given. Quoted in Webster and Frankland, Vol. I., p. 47.

this point by writing his often quoted remark that "the moral effect of bombing stands undoubtedly to the material effect in the relation of 20 to 1."<sup>1</sup> Thus the reaction of the population to heavy air attack was expected to be the decisive factor.

No one gave much thought to constraints or limitations on strategic bombing other than on the possible use of gas. Both sides were expected to go for the other's jugular vein in a struggle to the death. The Air Staff foresaw a war with two opposing air forces furiously pounding at each other's country until one or the other finally collapsed under the pressure. The Air Staff did not think that limitations, even if they were possible, would be advantageous to Britain.

It was felt that "air attacks will be directed against any objectives which will contribute effectively towards the destruction of the enemy's means of resistance and the lowering of his determination to fight." Trenchard acknowledged that it would only be legal to attack military objectives and "among these will be comprised the enemy's great centres of production of every kind of war material, from battleships to boots, his essential munition factories, the centres of all his systems of communications and transportation, his docks and shipyards, railway workshops,

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<sup>1</sup>Dispatch of Trenchard, July 1, 1919, quoted in Ibid., p. 46.

wireless stations, and postal and telegraph systems."<sup>1</sup>

Although this was certainly a broad description of military targets, pure terror bombing was not expected. Raids would be directed at particular target systems such as "centres of production and distribution" or "the various services and general amenities upon which the populations of large towns depend for their existence, such as transport for conveying food, water supply, drainage, and electrical power installations." Gossage described this as a type of "economic blockade" and reflected the general consensus when he said that indiscriminate attacks upon the civil population were "uneconomical."<sup>2</sup> It was thought, however, that the "economic blockade" attacks would have many of the beneficial effects of pure terror bombing, in particular that of breaking enemy morale.

It was not believed that massive attacks as we know them today would be necessary to pummel an opponent into submission. In 1921, for example, the Air Staff believed that a total of 1,500 tons of high explosives dropped in a month on London might be enough to bring Government and all public services to a halt.<sup>3</sup> Thus

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<sup>1</sup>Quoted in Boyle, p. 74.

<sup>2</sup>Gossage, pp. 110-11.

<sup>3</sup>Basil Collier, *History of the Second World War, United Kingdom Military Series*, ed. Sir James R. M. Butler, The Defence of the United Kingdom (London: Her Majesty's Stationery Office, 1957), p. 11. It was expected that

when the expected scale of attack mounted between 1919 and 1939 there was increasing pessimism about the ability of the population to withstand the attack. The view that "civilization itself is in danger of destruction from the air" was common.<sup>1</sup>

The strategic context of the calculations is of much importance because it provided the framework in which the computations were made. The calculations served to confirm the correctness of the strategy and for this reason, among others, the results of the calculations were widely accepted and went generally unquestioned in the R.A.F. Calculations are also, of course, the basis for strategy. It is upon calculations that appropriate strategies are determined.

One cannot say which comes first of strategy and calculations; it is rather like the "chicken and the egg" arguments. The strategy was dependent on the calculations which made it look possible. Since there was such general agreement that the strategy was the proper one, however, nobody looked very carefully at the calculations evaluating the threat of enemy attack which showed the ease with which targets might be destroyed by bombing.

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75 tons a day for 3 weeks would paralyze London, hence the figure of 1,500 tons.

etc

<sup>1</sup>Jonathan Griffin, *Britain's Air Policy* (London: Victor Gollancz Ltd., 1935), p. 23.



### Casualty Estimates

As soon as World War I ended the Air Staff began thinking about the expected characteristics of the next war. In their first such estimates they predicted a much higher level of bombing and casualties than any which had been sustained in the past. During the entire First World War they calculated that 300 tons of high explosives had resulted in 4,830 casualties, 1,414 of which had been fatal. The casualty ratio was thus 16 casualties per ton of high explosives.<sup>1</sup>

The Air Staff did not believe, however, that this would be representative of the ratio which would prevail in a future war. More relevant in their view as indicators for the future were, first, two daytime raids on London in 1917-1918 which had caused 832 casualties and a ratio of 121 casualties per ton of high explosives and, secondly, sixteen night raids during the same period which had produced a ratio of 52 to each ton. On this basis the Air Staff considered that it would be "fair to assume that, in densely populated areas such as London, there will be fifty casualties per ton of bombs dropped. Of these casualties, one-third will be killed and two-thirds wounded."<sup>2</sup>

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<sup>1</sup>More precisely 267 tons rather than 300 were dropped thus raising the ratio to 18 casualties for each ton of high explosive.

<sup>2</sup>Quoted in Richard M. Titmuss, Problems of Social

This was the origin of the figure of 50 casualties per ton which was used until World War II. The ratio, however, was not soundly enough based for it to be a reliable prediction for future air attacks. Nevertheless the figure was unchanged throughout the period between the end of World War I and the beginning of World War II. In order to determine the number of casualties that would result from air bombardment, the expected tonnage of enemy ~~attack~~ was multiplied by the ratio of 50.

The planning factor of 50 was derived from the number of casualties caused by the sixteen night raids on London during 1917-1918 in which 270 people were killed and 818 injured. The Air Staff, in calculating the ratio of 52 (rounded off to 50), assumed that 21 tons of bombs had been dropped during these raids. The Official History of the War, on the other hand, states a figure of approximately  $24\frac{1}{2}$  tons, thus giving a ratio of 45 casualties per ton.<sup>1</sup>

The sample used was a very small one and the assumption that it would be representative of future wars is questionable. Over forty per cent of the total casualties used in the calculation occurred during two raids in which  $7\frac{1}{2}$  tons of bombs were dropped by 17 aircraft. One extraordinary catastrophe at Odham's Printing Works at Long

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Policy, History of the Second World War, the United Kingdom Civil Series, ed. W. K. Hancock (London: His Majesty's Stationery Office and Longmans, Green and Co., 1950), p. 4.

<sup>1</sup>Jones, Vol. V, 1935, app. 1.

Acre resulted in 38 persons being killed and 85 injured.

The ratio of 50 casualties per ton is based on figures which include 130 casualties (13 killed and 117 injured) caused by anti-aircraft shells, and a further 28 casualties (14 killed and 14 injured) which resulted from a rush of people to an air raid shelter in the East End of London. Richard Titmuss points out two further errors which undermined the statistical bases for the factor of 50. "A figure of 532 injured was used whereas the true figure is 432, and the sum of 270 killed and 818 injured was printed as 1,098 - both these errors appeared in the Air Staff's report to the Committee of Imperial Defence."<sup>1</sup> He further points out that by 1937 the origins of the ratio were unknown to the majority of officials in the civil departments who used it as a basis for their planning.

The Air Staff did not take into account the changes which would take place in such a ratio during prolonged bombing. First, the population of London was bound to diminish if, as was calculated in 1921, bombing produced 75,000 casualties in one month. Either or both organized and unorganized evacuation would greatly reduce the size of the population if casualty levels reached those predicted by the Air Staff.

The government, in fact, later made plans for this

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<sup>1</sup>Titmuss, p. 13.

eventuality but did not change the expected ratio of casualties per ton. Periodic interviews were conducted to see how many people desired to leave London in the event of air attack and, for example, in 1938 during the middle of the Munich crisis 83 per cent expressed their desire to be evacuated in the event of war. This might take a few days to organize but within a week London would be a very empty city and casualty rates would necessarily decline due to the reduced density of the population.

Secondly, with an attack on the scale expected, an increasing number of bombs would be falling into previously destroyed areas and this would also act to reduce the number of casualties per ton. Thirdly, the number of injured removed to hospitals outside London would be large; preparation was actually made for beds in the area surrounding London so that those wounded would be safe from future air attacks. Fourthly, those who had to stay in London would make sure that there were adequate shelters available if attacks were on the scale imagined.

All these factors would combine to reduce the number of human targets in London as well as their vulnerability. The estimate that casualties would be as high as 50 per ton in the large raids expected seems based on too small a sample. In any case it should certainly not have been expected that the figure of 50 casualties per ton would remain constant.

### Initial Post-War Appraisals

In 1921 the Committee of Imperial Defence received from the Air Staff a prediction of the magnitude of an air attack that might be delivered against Britain. The French capability was used as the basis for these estimates as the best available standard, for it was the largest foreign air force that could reach Britain.<sup>1</sup> The Air Staff estimated that France, having at the time 300 bombers, could drop 1,500 tons of bombs a month using only 20 bombing days and 50 per cent of her total aircraft. It must be remembered that this estimated monthly level of tonnage was five times that experienced in all of World War I. Using the expected figure of 50 casualties per ton of high explosives this would have resulted in 75,000 casualties, of which 25,000 would die in one month. This was over fifteen times the number wounded and dead from the German bombing of England in all of World War I.

There was no question in the minds of the Air Staff that London would be the primary objective of any attacker. It was believed that France could drop 150 tons in the first twenty-four hours, 110 tons on the second day and 75 tons a day for "an indefinite period."<sup>2</sup> Therefore on the first day along there would be many more casualties

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<sup>1</sup>Collier, p. 8.

<sup>2</sup>Quoted in Collier, p. 11. The term "indefinite period" was regularly used in these and succeeding estimates.

and dead from bombing than in the entire 1914-1918 war.

Presiding over a Standing Sub-Committee of the Committee of Imperial Defence in 1922, A. J. Balfour, the former Conservative Prime Minister, wrote that "we must not suppose that the possibilities of an aerial attack in 1922 stand where they did in 1919." Recalling that in the worst German air raid of World War I only 3 tons of bombs had been dropped on London, Balfour pointed out that:

A continental enemy could drop on London a continuous torrent of high explosives at the rate of 75 tons a day for an indefinite period. . . Day after day, and night after night, the capital of the Empire would be subjected to unremitting bombardment of a kind which no city effectively acting as the military, naval and administrative centre of a country engaged in a life and death struggle has ever had to endure.<sup>1</sup>

He concluded that this "would paralyze the War Office and render London uninhabitable."<sup>2</sup>

The only answer to this sort of attack was seen to be a counter-offensive by British bombers. In view of this judgment, Balfour was particularly alarmed by the fact that the British striking force numbered at the time only 40. It was thought that this would not be adequate to deter an enemy from attacking Britain.

These estimates were apparently established on assumptions about the size of the enemy force, the location

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<sup>1</sup>Quoted in Titmuss, pp. 4-5.

<sup>2</sup>Ibid.

of its bases, the types of bombs employed, the strength of the defences, and whether or not either country had allies. The actual numbers were based on a direct French attack on Britain, given the then existing state of French offensive forces and British defensive forces. The exact manner in which the calculations were made at this time is not known.

In 1923 Sir Hugh Trenchard gave his views on the importance of air power before the Salisbury Committee and re-emphasized his view that a counter-offensive was the best form of defence.<sup>1</sup> Upon further information given it by the Air Staff, the Salisbury Committee reported that the French air force, still the strongest conceivable enemy, was capable of dropping a minimum of 168 tons in the first twenty-four hours, 126 tons on the second day, and 84 tons each subsequent twenty-four hours for an indefinite period. The reason for the decline and then the levelling out in tonnage is not clear. It was probably thought that the first raid would be a maximum effort and that thereafter not all enemy aircraft would be serviceable. If they had been thinking of attrition, they would not have anticipated a levelling off for an indefinite period.

In January 1924 these figures were raised again.<sup>bn</sup>On the basis of Air Staff figures, the Air Raid Precautions Sub-Committee of the Committee of Imperial Defence,

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<sup>1</sup>The Salisbury Committee was set up by the new Conservative Government under Bonar Law to investigate problems of defence.

established specifically in order to study problems of both active and passive defence, reported that 200 tons should be expected on the first day, 150 on the second, and 100 on each subsequent day. It was considered that London would be the primary target of any attacker, and that the maximum strength of the attack would be at the outset. Three-quarters of the attacks would come in the daylight hours. The period of attack at the level of 100 tons a day would be at least a month. It was believed that the bulk of the attack would be carried out with high explosives and incendiary bombs and that gas would be either unimportant or not used. The following figures were considered conservative by the Air Staff:<sup>1</sup>

AIR STAFF ESTIMATE OF CASUALTIES IN THE EVENT OF AIR ATTACK

	<u>Killed</u>	<u>Wounded</u>	<u>Total Casualties</u>
1st 24 hrs.	1,700	3,300	5,000
2nd 24 hrs.	1,275	2,475	3,750
Subsequent 24 hrs.	850	1,650	2,500

This would mean that in the first month there would be 78,750 casualties. These figures are strange because, although fifty casualties per ton was still assumed to be correct, this table assumes twenty-five. If they had assumed the fifty casualties per ton figure the number of casualties would have been doubled. This is the only known

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<sup>1</sup>Webster and Frankland, Vol. I, p. 62 and Terence H. O'Brien Civil Defence, History of the Second World War, United Kingdom Civil Series, ed. Sir Keith Hancock (London: Her Majesty's Stationery Office and Longmans, Green and Co. 1955), p. 16.



instance where they made this assumption. Why they did so is not clear.

The opportunity was taken by the Salisbury Committee to emphasize the probable moral effects of modern air attack. In particular they were concerned about the possibility of chaos in the community arising from moral collapse under bombardment of persons employed in vital services such as transport and lighting.<sup>1</sup>

Trenchard again offered no hope whatsoever that even largely expanded defensive forces would provide much immunity. He reiterated his belief that the offensive power of the R.A.F. had to be greatly expanded.

The Air Staff memorandum to the Air Raid Precautions Sub-Committee, which reported to the Cabinet in October 1925, asserted in terms that sound much like Trenchard that:

It is well known that the moral effect of air attack is out of all proportion greater than the material results achieved. While, therefore, serious material damage may be expected from bomb attack, the most probable cause of chaos in the community will be the moral collapse of the personnel employed in the working of the vital public services such as transport, lighting and water and food distribution."<sup>2</sup>

Discounted again was the possibility of an effective air defence. The Committee reported that "Sir Hugh

<sup>1</sup>O'Brien, p. 16.

<sup>2</sup>Report of the Committee on Air Raid Precautions, July 8, 1925, quoted in Webster and Frankland, Vol. I, p. 63.

Trenchard was so emphatically of the opinion that an increase in the defence forces beyond a certain proportion would not secure greater immunity from attack, that we felt we had no alternative but to continue our investigation with a view to mitigating so far as possible the evils attendant upon aerial bombardment."<sup>1</sup>

This pessimistic view of defensive measures was criticized by the General Staff who pointed out that in the 1914-1918 war "only half the German aeroplanes dispatched in daylight reached London and that, once the air defences of London were made efficient, twenty-two per cent of the attacking planes were destroyed." The General Staff also thought the estimates of casualties resulting from bombing that were made by the Air Staff were an exaggeration and they argued against excessively alarming the public in peace-time. The Air Staff, in reply, reiterated the seriousness of their warning which, in their words, "so far from exaggerating the menace, errs perhaps to a slight extent in understating the gravity of the situation."<sup>2</sup>

The concern with the "moral effect" of bombing was widespread in governmental circles. The Committee on Central Organization for Defence which reported in 1927 felt that "the moral effect is out of all proportion to

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<sup>1</sup>Ibid.

<sup>2</sup>General Staff Memo., Oct. 14, 1925, Air Staff Memo., Oct. 24, 1925, quoted in Ibid.

the material effect which [bombing] can achieve."<sup>1</sup> The Government's appraisal of the situation in the event of enemy bombing was well-known outside official circles and few people disagreed with the appreciation. For example, Professor Philip Noel Baker in a radio address over the B.B.C. in 1927 gave a very bleak picture of what would be left after an air attack. In the broadcast he was especially concerned about the consequences of a gas attack.

Lord Thomson, who had three years before been Secretary of State for Air, wrote in 1927 that the results of an air attack on the scale that would have been possible at that time would be to create "a state of panic among the inhabitants of the localities attacked, unlimited destruction of life and property, the devastation of dockyards, military centres and railway stations, and the consequent paralysis of mobilization."<sup>2</sup> We must remember that he was thinking of an attack in one day being equal in consequence to all of the 1914-1918 war. In his view there was no question that:

. . . the way to win will be by the ruthless bombing of localities, which in many cases will be densely populated. For every combatant killed in action, ten civilians will quite probably be slaughtered in their workshops or their homes.<sup>3</sup>

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<sup>1</sup>Quoted in Great Britain, Cmd. 6923, 1946, p. 4.

<sup>2</sup>Lord Thomson, Air Facts and Problems (London: John Murray, 1927), p. 22.

<sup>3</sup>Ibid., p. 26.

He concluded that "both victors and vanquished would be left with ruined cities, widespread distress among the masses of the people, hospitals filled with the maimed and mutilated of all ages and both sexes, asylums crowded with unfortunate human beings whom terror had made insane."<sup>1</sup> While this was not a pleasant picture it represented standard thinking in governmental circles.

There was widespread concern in the Government of the time about the possibility of frightening the population with excessively realistic descriptions of the dangers of being bombed. Marshal of the Royal Air Force Sir John Salmond, in 1928 the Air Officer Commanding-in-Chief, Air Defence of Great Britain, was asked to give a lecture on air defence with the thought that its contents would be made public. He prepared his talk and handed the draft to Trenchard who referred it to Samuel Hoare who was at the time the Secretary of State for Air. Hoare considered it out of the question to make it public for he feared alarming the public, yet it seems much less alarming than many of Trenchard's own comments, not to mention Thomson's book. Salmond, however, was permitted to give the talk to a number of senior staff officers.

He told his listeners:

No Air Force, however strong, can afford complete immunity from attack. I would like

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<sup>1</sup>Ibid., pp. 26-27.

Londoners particularly to realize this point and to accustom themselves to its import. . . It would not assist the defence materially to increase the number of defensive machines in proportion to the difficulty.

We must seek salvation by committing the weight of our forces to the attack. The problem resolves itself under two heads - the close protection of our own vital centres with the minimum force compatible with a certain degree of security, and the distant bombing of those of the enemy with the greatest force available.<sup>1</sup>

Strategically the position of London is unsound to the last degree, facing all comers from the east, while its natural frontier, the coast, lies at an average distance of only sixty miles away. A hostile machine will have reached the outer edge of our zone in twenty-two minutes from the time of the first warning ten miles offshore. . .

The raid will eventually be taken on by the guns. At the present time there is a gap in the organization as no guns exist. . .

He reminded his audience that in the Great War only 300 tons of bombs had resulted in the disruption of many vital services.<sup>2</sup> It was estimated in 1928 that an enemy could drop 200 tons in the first twenty-four hours and 100 tons every subsequent twenty-four hours. This would have resulted in 150,000 casualties in one month or more than thirty times the total level of World War I. The first raid would be over sixty times the strength of the worst known raid of World War I and the monthly average was almost six

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<sup>1</sup>The meaning of the first recommendation is not clear. He certainly was not very optimistic about defensive measures having much effect but at times seems to contradict himself.

<sup>2</sup>The actual number was 267.

hundred times that experienced between 1914 and 1918.

His pessimistic conclusion was that it is not possible to bar or barrage the sky. Enemy aircraft would always be able to find a way over, round or under any obstacles. A certain amount of bombardment must, therefore, be accepted . . . with stoicism. Should the next war involve air attack it will be necessary for the civil population to be with the defence forces in the struggle. . . It is no exaggeration that the belligerent whose people can endure aerial bombardment the longer and with greater stoicism will ultimately prove to be the victor. . . The public should be told what to expect if we are ever faced with attack on a large scale.<sup>1</sup>

In addition to the estimates of civilian casualties as a result of high explosive bombing, there was an increasing concern among some individuals about the use of gas in an enemy attack. The Earl of Halsbury addressed himself to this danger when speaking before the House of Lords in 1928 and 1929. He felt that forty tons of mustard gas (dephenylchlorasine) would be sufficient to kill the entire population of London.<sup>2</sup> Halsbury concluded that:

Many great powers were now in a position to put immense numbers of bombing aeroplanes into commission at very short notice. Should war break out there is no doubt that these aeroplanes would be used for attacking the civilian populations of other countries. The weapon which would chiefly be used would be poison gas.<sup>3</sup>

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<sup>1</sup>Quoted in Salmond's biography, Swifter Than Eagles pp. 202-04.

<sup>2</sup>The Times (London) July 1, 1928. He repeated the estimate eight years later. The Times (London) Dec. 4, 1936.

<sup>3</sup>The Times (London) Feb. 27, 1929.

Others such as Sir Charles Burney were more concerned about high explosive bombs. Burney felt within a week after the start of war it might be possible for an enemy to "destroy London and all the major towns of this country."<sup>1</sup> This was not a cheerful picture; for those who were not killed by gas there was always the high explosive bombs which would kill 50,000 and wound a further 100,000 each month.

In view of the expected consequences of air attack it is not surprising that considerable thought was devoted to the possibility of the breakdown of law and order during and after the raids. In 1930, for example, the Air Raids Precautions Committee proposed the creation of three battalions of troops for action in air raids, and the Chairman stated that if this were not done "he had little doubt that such a panic would be produced as might bring about a collapse, certainly of the community in London, if not of the whole country."<sup>2</sup> In the event of an attack their role would be to keep rioting and looting under control and also to be a demonstration of the Government's continuing existence. The fear was that air attack would produce complete chaos; the hope was that these troops might be able to minimize the panic on the part of the population so that at least a semblance of civil order could be maintained.

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<sup>1</sup>Sir Charles Dennestoren Burney, The World, the Air and the Future (London: A. A. Knopf, 1929), p. 129.

<sup>2</sup>Webster and Frankland, Vol. I, p. 45.

Some of the assumptions upon which the evaluation of the threat was based were derived from the air exercises which were held by the R.A.F. The R.A.F., for example, did not have much confidence in active defence for they doubted their ability to intercept incoming aircraft; this was in large measure based on the experience of these exercises.<sup>1</sup> A report in the Royal Air Force Quarterly on the 1930 Air Exercises indicated that fighters would not intercept enemy bombers very frequently.<sup>2</sup> The Aeroplane stated that "the very slowest of our long-range bombers succeeded by good navigation and by guile in outwitting the fastest and best of our fighters on more than one occasion."<sup>3</sup>

Reporting on the 1931 Air Exercises, The Times aeronautical correspondent wrote that "the intention that these fighters [defending London] some thirty miles an hour faster than the best bombers in the world, should intercept raiders between the coast and London was not fulfilled during the exercises."<sup>4</sup> During the 1931 exercises the number of daylight raids that "penetrated the defences" was 24; in the dark 68 bombers penetrated. "It has never been

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<sup>1</sup>Active defence measures are those aimed at destroying the attacking force. Passive defence involves preparing the country for attacks through shelters and evacuation.

<sup>2</sup>Anon., "Some Lessons of the Air Exercises of 1930," Royal Air Force Quarterly, Vol. II No. 1, pp. 59-69

<sup>3</sup>The Aeroplane, July 22, 1931.

<sup>4</sup>The Times (London), Nov. 14, 1931.



held," wrote the Times correspondent, "that London could be made secure against air attack at reasonable cost."<sup>1</sup> "The odds must always be against the fighters [defending London] so long as they are denied a heavy numerical superiority."<sup>2</sup> Unfortunately the only figures available in these reports are the number of aircraft which penetrated the defence. The total size of the striking force or the number of interceptions are not given and consequently it is impossible to determine what rate of attrition was achieved.

Referring to the 1931 Air Exercises the Aeroplane wrote

In considering the problems of the defence of London one has to realize that aircraft are characteristically stronger in attack than in defence, and the defenders have to protect a vertical front of about five miles in addition to the horizontal front. An enemy must be destroyed or disabled before he leaves his base if his efforts are to be averted with any reasonable hopes of success.<sup>3</sup>

In 1931 an effort was made to evaluate the increased precision of bombers that could be expected in a future war. The report of the special Sub-Committee of the Committee of Imperial Defence assumed a scale of attack of 300 aircraft a day (250 in the daylight hours, 50 at night). It was estimated that they would drop 100 tons in the first twenty-four hours and that thereafter the scale of attack would

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<sup>1</sup>Ibid., July 24, 1931.

<sup>2</sup>Ibid., July 18, 1931.

<sup>3</sup>The Aeroplane, July 29, 1931.

gradually decrease. Why a figure of only 100 tons was given is not clear. Normally it was expected that each plane would carry one and a half tons and thus 300 aircraft would drop 450 tons. According to Richard Titmuss, the Official Historian, "it was considered that this action might paralyze London's public services, putting out of action all the main line railway termini and a considerable part of the gas, telephone, and water services, closing the underground railways, and destroying or damaging half the important power stations."<sup>1</sup>

Part of the reason the predicted level of damage was so high was the anticipated precision of enemy bombers. It was estimated that 27 aircraft could release their loads simultaneously, dropping a total of 40 tons and that from a height of 20,000 feet this would produce a pattern in the form of a square with one-quarter mile sides. It was in part this order of accuracy and resulting concentration that occasioned the Committee to be so gloomy concerning the consequences of air attack. Being able to drop 40 tons in this area meant that two-thirds the weight of all bombs dropped on London in four years of World War I would land in one-quarter of a square mile. This served to produce visions of the complete destruction that would result after a bombing raid.

In a House of Commons address on November 10, 1932,

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<sup>1</sup>Titmuss, pp. 7-8.

Prime Minister Baldwin confirmed that the growing fear of air attack among the populace of the British Isles was well-founded. He spoke of "civilization being wiped out, as it will be" in the event of bombing, and declared:

The bomber will always get through. I think it is as well also for the man on the street to realize that there is no power on earth that can protect him from being bombed. . . . The only defence is in offence, which means that you have to kill more women and children more quickly than the enemy if you want to save yourselves.<sup>1</sup>

The Air Staff appraisal of the possibility of surviving enemy air attack was becoming more and more pessimistic. It was believed that in a period of a few weeks at the longest an enemy could destroy most of the vital services in London. There might be as many as 150,000 casualties in one month of air attacks, if indeed the war went on this long for this was over thirty times the total level of World War I. There was some consolation in the fact that it did not appear that the French were at all likely to attack and that there was no really dangerous nation with the capability of doing any damage to Britain. This comforting fact, however, would not long remain true.

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<sup>1</sup>Great Britain, House of Commons Debates, Vol. 270, col. 632, November 10, 1932.

## CHAPTER II

### THE RISE OF THE LUFTWAFFE: 1933-1935

#### The Threat of Attack

By 1933 a clear threat to British security had arisen in the growing power of Hitler in Germany. Unlike the French, the Germans presented to the Air Staff a real rather than theoretical danger. While the belief that France could inflict great damage on Britain was worrisome, no one really believed that the French were likely to try. The possibility of an attack by Germany was viewed as much more probable and consequently with greater concern. From this point all R.A.F. estimates of expected scale of attack assume Germany rather than France as the enemy even though France was obviously the stronger of the two for several years to come.

In 1933 the first major study of the economic and social consequences of air attack on Britain was made. This was produced in the form of the Air Raid Precautions Committee report on the estimated effects of air attack. This report was used until the beginning of the war for purposes of planning, although adjustments were made to the expected

scale of attack.<sup>1</sup> The Committee met under the direction of Sir Charles Hepwood and it is sometimes referred to by his name.

On the basis of Air Staff figures, the Committee estimated the scale of German attack on London alone at 100 tons on the first day, 75 tons on the second day, and 50 tons on each of the four succeeding days. Thus the total for the first six days would be 375 tons. This would mean 18,750 casualties in London in the first six days. In only four days there would have been over twenty times the casualties in London during the four years of war between 1914 and 1918.

It was assumed that of the 375 tons, 75 per cent would be dropped by day. Fifty per cent of the enemy sorties would be directed towards specified objectives and fifty per cent would be indiscriminate.

It was thought that this scale of attack would put the tubes and underground railways out of action and that above-ground railway termini in London would have to be abandoned. The gas supply to the city of London would be cut off as would about 50 per cent of the electrical power supply. The bulk of the water supply would still be usable.

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<sup>1</sup>"Summary of Effect of Air Attack Contained in Paper No. A.R.P. [P] 25," Appendix B to "Probable Courses of Action of German Air Force in the Event of Air Attack on United Kingdom, and Possible Distribution of Attack" Final Draft April 18, 1938, prepared by Plans and amendments suggested by A.C.A.S., D.D.I., A.I.3., D.D.Ops [H], and F.O.1. in Appreciation on Distribution of Attack, CS 1053, Great Britain, Ministry of Defence Air Historical Branch.

but distribution would be interfered with locally. The gasoline depots at Thameshaven and Shellhaven would be destroyed. The London docks would be damaged but functioning. Coal distribution would be very difficult under the prevailing conditions.

A Ministry of Transport Committee had assumed for its purposes a level of attack of 50 tons daily for a month, producing a total of 1,575 tons. The Transport Committee estimated that in this event there was little possibility of the maintenance of public services such as gas, telephone, electricity, water, and sewage.

Sir F. Baines of the Office of Works assumed the same scale of attack as the Transport Committee with fifty per cent of the total tonnage being gas and an average bomb weight of 200 pounds. Under these conditions it was estimated that no building in the city could be regarded as reasonably safe and the possibility of utilizing London would be seriously prejudiced if not entirely upset. Operating under similar assumptions the Postmaster General and the General Post Office were extremely pessimistic about the possibility of the telephone system continuing in operation.<sup>1</sup>

Meanwhile the extent to which Britain seemed indefensible was brought home by the annual summer Air

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<sup>1</sup>The above information derives from A.R.P. [P] 25, Ibid.

Exercises of 1934. The attacks were directed primarily at London. The Aeroplane observer who had flown with the bomber crews wrote that "our targets were the Air Ministry and the Houses of Parliament, and we picked them up without difficulty, and after two runs over them, during which the recognition lamps were flashed, the job was finished and, according to the rules, neither the Air Ministry nor the Houses of Parliament should bother us any more."<sup>1</sup>

In 1934 the newly formed Defence Requirements Committee was very apprehensive about the possibility of a "knock-out blow", although it doubted that Germany could at that time strike such a blow.<sup>2</sup> A February 1934 report of the General Staff had been the first to actually mention the term, although of course the concept was hardly new. It was to become one of the most frequently used terms in the Air Staff.

The R.A.F. thought in June 1934 that by October 1935 Germany would have a first-line strength of 576 aircraft backed by adequate reserves. This would in a few months be increased to 900 and then ultimately to 1,500 to 2,400 aircraft.<sup>3</sup> It was believed that this would enable Germany

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<sup>1</sup>Quoted in Ronald W. Clark, Tizard (London: Methuen & Co., Ltd., 1965), p. 106.

<sup>2</sup>Collier, p. 26.

<sup>3</sup>Lord Avon, Facing the Dictators: The Eden Memoirs (London: Cassell, 1962), p. 184 and Collier, p. 27. These figures do not agree with those presented by Webster and Frankland, Vol. I, p. 69, where they state that the Air Staff believed Germany aimed at producing 480 first-line

to bomb Britain at the rate of 150 tons daily for an indefinite period with aircraft operating entirely from Germany. This would mean 7,500 casualties a day or almost a quarter of a million casualties in a month. If this could have been concentrated in London this was almost 300 times the total of World War I. This shows the vastly increased rate of casualties the Air Staff expected over that caused by German bombing in World War I.

In the Chiefs of Staff meetings the General Staff continued to dispute the Air Staff's appreciation of the importance of air war generally and, more specifically, the effects of strategic bombing. They felt "air warfare itself would not end a war." They pointed out quite correctly that all evidence indicated that the Luftwaffe was designed for tactical or close-support operations and not a strategic bombing campaign. They also had reservations about the effectiveness of bombing. Their principal argument was that the main German attack would be by land and, unless defeated, this might give the Luftwaffe bases from which it really could cause a great deal of damage to Britain. For some reason which remains obscure, however, these considerations were not sent to the Prime Minister.<sup>1</sup>

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aircraft by the autumn of 1935 and then to have two further stages of expansion of equal size to produce 1,410 first-line aircraft by 1942 of which 1,230 might be bombers.

<sup>1</sup>C.O.S. Mtgs. May 4, June 27, 1934, cited by Webster and Frankland, Vol. I, pp. 87-88.



The Air Staff meanwhile continued to reiterate its fears of German air attack and in particular Sir Edward Ellington, Chief of the Air Staff, continued to emphasize the possibility of a successful "knock-out blow" in the early stages of a war.<sup>1</sup> Ellington admitted that his estimates depended upon where the German aircraft were based. According to the Official Historians, Webster and Frankland, he felt:

If Germany were able to occupy Belgium her attack would be overwhelming and most difficult to counter. If the Low Countries remained neutral and France was the ally of Britain, Germany would not be able to do so much harm, while, if the Low Countries were allied with Britain, the advantage would be very much on the other side and Germany would be driven on to the defensive. Germany could, however, by directing her main air attack on British ports, probably make it impossible or difficult to send a British expeditionary force to the Continent, at any rate by the usual channel route.<sup>2</sup>

Ellington felt that much more attention must be devoted to problems of air raid precautions and of educating the public so that they would be better able to endure air attack. Fighters could only be relied upon to defend objectives at least fifty to a hundred miles inland from the coast since, for distances less than this, there would not be sufficient time for interception. The idea of standing patrols had been rejected because of the high number of aircraft required to keep one squadron constantly

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<sup>1</sup>Memos by Ellington, June 12, July 11, 1934, cited in Ibid., Vol. IV, p. 88.

<sup>2</sup>Ibid.

in the air and because aircraft would wear out quickly if such patrols were used. His conclusion was that London and the other major cities would be at the mercy of an enemy who might well decide to deliver a "knock-out blow." The answer, as usual, was a British counter-offensive for which bases in France would be necessary due to the short-range of the bombers. In this case some of the German attack would be levelled at France, reducing that which Britain would receive.<sup>1</sup>

At about this time Churchill seems to have changed his position on the consequences of air attack because on July 20, 1934, in rebutting Labour and Liberal criticism of the proposed Government rearmament, he said:

no country is so vulnerable. . . With our enormous metropolis here the greatest target in the world, a kind of tremendous, fat, valuable cow tied up to attract the beast of prey, we are in a position in which we have never been before, and in which no other country is at the present time.<sup>2</sup>

In the House of Commons on November 28, 1934, he continued his appreciation of the danger of air attack.

No less formidable than the material effects are the reactions which will be produced upon the mind of the civil population. We must expect that, under the pressure of continued air attack upon London, at least 3,000,000 or 4,000,000 people will be driven out into the open country around the metropolis. This vast mass of human beings, numerically far greater than any armies

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<sup>1</sup>Ibid.

<sup>2</sup>Quoted in Winston Churchill, The Gathering Storm (New York: Bantam Books, 1961), p. 104.

which have been fed and moved in war, without shelter and without food, without sanitation and without special provision for the maintenance of order, would confront the Government of the day with an administrative problem of the first magnitude, and would certainly absorb the energies of our small Army and our Territorial Force. Problems of this kind have never been faced before, and although there is no need to exaggerate them, neither, on the other hand, is there any need to shrink from facing the immense unprecedented difficulties which they involve.<sup>1</sup>

The French were meanwhile evaluating the threat in very similar terms. M. Pierre Cot, the French ex-Minister for Air, at a meeting held at the British House of Commons in November 1934 stated:

Some three years ago experts stated that 40 tons of bombs would be sufficient to make life impossible in an area the size of London and its suburbs. Since then chemistry has progressed so that now less than 40 tons would be necessary. Any aviator would tell you that it is child's play to transport 40 tons over London or Paris. . . . If incendiary bombs were used, a much smaller weight would be enough. A bomb has been evolved weighing 1 kilogram, which would start a fire which firemen would be incapable of extinguishing. An aeroplane could carry three to four hundred of these bombs and then start some 20 or 30 or 40 centres of fire which the fire-fighting brigades could not cope with . . .<sup>2</sup>

The French source of this figure of 40 tons is not clear. It must, however, have been a sobering thought to the British Government that their Air Staff was telling them that Germany could drop almost four times this figure

<sup>1</sup>Great Britain, House of Commons Debates, Vol. 295, col. 859, Nov. 28, 1934.

<sup>2</sup>Quoted in Captain Philip S. Mumford, Humanity, Air Power and War (London: Jarrolds, 1936), pp. 35-37.

daily for an indefinite period. The Air Staff felt the Germans had a capability far exceeding what was required to defeat England and still the Luftwaffe was apparently becoming larger and larger. In 1921 the R.A.F. had thought in terms of 1,500 tons in a month being adequate to defeat England; by 1934 it appeared that the Germans could easily exceed this total in less than two weeks.

There was a general feeling of defeatism about the possibility of any sort of air defence. One who did not apparently share this perspective was the scientist F. A. Lindemann who in a letter to The Times on August 8, 1934, presented a strong case for a large-scale attack on the problem by the most competent scientists available although he agreed that at the present time there was no defence against the bomber.<sup>1</sup> In fact at the same time a scientist in the Air Ministry A. P. Rowe, assistant to H. E. Wimperis, was just beginning a study along these lines.<sup>2</sup>

Meanwhile writing for the general public on the dangers of air attack was becoming more widespread. Brigadier-General Groves, one of the most important figures in the founding of the Royal Flying Corps, the predecessor to the R.A.F., was sure that the next war would be based on attempts to destroy the will of the civilian population. As he said, "certain it is that if Europe should again go to

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<sup>1</sup>Lindemann was later made Lord Cherwell.

<sup>2</sup>Tizard, p. 107.

war the conflict would not be governed by humane considerations."<sup>1</sup> His conclusions about the effects of enemy air attacks were grim. His book was by no means the only one indicating a growing concern about the "air menace" as it was sometimes called.

#### Baldwin and German Air Strength

By the autumn of 1934, the Air Staff had produced an estimate of German aircraft production intentions which indicated the number of first-line aircraft Germany would have by October 1936 would be 1,368; an eventual expansion was foreseen to 1,500 or 1,600 aircraft.<sup>2</sup> These numbers were rather alarming in view of the modest scale of British expansion. On March 8, 1934, Baldwin had stated that Britain "shall no longer be in a position inferior to any country within striking distance of our shores;"<sup>3</sup> it now appeared to some that his promise was going unfulfilled.

Towards the end of 1934 there was a group in

<sup>1</sup>Brigadier-General P. R. C. Groves, Behind the Smokescreen (London: Faber and Faber, 1934), p. 186.

<sup>2</sup>Quoted by Lord Avon, Facing the Dictators: The Eden Memoirs, pp. 184-85. As Collier points out (p. 27) initially the first-line strength of a German squadron was reckoned as being 12 aircraft; the figure was later reduced to 9 by excluding immediate reserves supposed not to be strictly part of the first line. The "second stage" total without immediate reserves thus became 1,026 instead of 1,368. These figures comprise military aircraft of all types.

<sup>3</sup>Great Britain, House of Commons Debates, Vol. 283, col. 2078.

Parliament becoming increasingly concerned about German air rearmament. On November 28, 1934, Winston Churchill spoke.

I assert, first, that Germany already, at this moment, has a military air force - that is to say, military squadrons, with the necessary ground services, and the necessary reserves of trained personnel and material - which only awaits an order to assemble in full open combination; and that this illegal air force is rapidly approaching equality with our own. Secondly, by this time next year, if Germany executes her existing program without acceleration, and if we execute our existing program on the basis which now lies before us without slowing down, and carry out the increases announced to Parliament July last, the German military air force will this time next year be in fact at least as strong as our own, and it may even be stronger. Thirdly, on the same basis - that is to say, both sides continuing with their existing programs as at present arranged - by the end of 1936, that is one year farther on, and two years from now - the German military air force will be nearly fifty per cent stronger, and in 1937 nearly double. All this is on the assumption, as I say, that there is no acceleration on the part of Germany, and no slowing down on our part.<sup>1</sup>

Baldwin replied immediately;

I think it is correct to say that the Germans are engaged in creating an air force. I think that most of the accounts given in this country and in the Press are very much exaggerated. I cannot give the actual number of Service aircraft, but I can give two estimates between which, probably, the correct figure is to be found.

He then gave the range of total German military aircraft as between 600 and 1,000.

The total British strength, both home and overseas was 880 first-line aircraft. He was careful to point out the

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<sup>1</sup>Great Britain, House of Commons Debates, Nov. 28, 1934.

difference between total military aircraft and first-line strength, although his listeners still confused the two.

The House must realize that behind our regular first-line strength of 880 aircraft there is a far larger number either held in reserve to replace the normal peace-time wastage or in current use in training and experimental work. . . . It is not the case that Germany is rapidly approaching equality with us. I pointed out that the German figures are total figures, not first-line strength figures, and I have given our own first-line figures and said they are only first-line figures, with a considerably larger reserve at our disposal behind them, even if we confine the comparison to the German air strength and the strength of the Royal Air Force immediately available in Europe, her real strength is not fifty per cent of our strength in Europe today.

Baldwin then went on to speak of the future.

As for the position this time next year, if she [Germany] continues to execute her air programme without acceleration and if we continue to carry out at the present approved rate the expansion announced to Parliament in July . . . so far from the German military air force being at least as strong and probably stronger than our own, we estimate that we shall still have in Europe a margin - in Europe alone - of nearly fifty per cent. . . . I cannot look with any certainty either into their figures or our own for more than the two years that I have given. All I would say is this, that His Majesty's Government are determined in no conditions to accept any position of inferiority with regard to what air force may be raised in Germany in the future.<sup>1</sup>

This statement temporarily silenced his critics but did not convince them they were wrong. In March during the debates on the air estimates Churchill again spoke on the subject of the relative strengths of the Luftwaffe and the

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<sup>1</sup>Great Britain, House of Commons Debates, Nov. 28, 1934.

R.A.F. At this time he believed that Germany was already as strong and possibly stronger than Britain in the air.<sup>1</sup> In the same month Hitler informed Sir John Simon, the Foreign Secretary, and Anthony Eden, the Minister for League of Nations Affairs, that the Luftwaffe had achieved air parity with the Royal Air Force. What was particularly disturbing to Eden and Simon was that Hitler was overrating British strength, giving them 2,100 aircraft, including reserves. Simon noted that actually the first-line strength of the R.A.F. was only 690.

This served to rekindle the quarrel between the Air Ministry and the Foreign Office as to whose information on German air strength was correct. Eden claims that reports had been coming in since 1933 over Hitler's rising air strength but that the Air Ministry was unconcerned, not believing that the Luftwaffe was approaching the strength of the R.A.F.<sup>2</sup> The Foreign Office, he feels, was much more concerned, and was openly skeptical of the Air Ministry estimates. Eden notes that the growth of German air power was studied most carefully in the Foreign Office by "Mr. Creswell, who had practical knowledge of aviation, by Mr. Ralph Wigram, head of the Central Department, and by Sir Robert Vanstittart."<sup>3</sup>

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<sup>1</sup>Churchill, The Gathering Storm, pp. 110-11.

<sup>2</sup>Lord Avon, Facing the Dictators: The Eden Memoirs p. 182.

<sup>3</sup>Ibid., p. 183.



The Air Council of the R.A.F. doubted Hitler's boast made to Eden and Simon, but acknowledged that Britain had only 453 first-line aircraft in regular units. After a British request, Hitler's boast was supposedly clarified by the German Air Ministry a few days later when they said Germany had achieved parity with the first-line strength of Britain, giving this as 900. Even counting the R.A.F. aircraft not in regular units, the actual British total was no more than three-quarters of this figure.

Both Simon and Eden were much alarmed by this development. Simon pointed out on April 10, 1935, that the Air Ministry attributed only 1,375 aircraft to Germany, whereas the Foreign Office gave a total of 3,000. The Foreign Office was particularly alarmed at the German production rates which they claimed in mid-1935 could double the number of first-line aircraft in two months. Simon concluded from his figures that "if they are correct . . . this country is seriously open to the threat of sudden attack by a Continental Power in a degree to which it has not been exposed for hundreds of years."<sup>1</sup>

The difference of opinion between the Foreign Office and the Air Ministry is indicated by the fact that at this time Lord Londonderry, the Secretary of State for Air, was writing that "there is no ground for alarm at the present

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<sup>1</sup>Quoted in Ibid., p. 184.

situation."<sup>1</sup> He was, however, quite worried about the strength of the British reserves for the future and recommended a build-up of British strength. The Air Staff therefore recommended a program which would give Britain about 1,500 first-line aircraft, "on the written assumption," according to Eden, "included in their own tables, that the German air force would be at the strength of April 1937 in April 1939 and, indeed, in April 1940."<sup>2</sup>

Some members of the Air Staff believed during the spring of 1935 "Germany will not be ready for, and is not intending to go, to war before 1942."<sup>3</sup> Sir Edward Ellington had always maintained that there could not be a war before 1942 because he as Chief of the Air Staff would not be ready for one until that time.

Group Captain L. L. Maclean, a senior officer in Bomber Command, told Ellington in 1935 that the military delegations at Geneva had been discussing when war might come, most estimates being between the end of 1935 and 1938. Ellington brushed this aside for he said that his own rearmament could not be completed before 1942, and that the Germans were likely to take longer.<sup>4</sup>

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<sup>1</sup>Ibid., p. 185.

<sup>2</sup>Ibid.

<sup>3</sup>Ibid.

<sup>4</sup>Liddell Hart, The Memoirs of Captain Liddell Hart, Vol. II, p. 192.

When Ellington remarked to Captain Liddell Hart in the autumn of 1936 that "there cannot be war until 1942," the reason he gave was that "our rearmament programme will not be completed until then."<sup>1</sup> From this point of view the Foreign Office, as well as a number of senior R.A.F. officers, vigorously dissented.

Air Ministry intelligence sources, and even some German officers who could not at first believe that Hitler could make so preposterous a statement as claiming parity with Britain and who contradicted their leader's statement, could not change the fact that the Government's faith in the Air Ministry's sources was badly shaken. Churchill's confident speech on parity did not help to reassure Parliament's faith in the Air Ministry sources. On May 22nd Goering confirmed British fears by adding that he hoped to have 2,000 aircraft and, consequently, equality with France by the end of 1935. While the Air Ministry thought a total figure of 2,000 military aircraft of all types possible, they were certain that the first-line strength as this was understood by the R.A.F. would be far from this figure.<sup>2</sup>

Although officially the Government denied that Germany had reached parity with Britain, when Winston Churchill sent

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<sup>1</sup>Ibid.

<sup>2</sup>Collier, p. 30.

a memorandum to the Government on April 29, 1935, in which he tried to show that Germany already had superiority both in quantity and quality, the comment of Wing Commander C. E. H. Midhurst of the Directorate of Operations and Intelligence, was: "Mr. Churchill's statements are substantially correct, looked at from a broad aspect, but incorrect in relatively unimportant detail."<sup>1</sup> The meaning of this is not clear for Churchill's estimates were considerably above the Air Staff estimates for which Midhurst was in part responsible.

By this time the Cabinet had lost faith in the Air Staff estimates and chose to believe Hitler. They decided on a more accelerated pace of expansion than had been favoured by the Air Staff who feared that too rapid an expansion at that stage would destroy the quality of the force.

On May 22, 1935, Baldwin, in putting forth the fresh expansion scheme, said with reference to his statement of the previous November:

With regard to the figure I gave of German aeroplanes, nothing has come to my knowledge that makes me think that figure was wrong. . . . Where I was wrong was in my estimate of the future. There I was completely wrong. I tell the House so frankly, because neither I nor any advisers from whom we get accurate information had any idea of the exact rate at which production could be, and actually was being speeded up in Germany in the six months between November and now. . . . We .

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<sup>1</sup>Memo by Churchill April 29, 1935. Min. Midhurst to Ellington, May 3, 1935, quoted in Webster and Frankland, Vol. I, p. 70.

were completely misled on that subject. I will not say we had not rumours. There was a great deal of hearsay, but we could get no facts, and the only facts at this moment that I could put before the House, and the only facts that I have, are those which I have from Herr Hitler himself.

In fact Baldwin had no need to be so apologetic for he had carefully pointed out in the November speech that the figures he gave had assumed a constant rate of production, not that he believed this would necessarily be the case. Baldwin had been warned by Sir Christopher Bullock, the civil servant head of the Air Ministry, that the figures for Germany reflected only a first stage and that during the second stage the Luftwaffe would expand more rapidly.<sup>1</sup> Baldwin seemed to become confused about what he had said when he retracted statements about promised future parity which he had not in fact made.<sup>2</sup>

In their respective autobiographies Churchill and Eden are still convinced that they were right but an examination of the facts indicates otherwise.<sup>3</sup>

It is now known that in December 1934 there were

<sup>1</sup>Interview with Sir Christopher Bullock, Nov. 25, 1965. Bullock was one of the most ardent advocates of rearmament and for this reason was forced from his position in 1936. See The Memoirs of Captain Liddell Hart, Vol. I, p. 158.

<sup>2</sup>See also Denis Richards and Hilary St. G. Saunders, The Royal Air Force: 1939-1945 (London: Her Majesty's Stationery Office, 1953), Vol. 1, pp. 12-13, and Collier, p. 29.

<sup>3</sup>The Gathering Storm, pp. 99-116 and Facing the Dictators: The Eden Memoirs, pp. 182-86.

1,888 German aircraft of all types, military and civilian and that there were 565 military aircraft suitable for first-line duty. Many of the 565 aircraft lacked engines or other equally necessary components and thus the figure is far from the actual German first-line strength.<sup>1</sup> This compares with an Air Staff estimate of 2,300 aircraft of all types and between 600 and 1,000 military aircraft of which 176 were "service aircraft".

There can be no question that the Foreign Office estimate of 3,000 aircraft, even if this figure included civil aircraft for the spring of 1935, was absurd. Hitler's claim of 2,100 military aircraft of which 900 were first-line was a bluff which Eden and Simon believed.

In fact the Air Staff predictions seem to have exaggerated German strength rather than to have underestimated it as many people have suggested.<sup>2</sup> The R.A.F. maintained a superiority of 880 first-line aircraft to a Luftwaffe total of less than 565 in late 1934. Britain would in time lose parity with Germany but critics such as Churchill and Eden were quite wrong in thinking that the R.A.F. was behind in the spring of 1935.

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<sup>1</sup>Collier, p. 27. This figure derives from the captured German records of the Luftwaffe Quartermaster General (8th Abteilung), Great Britain, Ministry of Defence, Air Historical Branch.

<sup>2</sup>See Lord Birkenhead's Halifax (London: Hamish Hamilton, 1965), for a recent example, pp. 342-43.

### CHAPTER III

#### THE ESTIMATED SCALE AND CONSEQUENCES OF ATTACK:

1936-1937

The uproar over the Government estimates of German strength and how these were disputed by Churchill and Eden had the beneficial effect of urging some rearmament on an unenthusiastic Government. The Cabinet set up an Air Parity Committee to determine the seriousness of the situation and to propose a remedy. Sir Philip Cunliffe-Lister<sup>1</sup> was appointed Chairman and on June 7, 1935, he became Secretary of State for Air as Lord Londonderry was dropped from that post.

Meanwhile on February 27, 1935, the Air Defence Committee was set up with Henry Tizard as its Chairman, a significant event which went unnoticed by many. The other members of the Committee were Professor E. V. Appleton, Professor P. M. S. Blackett, Professor A. V. Hill, and Mr. H. E. Wimperis. It was this group that was to foster the creation of radar under Robert Watson-Watt.

On August 1, 1935, the Joint Planning Committee submitted its interim report, stressing the danger of the

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<sup>1</sup>Later to be made Viscount and then the Earl of Swinton.

"knock-out blow." It stated that a strategic bombing attack by Germany would be catastrophic for Britain. London might be made untenable and the feeding of the population made impossible by attacks on the ports.<sup>1</sup> Neither the Army nor the Navy was still willing to accept this appreciation, based mainly on their opposition to the assumption that the major attack would be from the air.

By the autumn of 1936 the Air Staff felt that the second stage of the German air expansion program was drawing near completion. At the beginning of October of that year the Luftwaffe was credited with the 114 squadrons predicted for them in 1934; however, in view of the new estimate of nine instead of twelve first-line machines in a squadron, the total number was put at 1,100 instead of 1,368 military aircraft of all types. There seemed good reason to expect that the estimate of 1,500 aircraft in the spring of 1937 would also be fulfilled. The Air Staff saw a final German goal of "not less than 4,000 first-line aircraft."<sup>2</sup> At this time, British air strength at home consisted of 696 first-line aircraft. It was due to rise to 1,736 aircraft but that would not be until the spring of 1939. For the time being it appeared to the British that air parity had unquestionably been lost. Since there are no figures available for the strength of the Luftwaffe between 1934 and

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<sup>1</sup>Cited by Webster and Frankland, Vol. I, p. 89.

<sup>2</sup>Quoted by Collier, p. 46.



August 1938 it is impossible to evaluate accurately these estimates.

Concern about the danger of air attack was spreading considerably and this was reflected in Parliamentary debates. To take two examples, first on June 28, 1936, Winston Churchill spoke for a deputation of Conservative members of both Houses to the Prime Minister. He still felt that the Air Staff estimate of the size of German strength

is too low. The number of machines which Germany could put into action simultaneously may be nearer two thousand than fifteen hundred. Moreover, there is no reason to assume that they mean to stop at two thousand. The whole plant and lay-out of the German air force is on an enormous scale, and they may be already planning a development far greater than anything yet mentioned. . . The German strength at this moment is double that of our metropolitan air force, judged by trained pilots and military machines that could go into action and be maintained in action. . . The relative strength of two countries cannot be judged without reference to their power of replenishing their fighting force. The German industry is so organized that it can produce at full blast a thousand a month and increase the number as the months pass. Can the British industry at the present time produce more than three hundred to three hundred and fifty a month? . . . When we allow for the extremely high rate of war wastage, a duel between the two countries would mean that before six months were out our force would not be a third theirs.

He doubted that British aircraft production was proceeding according to schedule and was concerned lest some of the aircraft might not be fully equipped. Churchill noted that Germany could drop 500 tons a day on London. Considering that "we know from our war statistics that 1 ton of explosive bombs killed ten people and wounded thirty, and

did fifty thousand pounds of damage," the consequences of an extended period of bombing would be severe. He was then asked: "What can we do?" He answered: "I submit for your consideration that this time next year, when it may well be that the potential discharge of the German fleet is in the neighbourhood of a thousand tons, we shall not be able to discharge in retaliation more than sixty tons upon Berlin." Churchill was particularly concerned about the danger of an attack by thermite incendiary bombs.

These small bombs, little bigger than an orange, had . . . been manufactured by millions in Germany. A single medium airplane can scatter five hundred. One must expect in a small raid literally tens of thousands of these bombs which burn through from story to story. Suppose only a hundred fires were started and there were only ninety fire brigades, what happens? Obviously the attack would be on a far more formidable scale than that. One must expect that a proportion of heavy bombs would be dropped at the same time, and that water, light, gas, telephone systems, etc., would be seriously deranged. What happens then? Nothing like it has ever been seen in world history. There might be a vast exodus of population, which would present to the Government problems of public order, of sanitation and food supply which would dominate their attention, and probably involve the use of all their disciplined forces.

Churchill was concerned that adequate defensive measures had not been taken. He urged the Government to consider what should be done to minimize the dislocation caused by enemy attack.

What happens if the attack is directed upon the feeding-ports, particularly the Thames, Southampton, Bristol, and the Mersey, none of which are out of range? What arrangements have been made to bring in the food through a far greater number of subsidiary channels? What arrangements have been made to protect our defence centres? By defence

centres I mean the centres upon which our power to continue resistance depends. The problem of civil population and their miseries is one thing; the means by which we could carry on the war is another. Have we organized and created an alternative centre of Government if London is thrown into confusion? No doubt there has been discussion of this on paper, but has anything been done to provide one or two alternative centres of command with adequate deep-laid telephone connections, and wireless from which the necessary orders can be given by some coherent thinking-mechanism?<sup>1</sup>

Churchill again incorrectly charged the Air Staff with underrating German strength. Although no accurate figures for German strength are available for the period between the fall of 1934 and the fall of 1938, since the British overestimated German strength on both these dates, it is reasonable to assume that they were not underestimating in the intervening period.

In a debate in the House of Commons two days later on July 30, 1936, R. Dyke Ackland also asked the Government for more information on the danger of air attack.

We hear statements about the effects of air raids and some of them are contradictory. We know that there are three possible methods of defence, (1) counter attack, (2) to bring down the aeroplanes before they arrive; . . . and (3) to minimize the damage when damage is done. The people are entitled to know what chances there are of minimizing the damage. Some people, authoritative experts, have made statements which would incline us to believe that if a mere 20 bombers were to appear over London they could, with a large number of light bombs, fell two square miles of London with such a concentration of poison gases that no one without a respirator would have a chance of surviving. We are told that from St. Paul's to the Natural History.

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<sup>1</sup>The Gathering Storm, pp. 609-14.

Museum and somewhere else in the south of London everybody would be wiped out unless they had gas masks. Other people of equal authority assure us that gas is a peculiar thing, and that there would need to be a very high concentration of gas before any effect could be made on human life. They say that the gas bombs would explode in the air, that the gases would hang about and not spread much, and that even if a large fleet of bombers came over, the bombs they could carry, which are very heavy, would be limited and would not contain much gas, and that even if 200 bombers came over life would not become impossible.<sup>1</sup>

Concern outside Parliament was also mounting and this was reflected in the growing number of books being written about the danger of air attack. In a book with a foreword by Field Marshal Lord Milne, past Chief of the Imperial General Staff, Sir Malcolm Campbell, the well-known automobile sportsman and writer, was primarily worried about a surprise attack which would destroy the morale of the population. He felt that "we may lose the next war in twelve hours."<sup>2</sup> He emphasized that it was possible for an enemy to drop 1,000 tons of bombs in one day, four times the amount dropped in the entire First World War. He discounted the possibility of a preventive attack by Britain as being impossible for a democratic country and advocated taking extensive passive defence measures in the form of shelters.

Campbell envisioned the enemy first sending hundreds

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<sup>1</sup>Great Britain, House of Commons Debates, Vol. 315, cols. 1789-90. July 30, 1936.

<sup>2</sup>Sir Malcolm Campbell, The Peril From the Air (London: Hutchinson & Co., 1935), p. 48.

of planes with incendiaries, then a wave with high explosives, and a final wave with poison gas. This might result in one million or more casualties. With the assumed maximum of seven to ten minutes warning any form of evacuation was impossible and thus the only solution was shelters. He advocated the immediate issuing of gas masks and felt that without shelters an attack would result in anarchy with the rush of people to get out of London. A complete collapse of morale he regarded as inevitable. He was particularly concerned about a poison gas attack and dealt with the measures citizens can take to protect themselves. Lord Milne found the book a timely one and believed that the warnings about the danger of air attack were not exaggerated. It was to books of this type that Ackland was referring in his Commons speech. With an introduction from someone as authoritative as Lord Milne, this served to heighten the concern about a "knock-out blow." Many books dealt with gas attack for which in most cases no defence was seen.<sup>1</sup>

This growing concern about air attack was also

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<sup>1</sup>See for example Boyd Cable, "New Horrors of Air Attack" in Sir John Hammerton, ed., War in the Air (London: The Amalgamated Press Ltd., 1935), cf. H. M. Hyde and G. R. F. Nuttall, Air Defence and the Civilian Population (London: Cresset Press, 1937), p. 62, see also J. B. S. Haldane, Callencius: A Defence of Chemical Warfare (London: Kegan Paul & Co., 1925), and Philip Noel Baker, "A National Air Force No Defence" in Storm Jameson, Challenge to Death (New York: E. P. Dutton, 1935), esp. pp. 193-205.

present in official circles. On March 17, 1936, a Subcommittee of the Committee of Imperial Defence which had been set up to estimate the possible scale of German attack expressed its anxiety about the possibility of a "knock-out blow."<sup>1</sup>

The Air Staff's Joint Planning Committee on the Situation in the Event of War Against Germany in 1939 reported on October 26, 1936, and made one of the first favourable judgments on the feasibility of air defence, recommending an increase in this capability. Generally, however, the conclusions that the Committee reached were much the same as those of its predecessors.

The Joint Planning Committee believed that Britain was much more vulnerable to air attack than Germany because of the concentration of her population and government in a small area and because German bombers had a much shorter distance to fly over British soil to reach London than British bombers would have to fly over German soil to reach German targets. It was believed that a British counter-offensive was the only means of reducing the German scale of attack. Hopefully the reduction would result from the German population becoming demoralized as a consequence of British air attack on some target system which would compel Germany to concentrate its retaliation on military targets in Britain; alternatively this might come from a

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<sup>1</sup>Cited by Webster and Frankland, Vol. I, p. 89.

direct British attack on German bombers.

The situation appeared bleak because neither of the alternatives for British policy looked feasible. First, it was thought likely that British morale would suffer even more than German morale. Secondly, it appeared unlikely that sufficient damage could be done to targets in Germany to reduce the German scale of attack. Thirdly, a British counterforce attack, the least undesirable of an unappealing lot of choices, was unlikely to be successful because of the inferior size of British forces.<sup>1</sup>

The Final Report of the Joint Planning Committee was submitted to the Chiefs of Staff and it was carefully studied first by the Chiefs and subsequently in the form of a general plan by the Committee of Imperial Defence and the Cabinet; both of these organizations approved the report in May 1937. Some recognition was given to the views of the other services but the report represented largely R.A.F. thinking. An appendix covered the "alarming situation" which would arise in the event of German air attack which might cause 150,000 casualties in the first week of war. This was thirty times the number that occurred in the bombing of Britain in World War I. The Chiefs of Staff did not endorse this part of the report and did not want it sent to the Cabinet, but they did accept the view that the war might begin with a German

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<sup>1</sup>Cited by Webster and Frankland, Vol. IV, pp. 88-95.

attempt to deliver the "knock-out blow" against Britain.<sup>1</sup>

In January 1937 the Chief of the Air Staff circulated a memorandum containing a revised estimate of the probable scale of air attack on the United Kingdom in the event of war with Germany. This memorandum was referred to the Home Defence Committee which endorsed the Air Staff conclusions and drew attention to the need for an appreciation of probable courses of enemy air action.<sup>2</sup> A paper was accordingly prepared to deal with the situation which it was thought would exist in April 1939.

The calculations that were made about the scale of enemy attack were all performed in a similar manner. The Air Staff considered that the 1937 bomb-lift of 1,710 German bombers would be 2,250 tons. One-seventh of this amount was deducted to allow for the proportion of aircraft which could be assumed to be unserviceable on any one day. The total bomb-lift tonnage was thus reduced to 1,900 tons. Assuming that France would be an ally of Britain, it was presumed that one-third of the German bombers might not be available for attacks on Great Britain which would reduce the tonnage to about 1,300 tons.

The effects of the British counter-offensive and of weather conditions and forced landings were very roughly assessed as reducing the figure of 1,300 tons by one-third, or to about 850 tons. A further reduction of one-quarter

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<sup>1</sup>Ibid.



was assumed to be sufficient to allow for the effects of fighter and ground defences, thus bringing the estimate of the average weight of bombs which could be dropped on the country daily by April 1939 to about 640 tons. At the 300th meeting of the Committee of Imperial Defence it was agreed that this figure should be rounded off to 600 tons. This would mean 30,000 casualties per day.

The Air Staff estimated that this scale of attack could be sustained by the enemy for a period of two or three weeks and furthermore that the German Air Force might be able to drop a much greater daily weight of bombs during the first few days, amounting possibly to as much as 3,500 tons during the first twenty-four hours. This would mean that 175,000 casualties should be expected in this period. This was thirty-five times the number of the entire World War I period and yet it would be accomplished in just one day. Still they did not allow for the casualty ratio to vary as a result of changes in the size of the population of London.

They considered that, in the unlikely event of a war not involving any British allies, all Germany's long-range bombers would be available for attacks on England in which case the scale of attack during the first two or three weeks would be very much higher, possibly amounting to as much as 1,000 tons a day. This would have meant over one million casualties in three weeks.

The Air Staff assumed that all German long-range

bombers could reach targets in Britain. For the German aircraft to reach Britain would in fact have required substantial reductions in bomb-load in order to carry necessary fuel. The German need to substitute fuel for bombs in the bombers was not recognized by the British. To reach London, German bombers would have needed to sacrifice their maximum bomb load considerably.

Some decrease in the scale of attack was expected after two or three weeks owing to the effects of British anti-aircraft defences and to German wastage generally. The Air Staff noted in conclusion that they were not excessively confident of their estimates but that they thought the predictions would not be too far off the mark.

This calculation of the estimated scale of enemy attack and those that preceded and followed it, contain a number of errors. First, as we shall see when examining the Air Staff estimates for 1938, the British exaggerated the total number of German bombers. We shall also see how they misinterpreted German air strategy which did not envision the use of offensive bombing except as this was in cooperation with land forces.

The Air Staff underestimated the number of aircraft that would be unserviceable on a given day. To assume only one-seventh was pessimistic, for as well as routine maintenance, many aircraft would be damaged and need

repairs. There would also be crew constraints imposed on the Luftwaffe.

The real error, however, lay in the British assumption of how effective German bombing would be. Even granted that such figures as they mentioned could be dropped, the problem would be first to find and second to hit the targets in Britain. This will be apparent when the R.A.F. Bomber Command pre-war calculations and actual war-time achievements are compared.

The Air Staff did not mention what attrition rates they assumed or what they estimated German reserves and production would be. If the attrition rate was 5 per cent, this would have required 75 new bombers to be brought into the Luftwaffe first-line each day. This would have needed a supply of over a thousand bombers in two weeks. The consequences of losses on this scale for the Luftwaffe would have been very serious. This attrition would also have resulted in a high rate of loss of crews with a possible serious reduction in morale.

In January 1937 it was estimated that by the end of 1939 the total German first-line strength would be 3,250 planes. Even if the British program were completed in time, and this was most improbable, it would only have provided a total force of 1,750 aircraft, of which 1,000 would be bombers. It was felt by the Air Staff that

British planes were of better quality, but Eden reports that the Foreign Office was not at all reassured.<sup>1</sup> In any case it appeared to the Air Staff that the British were falling further and further behind.

In January 1937 a mission of British Air Staff officers visited Germany and General Milch, the Under-Secretary for Air, generously invited Air Vice-Marshal Courtney to see the German Government's plans. These indicated that Germany would have, by the autumn of 1938, 1,755 first-line aircraft. This information agreed with British Air Staff intelligence and indicated that by that time there would still be a parity of numbers. They did not notice, however, that Germany was not procuring many long-range bombers but instead was concentrating on ground support aircraft. Once again the Foreign Office claimed that the Air Ministry was being deceived.<sup>2</sup> They saw this as a German plot to slow British production.<sup>3</sup> The Air Staff did acknowledge, however, that by May 1937 Germany would have 800 long-range bombers compared with 48 for the British, a rather substantial advantage.

In February 1937 the Chiefs of Staff produced an appreciation of the contingencies which British planning

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<sup>1</sup>Balfour papers and Facing the Dictators: The Eden Memoirs, p. 484.

<sup>2</sup>The other time was in the spring of 1935.

<sup>3</sup>Facing the Dictators: The Eden Memoirs, p. 485.

should be prepared to meet. They considered that the most probable form of enemy attack was either a "knock-out blow" on Great Britain combined with an attack on sea communications, or a combined land and air offensive against France.<sup>1</sup> They were primarily worried about the former.

In June of 1937 the Warren Fisher Committee submitted to the Cabinet a report on its examination of the scale and consequences of air attack. They believed it was quite possible that Germany would attempt a massive attack on the first day due to the German love of the "Kolossal" and that they might well succeed in dropping 3,500 tons of bombs in the first twenty-four hours; this was over ten times the total dropped in all of World War I and over a thousand times more than what was used in the largest single attack on Britain of that war. They examined and accepted the fifty casualties per ton estimate and pointed to a computation indicating that 600 tons per day meant casualties in the neighbourhood of 200,000 per week, one-third of which would be mortalities.<sup>2</sup> If the Germans succeeded in this massive attack, the figure might be reached on the first day of the war,

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<sup>1</sup>Marshal of the R.A.F. Sir John Slessor, The Central Blue (New York: Praeger, 1957), p. 212.

<sup>2</sup>They even felt that their estimates might be excessively conservative in view of the increased effectiveness of bombing.

although this level would not be sustained for any period. The Air Staff was at this time concerned about a mixed attack of explosives, incendiaries, and gas.

A caveat that was made by the Home Defence Committee and endorsed by the Chiefs of Staff indicated that the estimates were expressed in terms of averages, like all estimates, and "were of theoretical rather than practical value, since any attempt to translate them into terms of the effects likely to result in any particular locality or set of circumstances might be very misleading. The scales of attack were indicated for several contingencies."<sup>1</sup> Although the experts who produced the estimates throughout this period realized that they were of a speculative nature, the estimates had tended to acquire a natural authority in the minds of those who had to use them.

By the summer of 1937 the Committee of Imperial Defence was working with new casualty estimates. It was then calculated that the attack might continue for 60 days which would mean 600,000 killed and 1,200,000 injured in this period. Estimates were also being made about the material damage that would be sustained. The ratio of £35,000 per ton was chosen as typical of damage in a future war on the basis of losses sustained in the worst attacks

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<sup>1</sup>Terence H. O'Brien, Civil Defence, History of the Second World War, United Kingdom Civil Series, ed. Sir Keith Hancock (London: Her Majesty's Stationery Office and Longmans Green, and Co., 1955), p. 143.

of World War I. It was calculated that damage of £550,000,000 would occur in the first three weeks of war. This amounted to the conclusion that five per cent of all property in Britain (buildings and contents) might be destroyed in this period.<sup>1</sup>

In 1937, as in each preceding year, the Home Defence Exercises were held in the summer. On the first day of the exercise there were thirty raids of which half were intercepted, all but two before the bombers had dropped their loads. In the night there were forty-nine raids of which about nine got through without being intercepted. On the next morning there were thirty-six raids and thirty-five interceptions. On the following evening there were forty-two raids and thirty-seven interceptions. Thus of 157 raids there were 127 interceptions. This appears most impressive but the Air Staff agreed that the results were hard to evaluate as the bombers were expected at a given time and place by the defenders. It was really a test to find out how quickly a bomber could be intercepted after a report of its presence was received.<sup>2</sup> The fighters knew which course the bombers would take, only

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<sup>1</sup>This figure is an apparent miscalculation because 21 days x 600 tons per day x £35,000 damage per ton equals £441,000,000 not £550,000,000.

<sup>2</sup>Flight, August 19, 1937.

their altitude was in question.<sup>1</sup> Nevertheless to many this was a fairly convincing demonstration of the value of fighters, providing the enemy could be located in the sky.<sup>2</sup>

In response to a request from the Prime Minister made in the summer of 1937 wishing to know the exact position in which Britain would be if attacked on January 1, 1938, the Deputy Directors of Plans, Operations, Intelligence and Operational Requirements jointly made a study and produced a detailed report.<sup>3</sup>

The estimated situation was as bleak as Slessor, the Deputy Director of Plans, had anticipated. In a covering note submitting their report to the Chief of the Air Staff, Slessor wrote: "I am very doubtful whether the Government have any really accurate conception of our weakness in the air, and feel that the Cabinet to some extent probably share the popular but completely erroneous belief that, because we have now 123 squadrons nominally in existence, we are capable of taking on all comers."<sup>4</sup>

<sup>1</sup>The Aeroplane, August 18, 1937, p. 191.

<sup>2</sup>See N. N. Golovine, "Fighter versus Bomber", Royal Air Force Quarterly Vol. VIII No. 4 (October, 1937), pp. 329-350.

<sup>3</sup>"The Bomber Strength of Great Britain Relative to other Powers". Comparison of the Strength of Great Britain with that of Certain Other Nations 1938: State of Readiness of R.A.F. at 1st January 1938, D.D. Plans Branch Folder No. 77, Cat. II A/1/61/77, Great Britain, Ministry of Defence, Air Historical Branch.

<sup>4</sup>Slessor, p. 158.



The position of Great Britain in October 1937 gave her a nominal first-line strength of the Metropolitan Air Force of 816 aircraft or sixty-eight squadrons.<sup>1</sup> The mobilizable strength of long-range bombers was 96 first-line aircraft or eight squadrons. The latter figure was derived as follows:

Mobilizable Strength of Long-Range Aircraft

Medium Bombers:-	)	
3 Blenheim Squadrons	)	
3 Wellesley Squadrons	)	total
1 Battle Squadron	)	first-line
	)	96
Heavy Bombers:-	)	
1 Harrow Squadron	)	

There would be 204 first-line short-range bombers of the Heyford and Hind types that could be mobilized but these could only operate from continental bases. They would not be able to reach objectives on the Continent from home bases, and, in fact, for all practical purposes - in performance, bomb-load, and range - they had very little operational value compared to more modern bombers and considering the modern fighters which their potential enemies could put into the field.

There was also an assortment of squadrons not considered mobilizable for a variety of reasons, such as being unfit for operations, lacking essential equipment such as gun turrets or having insufficient personnel.

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<sup>1</sup>The metropolitan strength was that located in the United Kingdom.

It was not considered so easy to give comparable figures of German bomber strength because of lack of detailed information regarding such important factors as their methods of organization and composition of squadrons; it was assumed that what were termed "fully formed" units in Germany were the equivalent of the British mobilizable squadrons. The Air Staff felt quite certain that on April 1, 1937, "fully formed" units included a strength of 513 bombers. There was no doubt in their minds that this number had been increased by October 1937 in view of the fact that 738 bombers had been definitely identified in units, although the total strength of "fully formed" units was not yet definitely known.

It was estimated from an examination of all reliable information that had been received up to October 1937 that Germany possessed a first-line strength of 1,737 aircraft, of which 810 were bombers. All such bombers were thought to have an operational radius of not less than 350 miles which would have been adequate to allow them to bomb London from bases in Germany with full loads. This was a considerable error, as will be shown later.

The Air Staff felt it was reasonable to conclude that, at a conservative estimate, Germany had on October 1, 1937, at least six times the mobilizable strength of Great Britain in long-range bombers, of which a considerable proportion

would be of the latest types.<sup>1</sup>

The Air Staff also despaired for the future because by April 1, 1938, Britain would have at best only 324 first-line long-range bombers. The reserves immediately behind these aircraft were only thirty-three per cent of the first-line strength. Furthermore many of the Blenheims, Whitleys and Harrows still would not have gun turrets fitted due to a lag in production. It was estimated that Germany would have at least 900 long-range bombers, almost three times British strength. This figure was probably accurate for in October 1938 Germany had 1,120 long-range bombers.<sup>2</sup>

Depressing as this comparison must have been to the Air Staff, they also felt that the total picture was worse because as a result of sudden though inadequate expansion, the training and organization of the British force was not up to the most modern standards. By April 1, 1939, there would be a British metropolitan strength of 1,736 aircraft of which 1,022 would be bombers. There was no possibility of the full bomber force being mobilizable, even without reserves, before that date and the war reserve aircraft behind the force would not be available until December 1939

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<sup>1</sup>Unfortunately there are no available figures for German air strength during this period and consequently it is impossible to assess the accuracy of the R.A.F. estimates.

<sup>2</sup>Report of the 8th Abteilung of the German Air Force's Quartermaster General, trans. Air Historical Branch, Ministry of Defence, Great Britain.

at the earliest, 2 years and 4 months from the time the report was written in 1937. By December 1939 Germany would have a strength of 3,240 aircraft including 1,500 bombers. Therefore they estimated that Germany would have a major advantage in the air.

The Air Staff concluded this report by noting that the time had come when it was their duty to express their view to the Government on the effect of the present rate of production when related to the strength of their potential enemies, to their defence commitments, and to the risks of being involved in war before their expansion and re-equipment was completed. There was no question in their mind that they were and at the current rate of progress would continue to be, though in a decreasing degree, in a position of "shocking weakness" in the air relative to their two most powerful potential enemies, Germany and Italy. They felt that British commitments were no less, and indeed in some respects were more onerous than they had ever been.

In the Air Staff's view it was no exaggeration to claim that never in history had there existed an international situation which contained so many latent possibilities of war of the first magnitude. They believed that all previously accepted measures of the speed and lack of warning with which dangerous incidents could arise and with which they could be followed by ruthless action, had

been eclipsed in recent years; ethical considerations had no restraining influence whatever; and all legal safeguards in the form of treaties or international agreements had time and again proved to be not worth the paper they were written on.

The Air Staff thought, therefore, that they would be failing in their duty were they not to express their considered opinion that the Metropolitan Air Force in general, and the Bomber Command in particular, were at that time almost totally unfit for war; unless the production of new and up-to-date aircraft could be expedited, the air force would not be fully fit for war for at least two and a half years, that is until early 1940; and that even at the end of that time they felt there was no chance of their reaching equality with Germany in first-line strength - indeed that they also stood in grave risk of falling seriously behind Germany in the quality of aircraft actually in service. In brief, the situation was that so far as the Air Force was concerned, the country was in no condition to go to war and would not be at the then existing rate of progress for at least two years.<sup>1</sup>

After examining this gloomy estimate of British readiness for war, the Deputy Chief of the Air Staff minuted to the Chief of the Air Staff on September 13, 1937, that

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<sup>1</sup>This information all derives from the Air Staff paper, "The Bomber Strength of Great Britain Relative to Other Powers".

there was so wide a discrepancy between expansion viewed simply in terms of first-line strength, re-equipment, and output and their actual readiness for war that he felt convinced that neither the Secretary of State for Air nor the Air Council were fully seized of the seriousness of the situation and that it was his duty to lay the facts before them. He wanted to make it clear that Britain was in no shape to go to war and would not be at the current rate of progress for at least two years; he felt that the fact was not fully appreciated by the Government.

The Deputy Chief of the Air Staff felt that the situation was being brought into greater relief day by day because of the ever-changing risks of war in one theatre or another and because of the possibility of Britain becoming involved before her expansion and re-equipment were complete. There was no question in his view but that Britain was - and at the then present rate of progress would continue to be, though in a decreasing degree throughout the next two years - in a position of serious weakness in the air relative to her two most powerful enemies.<sup>1</sup>

The Air Staff had issued a very stiff warning to the Government. Their calculations pointed to the danger of 175,000 casualties in twenty-four hours and 1,800,000 casualties in two months. It appeared that British air

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<sup>1</sup>Minute from Deputy Chief of the Air Staff to Chief of the Air Staff, Sept. 13, 1937, Comparison of the Strengths of Great Britain with that of Certain Other Nations, 1938.

strength was falling farther and farther behind that of Germany. They could not look upon such a situation with equanimity and vigorously pressed their evaluation of the threat. They strongly urged that Britain should not become involved in a war before expansion was completed.

Lord Swinton, the Secretary of State for Air, was giving his full support to the research and development of radar and to the development and procurement of the Hurricanes and Spitfires. He saw this as the best means of meeting the threat of air attack in sharp contrast to those who advocated only increased bomber forces. Ellington, the Chief of the Air Staff, did not support radar, often calling it "Swinton's hobby", and he also opposed any diversion of resources from the offence to the defence.<sup>1</sup> He minuted to Swinton that the latter underestimated the vital importance of the strategically defensive role of the bomber force. He considered the bomber counter-offensive to be an essential element in the defensive system, so much so that the plans he directed to be drawn envisaged, in the situation of war with Germany, that the whole of Bomber Command would probably have to be employed against the enemy air force in attacks on Luftwaffe bases in order to reduce the scale of attack on Britain to manageable

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<sup>1</sup>Interview with the Earl of Swinton, December 1, 1965.

proportions. He concluded that Britain should not base its system of air defence on what he knew to be a bluff, one which Britain could not afford to see called.<sup>1</sup> The bluff was the employment of radar and fighters. Swinton, however, was not deterred from pressing on with his attempts to improve active defence.

In December 1937 the Air Staff prepared a memorandum for the Minister for Co-ordination of Defence, Thomas Inskip, on the state of readiness as of January 1, 1938. The report disclosed a truly alarming situation. The total number of R.A.F. aircraft available was given as 1,412 but because of lack of reserves and low production rates, the full number of squadrons which were mobilizable could not be maintained in action, assuming the correctness of estimates of war wastage.<sup>2</sup> For the newer type of aircraft there was a severe parts shortage. There were personnel problems both in the numbers and the training of the crews; heavy bomber crews in particular were badly in need of more training. It was felt, in short, that Bomber Command was without question still in no way ready for war. The number of fighter squadrons was twenty-one less than the

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<sup>1</sup>Draft Minute from Chief of the Air Staff to Secretary of State for Air, September, 1937, Comparison of the Strengths of Great Britain with that of Certain Other Nations, 1938.

<sup>2</sup>What these estimates were is hard to discern. Writing in 1927 (Air Facts and Problems) Lord Thomson spoke of casualties as high as eighty per cent per month in pilots and machines (p. 25). What changes might have taken place in ten years is not known.



minimum requirement of forty-five. It was also improbable that the radar (R.D.F.) stations would be very useful at the time. Anti-aircraft guns were also badly lacking. The estimated mobilizable strength of aircraft on January 1, 1938, showed many squadrons would be ineffective for various reasons and indicated the disparity with estimated German strength.

Although it was difficult to predict, it was estimated that Bomber Command could not be mobilized with new type aircraft, exclusive of reserves, until May 1, 1939, and with the desired 150 per cent reserves until November 1, 1939. Once again the Air Staff made clear its point that Britain must not become involved in war until substantial rearmament had redressed British inferiority in the air.<sup>1</sup>

In October 1937 the Air Staff further emphasized the weakness of the British position by predicting that by the end of 1939 Germany would have 3,240 first-line aircraft with a striking force of nearly 1,500 bombers. This estimate exaggerated the actual German bomber strength by about twenty-five per cent or three hundred bombers. Even if British production proceeded perfectly the R.A.F. would have no more than 1,736 first-line aircraft including about 1,000 bombers by that time. If the Air Staff estimate had

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<sup>1</sup>Memorandum on State of Readiness at Jan. 1, 1938, sent to Minister for Co-ordination of Defence, Thomas Inskip, Comparison of the Strength of Great Britain with that of Certain Other Nations, 1938.

been closer to actual German production, German and British bomber strengths would have been seen to be about equal by the end of 1939.

By early 1938 the expected scale of attack was raised to 700 tons daily, acknowledging what was believed to be an increased Luftwaffe capability. This would mean over one million casualties inflicted by bombing in a month, given the predicted casualty ratio of 50 casualties per ton of bombs. There was still no thought of modifying this planning factor.

It was the responsibility of the Ministry of Health to translate the Air Staff casualty estimates into requirements for Governmental social policy. Their estimates indicated that between 1,000,000 and 2,800,000 beds would be needed according to the length of stay that would be permitted in the hospital. The Home Office envisaged mass burials and burnings of bodies in lime, because otherwise 20,000,000 square feet of seasoned coffin timber would be needed each month at a cost of approximately £300,000. One million death certificate forms were distributed by the Ministry of Health. Not surprisingly, widespread disease was anticipated. There was an intuitive feeling among policy-makers that people would panic. The Commissioner of Police requested 17,000 regular troops, in addition to 20,000 reserve constables, to control the

exodus from London and to prevent panic at stations, at the entrance to tubes, and at certain provincial centers.<sup>1</sup>

In summary, as a result of their calculations of the previous two years, by 1938 the Air Staff considered that Britain was in no shape to engage in a war and would not be for at least two years. The estimated destructiveness of German bombing attacks was almost unimaginable and the Air Staff did not think that the country could take it. As well as arguing for greatly increased resources to speed rearmament, the Air Staff also pointed out the necessity of a cautious foreign policy until Britain was ready for war. During 1938 as war looked more and more likely, they were to return increasingly to this theme.

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<sup>1</sup>Titmuss, p. 18.

## CHAPTER IV

### THE NEWALL MEMORANDUM: 1938

The Air Staff by 1938 was extremely concerned about British vulnerability to air attack. They were rebuffed in their efforts to persuade the Government to spend more money for rearmament. Consequently they felt in view of the apparent overwhelming inferiority of the R.A.F. to the Luftwaffe, Britain must not become engaged in a war with Germany.

On April 8, 1938, the Chief of the Air Staff, Sir Cyril Newall, minuted to the Secretary of State for Air, Lord Swinton, as follows:

I feel strongly that the time for mincing words is past and that the Air Staff should state their view of the situation plainly. Their view is that unless the Cabinet is prepared to incur at the very least the full expenditure required for Scheme L and possibly more, we must accept a position of permanent inferiority to Germany in the air.<sup>1</sup> In that event we must be prepared to accede to any German demand without a struggle, since in the event of war our financial and economic strength, which the present financial limitations are designed to secure, will be of no use because we shall not survive the knock-out blow.

No one can say with absolute certainty that

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<sup>1</sup>The latest of the lettered expansion proposals.

a nation can be knocked out from the air, because no one has yet attempted it. There can be no doubt, however, that Germany and Italy believe it possible, as there can be no other explanation for their piling up armaments to a level which they could not hope to maintain in a long war. When, as I firmly believe, the issue is that of the survival of British civilization, we cannot afford to take so great a chance for the sake of £60 or £100 millions.<sup>1</sup>

Newall's concern was not a new one but his argument contained a strange mode of reasoning. His conclusion that Germany and Italy were preparing for a "knock-out blow" on Britain was apparently based on the fact that they were stockpiling arms. This would seem to be evidence that Germany and Italy in fact expected a long war, for if they believed in the efficacy of their supposed "knock-out blow", they would not need such great stocks of arms.

The appraisal of the situation in the event of war upon which the Newall memorandum was based derived from the most detailed Air Staff appreciation of the scale and consequences of air attack that had yet been produced. The title of the paper was the "Probable Courses of Action of German Air Force in the Event of Air Attack Upon the United Kingdom, and Possible Distribution of Attack". It was prepared by Slessor, the Deputy Director of Plans and amendments were suggested by, among others the Assistant Chief of the Air Staff, the Deputy Director of Intelligence, Air Intelligence Branch, and the Deputy Director of Operations.

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<sup>1</sup>Quoted in Slessor, p. 152 and Titmuss, p. 78.

The final draft was dated April 18, 1938.<sup>1</sup>

In their report the Air Staff reasoned that Germany's economic difficulties indicated that she could not face with confidence the prospect of a long war. Germany might, however, readily contemplate war against England if she thought that by the exercise of air power - combined possibly with naval attack on seaborne trade - she could obtain an early decision. Moreover, it was thought if she could succeed in defeating Britain there would be no doubt of her ability subsequently to crush France. British defensive preparations must be designed to deal with the worst case and therefore it was assumed that as much as possible of the German striking force would be directed against England in an attempt to achieve what they termed a "knock-out blow".

Britain was considered by the R.A.F. to be more vulnerable to air attack than Germany due: 1) to the numerical superiority in aircraft of Germany, 2) to the geographical area of Germany which provided more opportunity for dispersal. It was thought to be doubtful that a British counter-offensive would have much effect on the scale of attack on Britain for a considerable period of

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<sup>1</sup>Appreciation on Distribution of Attack, Cat. C.S. 1053, Great Britain, Ministry of Defence, Air Historical Branch. This paper later appeared almost unchanged on April 3, 1939, as an Air Staff report entitled "Possible German Courses of Action in the Event of Air Attack and Possible Distribution of Attack", Ibid.

time.

Instead of the two-thirds figure used previously, Plans now assumed that Germany might employ four-fifths of its force in the attack on the United Kingdom. In April 1939 this would amount to some 650 aircraft and 700 tons of bombs during the first week or fortnight. The estimate for April 1940 was 800 aircraft a day delivering 950 tons of high explosive on target. The bomb-lifts for the two dates were thought to be about 1,600 tons and 2,100 tons respectively. Estimates of the percentage of bombers which would get through were made on the same basis as in the January 1937 appreciation.

It was noted in the Air Staff paper that the weight of attack as a whole which must be anticipated was so great that, even if unlimited money and resources had been available, it would have been impossible to prevent heavy casualties and destruction of property; all that could be done was to take whatever steps financial and other considerations might permit, on the one hand to inflict as much damage as possible on the attackers and on the other to minimize the effects of air attack upon the morale of the people and the working of essential services.

The paper went on to evaluate the choices open to Germany. It was thought that the enemy might employ her striking forces initially against British air bases and possibly also the aircraft industry with the preliminary

object of crippling the British air effort. This was a course which the Air Staff was preparing to meet and, as their plans matured, they believed such a course would be difficult for Germany to achieve in a short time; preparations, however, would not be in an advanced stage until 1940. They believed that Germany would probably be more likely to employ her striking force in the main against objectives other than British air forces from the outset.

It was considered that the other courses open to Germany were: 1) to deliver unrestricted and sustained attacks on the civil population in the large towns of Great Britain with the object of demoralizing the people and forcing the Government to discontinue the war, or 2) to employ her air forces (in collaboration with her naval forces) in unrestricted attack on British seaborne supplies and against the internal distribution system so as to create a serious shortage of food and raw materials, or 3) to attack British armament factories so as to reduce British industrial capacity and cripple the war effort.

The Air Staff felt that air attack might take the form of an attempt to demoralize the will of the people upon which, particularly in a democracy, depended the ability of a Government to wage war. In this event the attack would be unrestricted in the widest sense of the word. No attempt would be made to confine the damage to



any specific area in which objectives of even a semi-military nature, such as centers of government and armament industries were concentrated. All the crowded centers of population might well be attacked in the hope that widespread damage could be caused to essential services such as power, water, light, sewage, and transport in addition to human casualties. They felt that an attempt would probably also be made to exploit the effect of gas and incendiary bombs.

The Air Staff hoped that Germany might be restrained by concern about the feelings of neutral countries or by a belief that air attack would make the British population defiant rather than submissive. They perceived, however, indications that the views of the German Air Staff were tending to turn in the direction of direct attack on civil population.<sup>1</sup> They felt such an attack might succeed and that the only answer to the problem of national security was to have the country adequately prepared so that it would be clear that any attack would fail and consequently look unprofitable. To reach such a level of preparedness would require major steps of rearmament.

If the objective of the German attack was not to be to break the morale of the population, it would most probably be either to starve Britain or to destroy the war industry. In the evaluation of the other possible courses

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<sup>1</sup>These were not specified.

of the German attack, the dislocation of war industry was discounted on the grounds that it would not produce the more rapid result. Attacks on the food supply and distribution facilities appeared to be more likely because it was felt that Germany would feel able to base estimates of the probable results of her bombing upon calculable data. This seemed to be the most obvious way in which an enemy could successfully deliver the "knock-out blow" to Britain. Owing to the proximity of the targets involved in such a form of attack to the major population centers, the raids would also have, as side effects, many of the merits of pure terror bombing.

German attacks on London were expected to be concentrated on the docks, the City, (the crowded business area), factories, railway termini and depots, Government offices, power stations, waterworks, oil storage, and important points in the General Post Office telephone and telegraph system.

It was expected that at the outset most attacks would occur by day. This was because daylight raids were better suited to precision bombing. Night attacks would be better suited for terror raids.

It was estimated that low bombing against an easily visible target might involve an average error of 50 to 100 yards. High level bombing was expected to be much less accurate but still with an average error of 200 to 300

yards.<sup>1</sup>

It was thought that at least seventy-five per cent of the bombs dropped on the United Kingdom would be high explosive, the remainder being incendiaries. The use of gas was believed possible but would probably only occur if Germany pursued from the outset a policy of indiscriminate bombing. If used, gas would probably be employed in conjunction with or after a high explosive attack to maximize its effectiveness.

The R.A.F. updated the 1933 air raid precautions appreciation. The degree of almost complete disorganization in London that had been anticipated by Sir Charles Hepwood's Committee in 1933 was now expected to be achieved in little more than twelve hours of bombing.<sup>2</sup> This rate of attack could be sustained by the Luftwaffe for several weeks during which casualties might run at the level of 30,000 a day.

The Air Staff concluded their updating of the Air Raid Precautions appreciation by noting that within a week attacks of this sort might cause very heavy casualties and force the partial evacuation of half a dozen of the centers of densest population in the United Kingdom, compelling many millions of people to abandon their homes. Telephone

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<sup>1</sup>In the 1939 report this latter figure was raised to between 600 and 900 yards.

<sup>2</sup>See Ch. II on the Air Raid Precautions Paper.

and telegraph communications throughout the country would be seriously disorganized, and railway, postal and electrical services and the distribution of food would be dislocated in varying degrees. Great fortitude on the part of the people would be essential if a degree of order was to be maintained, and loyal support would have to be given to the Government.

During the second week of war Britain should expect no noticeable diminution in the scale of attack. This second week might be a crucial period for national morale; the first exodus from London and other big cities would have taken place and it would then be clear whether or not reorganization could begin to deal effectively with the problems of feeding and administering the scattered population. It is curious that since an exodus was imagined, it was not expected that casualties from bombing would decrease. If at the end of two or three weeks demoralization had not set in, it seemed improbable that further attacks upon centers of population as such would bring success to Germany.

The Air Staff considered that bombing in the Spanish Civil War was relevant for its own planning relating to German bombing of Britain. During the three days of indiscriminate bombing of Barcelona it was thought that the morale of the population had been near to the breaking

point.<sup>1</sup> The forty-four tons that had been dropped during the period of indiscriminate bombing (March 1938) resulted in 600 dead and 700 injured who required hospital treatment and produced a casualty per ton ratio of 32.5 This was of course a minor scale of attack relative to what the R.A.F. was anticipating for Britain.

It was estimated that during all the attacks on Barcelona 728 tons were dropped, resulting in 2,500 fatalities and over 3,000 injured persons being treated in hospitals. Over 1,200 buildings were destroyed, over 6,000 more were damaged, 20 ships were sunk in the harbour and 40 more damaged; all the mechanical facilities and fuel storage facilities in the harbour were completely destroyed.

Nearly all the bombing had been from high altitudes (approximately 13,000 feet) and it appeared from such photographs as had been inspected in relation to known targets that the mean error of the indifferent Italian bombing was of the order of 300 yards. Many of the attacks were made in moonlight, and of the remainder the majority were made in the morning from the direction of the sun.

While both offensive and defensive action were on a relatively small scale compared to what would be involved in a German attack on England, it was thought the relationship between the two, offence and defence, had not

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<sup>1</sup>This seems doubtful. N. de P. MacRoberts, A.R.P. Lessons from Barcelona (London: Eyre and Spottiswoode, 1938), pp. 5, 90 et passim.

been wholly disproportionate to what was expected in German bombing of Britain. The Air Staff noted that as air defence capabilities improved, bombing would necessarily become more indiscriminate.

In their conclusions to the report on which the Newall memorandum was based, the Air Staff considered that the advantages and disadvantages of the two methods by which Germany might attempt the "knock-out blow" - demoralization and attack on food supplies - were so evenly balanced that it was difficult to predict which of them Germany would be more likely to adopt. The enemy might also open the war with a surprise attack against British air bases lasting a day or two so as to reduce the scale of Britain's offensive and defensive capabilities before turning to the principal objective. It was felt that passive defence and a counter-offensive were the two best means of preventing the "knock-out blow" from succeeding. Unless Britain could deliver a sizeable counter-offensive, security could not be achieved and nothing would stop the German offensive.

#### The Attack on the Docks

The Air Staff paper upon which the Newall memorandum was based examined the consequences of attacks on the docks

in some detail.<sup>1</sup> A scale of attack of 600 tons in twenty-four hours was assumed. The calculation was made only for the King George V and Victoria and Albert docks. The area of these docks was roughly one-third that of the entire dockyard area controlled by the Port of London Authority. It was assumed that the attack would be evenly distributed and thus that one-third of the total tonnage or 200 tons would be dropped on these docks. The estimated results of this attack were then assumed to be representative of an attack on all of the docks controlled by the Port of London Authority.

The total area is roughly 1,500 yards by 5,000 yards. It was considered improbable that, during bombing from moderate heights or in clear weather, any bomb aimed at a point towards the center of this rectangle of the dock area would fall outside so large an area. Since it was possible that the defence might force the attackers to fly very high and that bombing accuracy would be hindered by low clouds or poor visibility, the weight of attack was reduced by one-third to 133 tons.

It was assumed that all daylight raids would find their targets and although at night some raids might fail to find them, other raids not intended for these docks might

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<sup>1</sup>"Estimate of Effect of Air Attack on Docks", Appendix to "Probable Courses of Action of German Air Force in the Event of Air Attack Upon the United Kingdom, and Possible Distribution of Attack", Ibid.

hit them. It was further assumed that the raids would be about equally divided between day and night and that 25 per cent of the night raids would fail to find the target. Thus the weight of bombs falling within the target area was further reduced to 116 tons.

Since it was clear to the R.A.F. that incendiaries would be very effective against warehouses, it was assumed that they would be so used. Little would be gained by using toxic gas as well. Thus it was assumed that the attacker would use 75 per cent high explosive, 20 per cent incendiary, and 5 per cent gas bombs. The bombs falling within the King George V and Victoria and Albert Docks area were assumed to be:-

High explosive	87 tons
Incendiary	23 "
Gas	6 "
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Total	116 tons
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It was not thought that many very heavy high explosive bombs would be used. It was concluded that a fair impression of possible damage would probably be obtained by assuming that about 60 per cent of the total weight of high explosive bombs would be 550 pounds and about 40 per cent 110 pound bombs. The 87 tons of high explosives were thus divided into approximately 200 of the 550 pound bombs and 800 of the 110 pound bombs.

In estimating the effects of such an attack the



R.A.F. decided that no more useful basis for the distribution of the fall of the bombs could be taken than what they conceived to be a mathematical one, based on the estimate that the density of fall would be twice as great within a central rectangle, 900 yards by 4,900 yards, as in the remainder of the area. On this basis, in the inner rectangle one 550 pound and four 110 pound bombs would fall on an average in every 31,650 square yards (a square with sides of 178 yards), and in the outer rectangle one 550 pound and four 110 pound bombs would fall on an average in every 63,300 square yards (a square with sides of 250 yards).

German incendiary bombs weighed 2.2 pounds and 66 pounds, but the smaller size was considered likely to be more frequently used by the attacker. Assuming an average weight of 5 pounds, the 50 tons would represent 10,300 bombs, and thus on an average one incendiary bomb might drop in every 800 square yards of the dock area. The same calculation was used with gas bombs and indicated an average figure of one bomb in every 30,500 square yards (a square with sides of 175 yards).

Calculations were then made based upon the average density of the fall of bombs and upon the area presented by various targets in the central area of the docks. The calculations were all expressed in terms of probabilities. On a warehouse that was 80 feet by 500 feet, the odds were

one in two for a hit by a 110 pound bomb and one in eight for a hit by a 550 pound bomb. It was probable that a break would occur in every 1,000 yards of railway track.

For large dry docks, it was assumed that the odds were even on a hit by 110 pound bombs and 7 to 2 against a hit by a 550 pound bomb. Hits, however, would probably do little damage to the dry docks unless they damaged the caisson which was used to drain water from the dock. The odds were about 15 to 1 against a direct hit on any given caisson during the 24 hour attack which was being considered. The Air Staff also calculated the odds against direct hits on ships in the harbour in a similar manner.

The R.A.F. concluded that the electricity and telephone services would be out of action after the first twenty-four hours. They were particularly concerned about the damage which might be caused by fires started by incendiaries. Gas would be particularly devastating after an attack by high explosives and incendiaries and would hamper repair and reorganization.

In twenty-four hours of attack they concluded the entire London dock area under consideration could be rendered useless by the Germans. By compiling the total length of wharfage at all of the ports between the Tyne and Southampton, and making allowance for the fact that some of these ports were small targets and would be more difficult to hit, and also allowances since some attacks

would have to be made again on the London docks to prevent reorganization there, it was considered possible that only a further four or five days of air bombardment would be needed to damage all the ports in this area to the same extent as London was harmed in twenty-four hours.

The remaining ports in England could be put out of action in a further twelve to fourteen days, the relatively long time being to allow for greater inaccuracy on smaller ports and for the greater risks which the attackers would take in flying over more of Britain. The Air Staff concluded that in three weeks, if weather conditions were favourable, it would be possible to inflict damage at the level of that imagined for London docks on all the docks of Britain. The consequences of such an attack would be to completely prevent the importation of food and other vital products into Britain for an indefinite period.<sup>1</sup>

It was upon these calculations that the Newall memorandum indicating the vulnerability of the country to air attack was prepared. All indications pointed to the ease Germany would have in conducting a strategic air offensive. The Air Staff had thought in terms of a decisive attack fifteen years earlier when an enemy might drop 1,500 tons in a month. They now expected over twice that amount

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<sup>1</sup>Ibid. The information above comes from the Air Staff report which was the basis for the Newall memorandum.

in the first twenty-four hours and their expectation of the consequences went up in linear proportion.

### German Air Strategy

The Germans had lately been developing rather different ideas about the use of air power. In the early days of the Luftwaffe German air doctrine was somewhat similar to the British. In 1933 Colonel Wimmer, then Chief of the Technical Office, was successful in his efforts to persuade Colonel Wever, the Chief of the Miscellaneous Branch of the Reichs Air Ministry, of the need to develop a heavy bomber. He pointed out that three years of research and development would be necessary before any testing could take place and that because of the long lead time to production it would be necessary to begin work immediately.<sup>1</sup>

Wever was convinced and work immediately began on the "Uralbomber", as it was known, the name being a clear indication of its intended range.<sup>2</sup> By 1936 both

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<sup>1</sup>General der Flieger a. D. Wilhelm Wimmer, Kurze Angabe ueber die Geschichte des 4-motorigen Bombers (Brief Notes Concerning the History of the Four-Engined Bomber), April 26, 1956, Karlsruhe Document Collection quoted in Richard Suckewirth, Historical Turning Points in the German Air Force War Effort, U.S.A.F. Historical Studies: No. 189, U.S.A.F. Historical Division, Research Studies Institute, Air University, p. 41.

<sup>2</sup>General der Flieger a. D. Paul Deichman, Warum verfuegte Deutschland im Zwierten Weltkrieg ueber keinen brauchbaren viermotorigen Bomber? (Why did Germany have no Adequate Four-Engined Bomber at her Disposal during World War II?) Karlsruhe Document Collection, Ibid.

Junkers and Dornier had developed prototypes, the JU-89 and the DO-19 respectively. According to General Deichman who was at the time Chief of the Operations Branch of the Luftwaffe General Staff both models appeared to merit further development, although they had relatively weak engines.<sup>1</sup> Field-Marshal Milch concurred with Deichman's appraisal.<sup>2</sup>

The Dornier 19 had a speed of 199 m.p.h. and a range of 990 miles. The Junker JU-89 had almost identical performance except that it had a top speed of 242 m.p.h. if required. One or both could have formed the basis of a strategic bomber force second to none. Had Germany proceeded quickly with the development of these bombers it is doubtful if Britain would have had time to catch up.

On June 3, 1936, Major-General Wever, then Chief of the German Air Staff, was killed in an air crash. Hermann Goering ordered all development on the four-engined bomber to stop. According to Field Marshal Milch's testimony at Nuremberg, this was at the instigation of General Albert Kesselring who had succeeded Wever.<sup>3</sup> Deichmann has emphasized Milch's role in the decision. Udet, who became General Wimmer's successor as Chief of the Technical Office

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<sup>1</sup>Ibid.

<sup>2</sup>Ibid., see p. 41 - A letter to General Deichman, Feb. 21, 1954.

<sup>3</sup>I.M.T. (International Military Tribune), Vol. IX, p. 72.

on June 10, 1936, is also known to have been opposed to the four-engined bomber. Although Wever had been transferred from the Army, it would appear that Kesselring's background as a senior officer in that service influenced his judgment in favour of the Luftwaffe playing a tactical rather than a strategic role.

Development of the four-engined bomber was consequently dropped in the Spring of 1937 and it was a long time before steps were taken to resume the development. The British were apparently not aware of this development and proceeded on the grounds that the Germans would use their air power for strategic bombing.

After 1937 no one in Germany saw a requirement for a long-range bomber and Wever was no longer present to argue about its effectiveness. When research began again on the development of a four-engine bomber, the Luftwaffe introduced the stipulation that the bomber must also be suitable for dive bombing; this combination proved to be impossible and consequently development of a long-range bomber was further delayed.<sup>1</sup>

The German concept of air warfare called for maximum precision in hitting a militarily significant target - normally a relatively small area - with a minimum of danger

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<sup>1</sup>See also Derek Wood and Derek Dempster, The Narrow Margin (London: Hutchinson, 1961), pp. 44-45; Roger Manvell and Heinrich Fraenkel, Hermann Goering (London: Heinemann, 1962), p. 215; and Telford Taylor, The March of Conquest (New York: Simon and Shuster, 1958), p. 24.

to the surrounding countryside. Hitler and the German Air Force were eager to avoid the bombing of civilian populations for they saw no advantage for Germany in adopting such a strategy.<sup>1</sup> In the tactical requirements summary issued by the German General Staff in the spring of 1938, it was stated that "the emphasis in offensive bombardment has clearly shifted from area to pinpoint bombardment."<sup>2</sup> Apparently the British Air Staff did not know about the change in favour of precision bombing which took place after Wever's death.

The Luftwaffe leaders clung to the tactical use of air power involving dive-bombers as tenaciously as the R.A.F. clung to strategic bombing. So far as the Germans were concerned, horizontal bombardment was completely out of the question. The dive-bomber might almost have been termed the idol of the Luftwaffe General Staff.

Because of the requirement to incorporate a diving capability into the long-range bomber, Heinkel engineers used two engines combined tandem fashion to drive one propeller instead of the more stable design of four independently functioning engines. This resulted in a series of accidents and delayed production until it was finally decided to return to the original four engine

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<sup>1</sup>Suckenwirth, p. 29.

<sup>2</sup>Quoted in Ibid., p. 31.

design.<sup>1</sup> It shows the great reluctance of the Germans before World War II to develop planes only suitable for strategic bombing; this is not really surprising when they saw no requirements for such aircraft.

The lectures given in the Luftwaffe Staff College at Satow emphasized that the air force would not have an independent role. It was intended that it should operate in tactical support of the land and naval forces. At certain times it might be expected to conduct strategic warfare of its own in defence of German cities and industries or in the attack on enemy industry, shipping and communications, but any strategic bombing would be directed at a specific target and last for only a short period. Any attack on an enemy air force or his industrial cities was intended to be the immediate prelude to an army operation.<sup>2</sup> This doctrine was followed in the aggression against Poland and Rotterdam. The Germans were not reluctant to engage in quite indiscriminate bombing when this hastened surrender of a city such as Warsaw or Rotterdam.<sup>3</sup>

Before the war the British failed to realize that

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<sup>1</sup>Ibid., p. 38.

<sup>2</sup>The Rise and Fall of the German Air Force: 1933 to 1945, Great Britain, Ministry of Defence, Air Historical Branch, 1948, p. 42.

<sup>3</sup>Sir James R. M. Butler, Grand Strategy, Vol. II History of the Second World War, United Kingdom Military Series, ed. Sir James Butler (London: Her Majesty's Stationery Office, 1957), pp. 569-70.



Germany, in the words of Sir Arthur Harris, had

no strategic bombers at all since their whole force of well over a thousand bombers was designed for army cooperation work. . . Even in day-time it was fitted only to carry out the work of a tactical air force, not strategic attack; the bombers were too small, and they were not equipped for weight carrying. . . Not only did they have no strategic bombers, they had no plan of strategic attack on industries and communications.<sup>1</sup>

In short, they had a completely different approach to air war than the British.<sup>2</sup>

Although General Wever died in 1936 his views on strategic bombing are sometimes thought to have dominated the Luftwaffe. His doctrine of air power is, however, often misunderstood. In one of General Wever's talks given at the opening of the Air Warfare Academy and Aero-Technical Academy at Berlin-Satow he specified the tasks of the air force as being directed at the enemy's military establishment including armaments factories as well as interdiction in close support of the ground troops. Nowhere did he mention

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<sup>1</sup>Marshal of the R.A.F. Sir Arthur Harris, Bomber Offensive (New York: MacMillan & Co., 1959), p. 86.

<sup>2</sup>For further evidence see General of the German Air Force Werner Kriepe in The Fatal Decisions (London: Michael Joseph, 1956), pp. 11, 13 and 22; Hans Herlin, Udet: A Man's Life (London: MacDonald, 1960); Herman Hauptman, The Rise and Fall of the Luftwaffe (London: John Long Ltd., n.d.), p. 81; C. G. Grey, The Luftwaffe (London: Faber and Faber, 1944); and W/Cdr. Asher Lee, The German Air Force (London: Duckworth, 1946), pp. 8 and 96.

terrorizing the population or any form of attack on morale.<sup>1</sup>

The German Air Force did not believe that a strategic air offensive independent of the Wehrmacht was the way in which they would defeat their enemies. According to a war-time study of the German Air Historical Branch:

Although no doubt existed that the economic life of a country could be disrupted by the carrying out of ruthless air attacks in great strength, no indications were available between the wars as to what course such strategic air warfare would take.

In this respect, Germany was in a very unfavourable position. With the development of air power, the natural protection afforded to Germany by the North and Baltic Seas in the North, and the Alps in the South, lost much of its former significance.<sup>2</sup>

This is an interesting analysis, for the British had a mirror-image that they were in the particularly unfavourable situation because of the development of air power. The Germans believed that their economy was particularly vulnerable to air attack; the British had similar fears with respect to their economy. Germany felt that it would have more to lose than its enemies if strategic bombing began and this was the basis for Hitler's appeals, for example that of March 31, 1936; for the

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<sup>1</sup>Eugene Emme, Impact of Air Power (Princeton: Van Nostrand, 1959), pp. 182-85.

<sup>2</sup>The Course of the Air War Over Central and Western Europe 1939/41, A study prepared by the German Air Historical Branch (8th Abteilung), and translated by the Air Ministry, London, A.H.B.6, November 21, 1946, No. VII/10.

"humane conduct" of air warfare.<sup>1</sup>

In the Top Secret memorandum prepared by Hitler and General Keitel on Operation "Green" (against Czechoslovakia) on April 22, 1938, the role of the Luftwaffe was clearly spelled out. "The Luftwaffe is to support the individual columns (for instance, dive-bombers) sealing off fortification works at the points of penetration, hindering the movement of reserves, destruction of signal communications and thus isolating garrisons."<sup>2</sup> Air power was clearly to be used for interdiction and not to demoralize the population and disrupt production. This was not due to a particular form of humanity or "morality" on the part of the Germans, far from it; they would be willing to do what was required to win the war. They did not, however, think that strategic bombing was the way to go about seeking victory in war. The Luftwaffe was not more ethical than the R.A.F.; they simply had opposite ideas of the best air strategy.

#### The Calculations

In the Newall memorandum it was assumed that there

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<sup>1</sup>Ibid., see also The Course of the Air War Against England, German Air Historical Branch (8th Abteilung) trans. by the Air Ministry, London, A.H.B.6, May 20, 1947, No. VII/26.

<sup>2</sup>Documents on German Foreign Policy 1918-1945, Series D, 1937-1945, Washington: U.S. Department of State, II, p. 133.

might be a low level bombing error of 50 to 100 yards and a high level error of 200 or 300 yards. This was an extremely optimistic view of what could be achieved in war-time given the equipment and crew proficiency then available. It was in large measure this miscalculation of navigation and bombing accuracy which led to the fantastic scenes of destruction that were imagined by the Air Staff.

In their important calculation of the effects of an attack upon the London docks, it was assumed probable that no bomb aimed at the center of the King George V and the Victoria and Albert docks would fall outside the area of these docks. If the defence forced the attackers to fly high, it was thought that one-third of the tonnage might miss the target area. Furthermore, it was assumed that all daylight raiders and 75 per cent at night would find the target. These figures exaggerated greatly the possible effectiveness of the German bombers. When the results of bombing during World War II are examined, it will be seen that most of the aircraft were not bombing within five miles of their targets, let alone with errors of a few hundred yards.

One of the most important mistakes was that of the assumed distribution of the falling bombs. The R.A.F. estimated that the density of fall would be twice as great within a central rectangle 900 yards by 4,900 yards.

as in the remainder of the target area. It was then assumed that the density would be constant within each of the rectangles. This led to a figure of how many bombs would fall "on an average," in a given number of square yards. The mathematical basis for such an assumption is very dubious; more careful calculation might have indicated that the results produced by an attack would not materialize in this manner. This estimate of bomb distribution acted to greatly exaggerate the effects of bombing.

There was also a considerable overestimation of the effects of the explosion of an H.E. bomb. Tonnages required to destroy a building were considerably more than those assumed before the war.

Part of the reason that the Government was so concerned about air attack was because of the expected "moral effect." Although the calculations for the Newall memorandum indicated that Britain could be starved from the air, one of the major worries was that the non-material effects of bombing might lead to defeat.

In the summer of 1938 a number of eminent psychiatrists under Government supervision formed a committee to consider the problem of mental health in time of war and particularly in an environment involving air bombardment. They believed that psychiatric casualties might exceed physical casualties by a ratio of 3 to 1. On the basis of the Air Staff estimates, their pessimistic conclusion was

this would mean it was necessary to be prepared for some three to four million cases of acute panic, hysteria, and neurotic conditions during the first six months of air attack.

After the Spanish Civil War results had been analyzed, the R.A.F. believed that they had a test which confirmed their estimates of casualties that would accrue as a result of air attack. The Air Raid Precautions Department raised the expected ratio of casualties per ton of high explosives to 72. This would mean over a quarter of a million casualties in twenty-four hours.

Some people still refused to believe in the air menace. Lord Kenilworth, President of the Society of Motor Manufacturers and Traders, spoke out, saying he "did not know how anybody could expect the country to settle down to normal occupations when people's minds were so distracted by foolish talk."<sup>1</sup> This was a view representative of a very small minority for most believed that Britain could be defeated in a very short period after the commencement of air attacks. The prospects for survival looked dimmer after each new set of calculations, the shortcomings of which were not realized at the time.

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<sup>1</sup>The Times, (London), July 9, 1938.

### The Prospects for Radar

The distant horizon showed a glimmer of light; it appeared that a revolutionary development in the detection of aircraft might change the dominance of bombers over fighters which had existed since the start of air warfare.

After a series of exercises were held from July 20 to 23, 1938, the first full-scale Home Defence Exercise in several years was held from August 5 to 7.<sup>1</sup> The Air Ministry stated: "The main objects of the Exercise were to train the air and ground defences of Great Britain against air attack. The Exercise had no political significance and the area of operations was chosen for economy and convenience."<sup>2</sup> The area, nevertheless, was exactly that from which a German attack would probably come, that is from Hull south to the Thames estuary. The number of aircraft involved was 925, more than double that of any other year and almost all of the aircraft were of the latest type. There was conspicuously less information given out about the results than in previous years.

The entire radar chain, which had never before seen more than six aircraft at any one time, was given a real work out. In 1937 the Bawdsey Research Station alone had tried to locate a large R.A.F. raid but it was nothing like the scale of the 1938 exercises. To some extent

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<sup>1</sup>The Aeroplane, July 27, 1938.

<sup>2</sup>Ibid., August, 10, 1938, p. 1167.

realism was sacrificed by not permitting bombers to fly lower than 4,000 feet within seven miles of the Tower Bridge but the general conclusion drawn from the Exercise was that the new fighters and the radar chain appeared to be very promising developments for the future but that their operational utility at that particular moment was rather low.

Slessor, the Deputy Director of Plans, sent out a number of questionnaires about the expected impact of the Hurricanes and Spitfires when they came into service. He believed that the bomber would continue to be dominant because of its increased speed but the Commander-in-Chief of Fighter Command, Sir Hugh Dowding, and the Assistant Chief of the Air Staff, Sholto Douglas, took a different view. Wrote Dowding:

I do not agree that the value of the fighter in home defence is, if anything, declining. I think that within the last few months, what with the advent of the 8-gun fighter, R.D.F., and the Biggin Hill Interception scheme, the pendulum has swung the other way and that at the moment - or at any rate as soon as all our Fighter Squadrons are equipped with Hurricanes and Spitfires - the fighter is on top of the contemporary enemy bombers.<sup>1</sup> How long this will be the case it is of course difficult to say, but that is my view at the moment.<sup>2</sup>

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<sup>1</sup>R.D.F. was the early notation for radar.

<sup>2</sup>Min. Slessor to Douglas, March 11, 1938 and Min. Douglas to Slessor, March 23, 1938, enclosing answers to questionnaires quoted in Webster and Frankland, Vol. I, p. 102.



There had been a search in Britain for a better means of detecting and locating distant aircraft since the end of World War I. The first efforts were made in trying to improve sound-locators and acoustic mirrors but the results of these experiments were not promising. In view of the decreasing time that intercepting aircraft would have to complete their missions the prospects for a successful air defence looked rather dim. In 1935 an investigation was conducted of possible ways of damaging the mechanism or detonating the bombs of incoming aircraft, but such a scheme looked unlikely to succeed. Mr. R. A. Watson-Watt of the National Physical Laboratory reported that the goal of damaging approaching aircraft, or harming their occupation by means of electro-magnetic radiations was impossible of achievement. He added that he thought certain research he was undertaking in connection with the reflection of radio waves from an ionized layer about sixty-five miles from the earth might lead to a better means of detecting aircraft.

Watson-Watt gave a practical demonstration to Air Marshal Sir Hugh Dowding who recommended that a sum be given for further research. Immediate results in the summer of 1935 were extremely promising as detections were possible at forty miles. Sanction was obtained for the construction of five detecting stations north and south of the Thames estuary, intended as the first installment of a chain of

about twenty stations covering the coast from the Tyne to Southampton. Erections of the masts took longer than expected and other difficulties were encountered and thus an ambitious program of exercises planned for the fall of 1936 had to be postponed. The Air Ministry decided that if work did not begin on the remaining fifteen stations until the first five were completed, the whole system would not be ready before the spring of 1940 which would be too late, and consequently they decided to proceed with the whole system, now to cover the coast from a point north of St. Andrews to St. Catherine's Point. The range of the equipment was gradually being increased but a weakness remained in detecting aircraft at altitudes beneath 3,000 feet.

There was no disagreement in the summer and fall of 1938 that although radar promised a great deal in the way of a revolution in the relative position of the bomber and the fighter, the fruits of this promise were still some way off. Quite apart from the inadequacy of the radar chain at the time, the fighter build-up was in the very early stages of infancy. Thus although the Air Staff was hopeful about the future, providing of course that they received the equipment which they wanted, their appreciation of the present situation was a very pessimistic one.

There were other respected men who, apparently without any knowledge of radar, were also giving serious thought

to the possibility of air defence. For a very long time exclusive thought had gone into offensive problems and now, almost for the first time in Britain, defence received its share.

Lieutenant-General N. N. Golovine in a series of articles first published in the Royal Air Force Quarterly in 1937 and 1938 and then collected together in a book entitled Views on Air Defence sought to dispute the popular notion that a successful air defence was impossible.<sup>1</sup> He used an argument which involved calculations indicating the amount of time and number of miles required to overtake an incoming bomber given a variety of different assumptions. He concluded that with the British fighters and German bombers available at the time there would be adequate time for interception. No effort was made to estimate the number of incoming planes that could be shot down; the author was contented to make his case that bombers could be intercepted. He felt that adequate protection could only come from a combination of fighters and anti-aircraft guns. He did not make any claim that Britain at its existing level of preparedness could conduct a successful air defence for his thoughts were rather more on future feasibility as were those thinking of radar.

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<sup>1</sup>See also his Air Strategy (London: Gale and Polden, Ltd., 1936).

Although the future looked brighter the current situation in the fall of 1938 was extremely disturbing. The Air Staff believed the chances of successfully defending against the "knock-out blow" were very low and there was no deterrent because Bomber Command did not have the forces to mount any meaningful form of counter-offensive. They counselled that Britain must not become involved in a war until the current imbalance had been remedied. While the Newall memorandum is the best known source of this advice, it was included in many Air Staff papers.

In September 1938 the Air Staff produced a new report entitled "The Possible Weight of German Air Attack on Great Britain at the Present Time."<sup>1</sup> It differed little from the paper which formed the basis for the Newall memorandum. Although the Air Staff thought it to be an improbable situation, they estimated that if all German long-range bombers were directed against Great Britain, the maximum number of sorties which Germany would be able to dispatch would be 720 a day. This would represent a scale of attack of 940 tons. The average number of sorties over the first two months of war might be between 400 and 500, representing a daily weight of attack amounting to as much as between 500 and 600 tons. This would mean between 1,500,000 and 1,800,000 casualties during this period. At the end of the

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<sup>1</sup>September 12, 1938, D.H.O. September 1938 to March 1939 Emergencies, Cat. II H/157, Great Britain, Ministry of Defence, Air Historical Branch.

second month the attack might fall to about 70 per cent of the level of the first two months or approximately 350 tons but it would probably not drop below sixty per cent at any time. Therefore in six months, using these estimates, 3,600,000 casualties should be expected. When this is added to the expected number of three to four million psychiatric casualties, perhaps as much as one quarter of the population of England would be casualties of some sort requiring hospital or other major treatment.

The international situation appeared to be getting steadily worse in view of Germany's take-over of Austria and the subsequent problems created by the German minority of Poland. The British Government could only weigh choices of foreign policy in the light of the expected consequences of a German attack. This did not encourage them to take any action which involved a risk of war.

## CHAPTER V

### THE MUNICH CRISIS

#### The British People and Air Attack

The British people were becoming increasingly aware of the dangers of air attack in 1937 and 1938 because of the growing number of publicly available books on the subject. These were often written by men with high military or scientific reputations. At a time when the foreign situation appeared to be increasingly grave, the British people widely believed that if there was war, as they were told there surely would be if Hitler's demands were opposed, German planes would begin bombing London without warning and with devastating results.

The fear of the "knock-out blow" was present in a wide section of the population and was not only restricted to the Air Ministry. The conclusions that were drawn from the images of British vulnerability to air attack seemed inescapable. Since any war involving Britain's standing against Hitler would result in the "knock-out blow", there should be no war unless the alternative appeared even worse than the certain destruction which would follow bombing. In view of the dire predictions of the consequences

of bombing such an alternative would have to appear catastrophic.

The authors, while themselves a varied group, usually came to this same conclusion. Air Commodore Lionel E. O. Charlton is a good example. He served in the Boer War and in World War I and in 1919 was appointed Air Attaché in Washington where he remained until 1922. Subsequently he was Chief Staff Officer of the Iraq Command in 1923 and 1924 and resigned from the R.A.F. in 1928 in opposition to R.A.F. bombing of the rebels. In 1936 Charlton wrote War Over England in which he emphasized the extreme danger of air bombardment by presenting an illustration of how a war might start.<sup>1</sup> The story began with the annual air show at Hendon which was taking place after things seemed back to normal following an unspecified crisis on the Continent. The crowd numbered in the hundreds of thousands and many high Government, military, and business officials were present. All present were waiting for the initial fly-past when the roar of planes was heard from the northeast. The crowd cheered and looked up expectantly; in a flash the aircraft swept low as they machine-gunned and bombed the crowd. The Luftwaffe had executed the perfect surprise attack.

The R.A.F. was caught on the ground and destroyed;

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<sup>1</sup>Air Commodore L. E. O. Charlton, War Over England (London; New York: Longmans, Green and Co., 1936).

incendiaries and gas were used to inflict casualties which in this one raid numbered well over 150,000. This number was almost exactly that expected by the Air Staff in the first twenty-four hours of war. Virtually all of the senior military personnel of the country were killed in the first few minutes of war. The result of this and subsequent attacks was that Britain was completely paralyzed, civil order destroyed, and the Government unable to function.

It is impossible to judge the influence of any one book like this. While it was sensationalist, it paralleled in the public sphere the official views of the Air Staff about the danger of air attack. Charlton's appraisal of the effects of air attack did not greatly exaggerate the conclusions reached in the Air Ministry.

The use of imaginative essays such as Charlton's was quite common. In a book of some 800 pages edited by Sir John Hammerton entitled War in the Air and published in 1935, Boyd Cable wrote an article entitled "Death From the Skies." He explicitly relied on the H. G. Wells film, "Things to Come" and concluded that there was little hope of survival after air attack.<sup>1</sup>

Many of the authors were, like Charlton, retired military officers. General Groves who, as has been noted

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<sup>1</sup>Sir John Hammerton, War in the Air (London: The Amalgamated Press, 1935).



before, was Director of Flying Operations during the Great War and a British military delegate at Versailles, was very pessimistic about the possibility of air defence. He felt that the only way Britain could avoid a "knock-out blow" was to have a large bomber force capable of executing a successful counter-offensive. Failing this Groves wrote that England was liable to be knocked-out from the air during the early stages of the war.<sup>1</sup>

Groves, like many of the authors, was arguing for more money for the R.A.F. At the heart was the "bomber vs. battleship" controversy which centered on the competing demands of the R.A.F. and the Navy. Air Force officers generally made two points in stating their case. First, if the R.A.F. was given more money it would be able to defeat an enemy virtually single-handed. Second, if the R.A.F. was not given more money, Britain could be destroyed by enemy air attack. Therefore in addition to saying "we can do it better than the Navy," in effect they said "if you don't give us what we want the country is doomed and there is nothing that can save us." In their arguments to persuade the Government to give them more money they repeatedly indicated the extreme vulnerability of Britain to German air attack.

Another author was Heinz Liepmann, a well-known scientist of the day, who particularly despaired of the

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<sup>1</sup>Groves, Our Future in the Air, p. 72.

consequences of gas and bacteriological warfare.<sup>1</sup> Major-General J. F. C. Fuller represented the general consensus when he wrote that in a future war "we may expect complete industrial paralysis" and that air bombardment would be the decisive factor in a future war.<sup>2</sup> Watson O'Dell Pierce wrote that if war was not avoided, the possibility must be faced that civilization will be destroyed.<sup>3</sup>

Frank Morison, another journalist, asserted that London must, of necessity, "become the primary battlefield within a few hours of the outbreak of hostilities."<sup>4</sup> If a formation was sighted at Beachy Head, travelling at 250 m.p.h., it would be over the center of London 13 minutes later. Even a warning from Calais or Boulogne would allow only 20 minutes which would be insufficient to get fighters into the air. Morison concluded that "no target deliberately selected by the enemy could have more than a brief tenure of existence."<sup>5</sup>

Morison was virtually certain that incendiaries would be used with great effectiveness in any future war. He believed that the system of zone bombing would permit

<sup>1</sup>Heinz Liepmann, Death From the Skies.

<sup>2</sup>Major-General J. F. C. Fuller, Towards Armageddon (London: Lovat, Dickson Ltd., 1937), p. 167.

<sup>3</sup>Watson O'Dell Pierce, Air War (London: Watts and Co., 1937).

<sup>4</sup>Frank Morison, War on Great Cities, p. 191.

<sup>5</sup>Ibid.

tremendous concentrations which could well start a conflagration that would spread unstopped. He felt it possible that localized use might be made of chlorine, phosgene, or tear gas which would greatly complicate fire fighting. He described a most frightening situation of a mixed attack using high explosives, incendiaries, and gas and concluded that because few Londoners would have protection against gas, moving them through streets congested with fire-fighting equipment and falling buildings would be a super-human task. Enemy bombing would be so accurate that a zone could be blocked off with demolished buildings and then the center could be razed and the population poisoned.

Morison expected 5,000 pound bombs to be available,<sup>1</sup> and on the basis of some other rather dubious assumptions and calculations, he reached the conclusion that one cannot

logically avoid the conclusion. . . The total distance from the corner of Budge Street, Westminster, to Trafalgar Square is less than half a mile! It follows that should one bomb fall in Parliament Square and another, say, on the Horse Guards Parade, there would, necessarily, be very little of Administrative London left standing.<sup>2</sup>

In 1938 the output of this type of writing reached its peak. J. M. Spaight, an acknowledged expert in matters of strategy, assured his readers, as if there might be a

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<sup>1</sup>Here he was clearly out of touch.

<sup>2</sup>Ibid., p. 194. He assessed the destructive zone of a 5,000 pound bomb at .5 of a mile.

question in their minds, that any war would involve strategic bombing. It is striking that the possibility of Germany not having any intention to conduct such attacks was not considered. Although cautioning that air action would not be the only factor, Spaight thought it would probably be decisive.<sup>1</sup>

One cannot help but wonder what sort of cooperation these authors received from members of the Air Staff anxious to persuade others of their point of view. Major-General H. Rowan Robinson anticipated an attack at the level of 600 tons per day, exactly the figure used by the Air Staff. He too believed that this might well prove to be decisive.<sup>2</sup>

J. B. S. Haldane, a leading scientist, wrote a book "intended for the ordinary citizen, the sort of man and woman who is going to be killed if Britain is again raided from the air."<sup>3</sup> His conclusions about casualties per ton to be expected in the next war are similar to those of the Air Staff.

Between January 1917 and November 1918 German aeroplanes dropped 71 tons of bombs on England. These killed 837 people and wounded 1,991. On March 16-19, 1938, 41 tons of bombs were dropped

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<sup>1</sup>J. M. Spaight, Air Power in the Next War (London: Geoffery Bles, 1938).

<sup>2</sup>Major-General H. Rowan Robinson, Imperial Defence (London: Frederick Meuller, 1938).

<sup>3</sup>J. B. S. Haldane, A.R.P. (London: Victor Gollancz, 1938), p. 40.

on Barcelona by German and Italian aeroplanes. They killed about 1,300 people. Thus the number killed per ton went up from 12 to 32. However, Barcelona was practically undefended, owing to the 'non-intervention' agreement. And it was crowded with refugees. Had it been defended the aim would have been worse and the casualties somewhat less. On the other hand there were bomb-proof shelters for about one-sixth of the population. We may take 20 deaths per ton as rather a low figure for modern aeroplanes. Thus 500 planes carrying two tons each could kill about 20,000 people.<sup>1</sup>

The highly respected Fuller wrote that after an air attack "London for several days will be one vast raving Bedlam, the hospitals will be stormed, traffic will cease, the homeless will shriek for help, the city will be in a pandemonium. What of the Government at Westminster? It will be swept away by an avalanche of terror."<sup>2</sup>

Writing in a Penguin Paperback published in early 1938 Charlton emphasized once again the danger of air attack on civilian populations. He believed that the attacks on Barcelona were child's play compared to what a future war between the great powers would be like. "The coming war, for so it must be called, will burst like a storm-cloud overhead, giving no opportunity for an acclimatizing process, and with no more warning than an avalanche."<sup>3</sup> Although he acknowledged that some German

<sup>1</sup>Ibid.

<sup>2</sup>Major-General J. F. C. Fuller, The Reformation of War (New York: Dutton, 1923).

<sup>3</sup>Air Commodore L. E. O. Charlton, G. T. Garrott, Lt. Commander R. Fletcher, M.P., The Air Defence of Britain (Harmondsworth: Penguin Books, Ltd., 1938), p. 32.

planes would be lost, he believed that Britain would be defeated before such losses were significant. He believed that London would be defeated "in a flash of time."<sup>1</sup> There was no question in his mind that a "knock-out blow" was feasible.

There was little opposition to this viewpoint.<sup>2</sup> It is striking that the literature had what could almost be called a "party line," the same line that was heard in the Air Ministry.

J. Thorburn Muirhead in his book Air Attack on Cities was equally pessimistic. He too believed in the feasibility of a "knock-out blow" being delivered against Britain. He was particularly concerned about the effects of chemical warfare, for he felt that this would be more severe than that caused by high explosives or incendiaries. Chlorine and phosgene were the most suitable agents for cloud gas attacks against civilian populations due to their ability to linger and descend to low places. The effect in small concentrations was to produce vomiting and in larger concentrations to act as a severe lung irritant. He felt, however, that "mustard gas is the most effective casualty producer in chemical warfare. . . . In contrast to chlorine which can easily be detected, mustard gas rapidly becomes

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<sup>1</sup>Ibid., p. 44.

<sup>2</sup>One of the exceptions was James Kendall, Breathe Freely (London: Appleton Century Company, 1938).

unnoticeable due to its fatiguing effect on the olfactory nerve."<sup>1</sup> He outlined its effect on the eyes and lungs and its ability to linger for a long period of time. Much of the book details protective measures against a gas attack in the same way that Morison detailed the best means of constructing bomb shelters.

There was no unanimity that gas would be a necessary part of the war. Another author, J. M. Spaight, rather doubted that gas would be used but felt strongly that Britain should be prepared for such a contingency. Though pessimistic about the damage of bombing, he was not so alarmist as Morison.

As a rule the authors were not very precise about how long it would take an enemy to succeed in his "knock-out blow." One of the exceptions was Sir Charles Burney who writing as early as 1929 thought that within a week or two it might be possible to destroy London and all the major towns of England.<sup>2</sup> None seemed to think that it would take more than a few weeks or at most months.

A number of the books on air attack were in the form of novels. Gas was usually thought to be of terrible potency, as in Halsbury<sup>3</sup> who should have known in view of

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<sup>1</sup>J. Thorburn Muirhead, Air Attack on Cities, p. 35.

<sup>2</sup>Sir Charles Dennestoren Burney, The World, the Air, and the Future, pp. 101 and esp. 149.

<sup>3</sup>Earl of Halsbury, 1944 (London: Thornton Butterworth, 1926).

his associations with chemical warfare in the Government. Occasionally gas was thought to be milder and used to make the people receptive to a new religion.<sup>1</sup> In The Gas War of 1940 by "Miles" there are fifteen million deaths in a week.<sup>2</sup> This book, however, was not to be taken seriously, being little more than imaginative science fiction, but still it must have had influence on its readers.

General Golovine, in a series of articles first published in The Royal Air Force Quarterly, sought to refute the claims that London could be easily gassed. He used the figure of 100 tons of gas per square mile as that necessary to kill. Since London was about seventy-five square miles he calculated that 7,500 tons of gas would be required for the entire city. At one and a half tons per bomber, this would mean 5,000 successful sorties. He estimated that 30 per cent of all aircraft taking off would fail to reach their target and consequently that 6,500 sorties would be required in a very short period, a capability he believed to be beyond that of any current air force.<sup>3</sup> Most of the writers did not trouble themselves to make such computations.

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<sup>1</sup>Rowland James, While England Slept (London: J. Balet Co., 1932).

<sup>2</sup>"Miles" (Stephen Southwold), The Gas War of 1940 (London: Eric Partridge, 1931).

<sup>3</sup>General N. N. Golovine, Air Strategy (London: Gale and Polden, 1936), p. 3.



Some pressed strongly for the build-up of passive defences because to most active defence appeared impossible. T. H. Wintringham was not alone in his belief that without an increase in passive defence measures, London could be devastated in a very short period of time.<sup>1</sup> The government issued a large number of pamphlets dealing with air raid precautions that civilians should take.

Only a few of the authors were critical of what they regarded to be an excessive fear of air attack. Their arguments tended to be phrased in general terms and no figures were produced to contradict those of the Air Staff or even those of Morison. These critics were not infrequently former naval officers who might be thought to have vested interests, for example Admiral Sir Reginald Custance and Admiral Sir Herbert Richmond.<sup>2</sup>

What conclusions for foreign policy were derived from these books describing the horror of air bombardment? Here there was wide agreement which may be summarized with a quotation from a book by Jonathan Griffin entitled Glass Houses and Modern War.<sup>3</sup> He emphasized that war must be

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<sup>1</sup>T. H. Wintringham, Air Raid Warning (London: The Worker's Bookshop, 1934), p. 5.

<sup>2</sup>Admiral Sir Reginald Neville Custance, A Study of War (London: Constable & Co., 1924), Admiral Sir Herbert William Richmond, National Policy and Naval Strength (London: Oxford University Press, 1923), and Sea Power in the Modern World (London: G. Bell & Sons, 1934).

<sup>3</sup>Jonathan Griffin, Glass Houses and Modern War (London: Chatto and Windus, 1938).

avoided at all costs, especially until Britain's defences were greatly strengthened and concluded that "those who live in glass houses should not throw - should not even brandish or collect - stones until they have converted the glass into Triplex."<sup>1</sup>

This was a natural conclusion to arrive at and is identical to that of the Air Staff. It is doubtful if these books had much direct influence on the Air Staff and the Government for they had their official figures and estimates to rely on. Judging from the reaction of the British people in September 1938, however, the impression that a German air attack might have disastrous consequences was quite widespread. These books naturally lead to their paramount concern about German air attack.

Many of the authors had been with the R.A.F. and others had the assistance of the Air Ministry in their research. In a very tangible way the Government and the military were responsible for the state of mind of the British people during 1938 when the paramount fear was the threat of the "knock-out blow!" There was a striking agreement between R.A.F. thinking and the great majority of independent authors who believed a German air attack was inevitable in the event of war and that its effects would be completely devastating.

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<sup>1</sup>Ibid., p. 12.

During September 1938 when Hitler was making his threats over Czechoslovakia, the British people had foremost in their minds the possibility of German bombers over London and other British cities. Such images did not result in encouraging the Government to take a stand against Hitler; Chamberlain in any case had no intention at this time of risking the air attacks which might produce a "knock-out blow."

#### Crisis in September 1938

As the Czech crisis mounted in September 1938 the danger of air attack loomed larger and larger in the minds of officials and the public at large. Hitler's demands concerning the Sudetenland appeared as the prelude to war. The British Government ordered an emergency deployment of the home defences which served mainly to frighten the population and to show to the Government just how poorly the country was prepared for war. Fighter Command had twenty-nine squadrons but only five with Hurricanes. Even these were incapable of fighting above 15,000 feet because their guns had not yet been modified to prevent freezing.<sup>1</sup> The second most modern fighters were the five squadrons of Gladiators and although they would be no match for German fighters, they could have engaged enemy bombers. The

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<sup>1</sup>The minimum temperature at which they could operate was -10° C.

remaining nineteen squadrons were equipped with obsolete aircraft. Immediate reserves stood at two-fifths of first-line strength and there were no stored reserves. The radar network was of little use as only a few masts had been erected and communications with the fighter bases were inadequate. The balloon barrage was only one-third ready and the condition of the anti-aircraft guns and searchlights was even worse.<sup>1</sup>

Bomber Command was at least as unprepared. Fifty-two squadrons were available on paper but only ten had Whitley and Harrow aircraft, at that time considered as heavy bombers. There was a reserve of only ten per cent in aircraft and although 2,500 reserve pilots had been planned, only 200 were available. Many of the bombers lacked such essential parts as turrets. The only way to have a spare parts supply would have been to break up some of the squadrons. The crisis also showed the extent to which the administrative machinery was inadequate.<sup>2</sup>

During the crisis period the Air Staff made every effort to convey to the Government their lack of preparedness for war. Air Vice-Marshal Sholto Douglas advised the Chief of the Air Staff to tell the Government bluntly that Britain could not go to war because she

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<sup>1</sup>Collier, p. 65.

<sup>2</sup>Webster and Frankland, Vol. I, p. 79.

would be wiped out from the air.<sup>1</sup>

The Air Staff prepared a table (see page 150) to show the huge gap between what had been available and the approved programs.<sup>2</sup>

The Air Staff felt a war at that time would be disastrous. They made their view known to the Government. Hore-Belisha, writing in his diary a few days before the Munich conference, reflected on the situation.

The P.M. spoke to us of the horrors of war, of German bombers over London and of his horror in allowing our people to suffer all the miseries of war in our present state. No-one is more conscious than I am of our present deficiencies. Chiefs of Staff view - to take offensive against Germany now would be like 'a man attacking a tiger before he has loaded his gun.'<sup>3</sup>

Analogous to the anxiety in the military and Governmental circles public concern also mounted greatly during the crisis in late September. The London Times of September 26 described in detail the trenches being dug in the parks and gave a number of pictures. It also provided specifications for any readers who might want to construct their own private shelters.

Trucks with loudspeakers cruised about London with

<sup>1</sup>Interview with Lord Douglas.

<sup>2</sup>"Notes on Defects in the Defence System at the Time of the Czechoslovak Crisis," D. D. Op. 5(H), Oct. 17, 1938, September 1938 to March 1939 Emergencies, see also Slessor, pp. 223-24 et passim.

<sup>3</sup>Quoted in R. J. Minney, The Private Papers of Hore-Belisha (London: Collins, 1960), p. 146.

## BRITAIN'S WAR PREPAREDNESS, OCTOBER 1, 1938

Defence Requirement	Approved Program	Available	% Gap
Long Range	4.5"-288	4.5"-Nil	100
A.A. Guns	3.7"-352	3.7"- 44	88
	3"-320	3"-290	9
Searchlights	4,128	1,430	65
Light A.A. Artillery (barrels)	1,112	Nil	100
Bombers (squadrons)	68	42	38
Fighters (squadrons)	30	29	3 <sup>1</sup>
Reserve bombers	2,380	277	89
R.D.F. stations	18	5 <sup>2</sup>	72
Fighter D/F stations	48	17	65
Underground Operations Rooms	11	0	100
Balloon Barrage	1,455	500	66
Vickers "K" Light Automatics	1,300	Nil	100
Anti-gas clothing (suits)	305,000	25,000	92
Satellite Aerodromes	63	16	75
Observer Corps	34	23	32

<sup>1</sup>Twenty-four squadrons, however, were equipped with obsolescent types.

<sup>2</sup>Incomplete.

the announcement: "Will every citizen of Westminster (or whatever the area) get his gas mask fitted as soon as possible? Please do not delay."<sup>1</sup>

The Times described a couple married in Canton Hall who went straight from the office of the registrars of marriages to another part of the building to be immediately fitted with gas masks. It was reported that:

Announcements on the screens at cinemas, from the stage at theatres, from the pulpit in churches, and at sports and social gatherings, and posters and postcards were among the methods adopted over the week-end to inform people that they should have their gas masks fitted.<sup>2</sup>

On September 27th the moment of attack seemed even nearer. There were great crowds in Whitehall awaiting any developments and many wreaths were laid at the Cenotaph. The newspapers were filled with many articles on air raid precautions.

The Daily Herald had a number of pictures of men digging ditches. The Times published calls for all kinds of volunteers. Officers and men of the Anti-Aircraft Units of the Territorial Army as well as the Observer Corps were called up. It was public knowledge that all R.A.F. personnel were being recalled from leave.

The Times announced exhibitions were being held of typical shelters and "gas precaution chambers." It was

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<sup>1</sup>The Times (London), September 26, 1938.

<sup>2</sup>Ibid.

reported nine miles of trenches had been dug in Cardiff. The word spread through London that old sheets were being solicited to eke out the deficiency in London's supply of coffins. In Paris reportedly one-third of the population fled the city, but in London, although "many a Londoner went about with a sensation of sick apprehension at the pit of his stomach, there was no panic."<sup>1</sup>

The fear of air attack transcended all else in people's minds. This is not surprising in view of what was available in the popular literature. Nor is it surprising in view of the action which the Government was taking in informing people on how they could best be prepared for bombing.

#### In London

everything came to a standstill. No business was done, restaurants were empty. There was a feeling that nothing was worth doing. . . . The police were with us on account of the continual demonstrations. They were strange, the demonstrations. There was one which came from a peace organization with a manifesto that 'Britain must fight.' Then there were the Fascists with their cries of 'mind Britain's youth.'

Early in the crisis the Left Wing were the greatest demonstrators, but they did their cause more harm than good, for instead of singing patriotic songs and showing some activity by at least waving an A.R.P. badge, they sang the 'Red Flag' and wore Communist badges.

And the people. There was a set expression on people's faces. They went about with their

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<sup>1</sup>John W. Wheeler-Bennett, Munich: Prologue to Tragedy (New York: The Viking Press, 1964), p. 159. The figure for the evacuation of Paris is unconfirmed.



mouths tightly shut.

In all the parks great trenches were hurriedly dug by the unemployed under the supervision of contractors. . . In Hyde Park 6 3.7's pointed in the air. Here and there one came across searchlights and batteries. There was one on the roof of the Admiralty, another on Whitehall. There was one on Westminster Bridge and another on the Embankment. . .

Traffic lights were blanked in except for a little cross. . . It was impossible to get a cottage or a room in a hotel in any isolated place. . . Led by Mrs. Chamberlain who went daily to Westminster Abbey, the people prayed. Special services were held. As I drove home . . . everything I visualized as smashed from the air.<sup>1</sup>

It appeared to the Air Ministry as well as the entire country that the dreaded moment of the beginning of enemy air attack was near at hand. The British believed the results of war would be immeasurably greater than anything which had gone before. They were not confident that they could survive enemy air attacks because they were so vulnerable.

Chamberlain was not speaking only for himself but for an entire country in great apprehension of the danger of a crippling enemy air attack when he went before the nation on radio with an important statement at 8:30 p.m. on September 27th.

How horrible, fantastic, incredible it is that we should be digging trenches and trying on gas masks here because of a quarrel in a far away country between people of whom we know nothing. . . However much we may sympathize with a small nation confronted by a big and

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<sup>1</sup>Michael (Lord) Killanin, Four Days (London: William Heinemann Ltd., 1938), passim.

powerful neighbour, we cannot in all circumstances undertake to involve the whole British Empire in war simply on her account. If we have to fight it must be on larger issues than that. . . War is a fearful thing, and we must be very clear, before we embark on it, that it is really the great issues that are at stake, and that the call to risk everything in their defence, when all the consequences are weighed, is irresistible.<sup>1</sup>

The horror of war must be translated as the horror of air attack, based on the calculations indicating the feasibility of a "knock-out blow." The so-called "thug with the bomber force" was blackmailing Britain without even being specific about any threat of attack other than to take Czechoslovakia by force if necessary. The British had so shaken themselves with their consternation about bombing that nothing else was needed. More trenches were meanwhile being dug, and on the night of the 27th - 28th digging went all through the night with the use of flares. Millions were outfitted with gas masks. The London Zoo announced its plan to kill all poisonous snakes the instant war began so they would not escape if the zoo were bombed. The Archbishop of Canterbury led the country in praying for peace. Sleep was difficult at night with the R.A.F. and ground searchlight crews engaging in exercises until dawn.

On September 28

men and women work with an eerie feeling that this was 'the last day' and that by tomorrow night Paris and London might be in flaming ruins. . . . I recall that while shaving that

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<sup>1</sup>The Times (London), Sept. 28, 1938.

morning the hymnal injunction to 'live this day as if thy last' came into my head and remained with me much of the day.<sup>1</sup>

Chamberlain's dramatic announcement in the House on September 28 that he would go again to meet Hitler to try to avert war, this time at Munich, was greeted with cheers throughout England. The trip to Munich the following morning and his triumphant return to London were widely heralded specifically on the grounds that in trying to prevent war, Chamberlain was trying to prevent air attacks on England. W. W. Hadley has collected the editorials in the British papers following the announcement of the Munich agreement which conceded to Hitler German demands on Czechoslovakia.<sup>2</sup> It is striking how many thought Chamberlain had saved the country from German air attack. The Times concluded that if it had not been for Chamberlain, "war, incalculable in its rage, would have broken out." The Daily Mirror said "at least let us be thankful that this week-end there is time to think - that prudent thought is not abolished by feverish preparation for the lightning stroke." On October 2 the Sunday Chronicle wrote that "last week we were given our gas masks; war seemed imminent. Today those gas masks belong to a world remote and hideous

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<sup>1</sup>John W. Wheeler-Bennett, Munich: Prologue to Tragedy, p. 167.

<sup>2</sup>W. W. Hadley, Munich Before and After (London: Cassell and Co., 1944), p. 99 ff.

through which we have travelled to a profoundly happier land."

Had Chamberlain really delivered Britain from the horrors of a "knock-out blow?" This is not a question susceptible to any easy answer. The British estimated that Germany had 3,250 military aircraft of which 1,350 were bombers. In fact there were 3,036 German military aircraft but only 2,738 were serviceable and there were only 2,155 fully trained crews. Therefore the total German strength that was operational was considerably lower than the British estimate.

More relevant to the calculations of the "knock-out blow" was the British estimate of German bombers. The British estimate of 1,350 exaggerated to some extent the German strength of 1,120. An important factor, however, was that of these 1,005 were serviceable and there were only 744 fully trained crews. This would have made attacks on the scale Britain was expecting impossible.

The R.A.F. considerably overestimated the capabilities of the German bombers. If they were to fly against England from bases in Germany they would have not been able to carry their full bomb-loads. The carrying capacity which the British assumed the German bombers to have was only feasible in short flights. On a long flight such as would be necessary to reach England a considerable

reduction in the bomb loads would have had to be made.

We have seen that in any case German air doctrine and war plans did not call for the strategic use of long-range bombers. Moreover even if Germany might have wanted to bomb Britain in the event of war over Czechoslovakia in September 1938, a great deal of the Luftwaffe would have been tied down in its primary role in support of the Army. The planes could not have been available at the same time both for bombing Britain and aiding the Wehrmacht.

We now know that the Germans were far from confident about their air superiority at the time of Munich. "Great Britain's entry into the war and the employment of British air combat forces . . . must be reckoned with. . . It is questionable whether France and Great Britain will respect a possible Belgian neutrality."<sup>1</sup> The Germans were quite concerned about a British strategic air offensive and even though the British capability was fairly small, it probably would have been adequate to deter Germany from bombing Britain if that had been Germany's preferred strategy.

The fact that Germany could not have sustained military operations on two fronts at the time of Munich.

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<sup>1</sup>Strategic Study 1938: Instruction for Deployment and Combat: Operation Red, issued by the Supreme Commander of the German Air Force, June 2, 1938, I.M.T. Nuremberg, XXXVIII 415 (ISO-R), trans. in Documents on German Foreign Policy, II, pp. 380-81.

is clear from the Nuremberg testimony of both General Keitel, former Chief of the High Command of the Wehrmacht and General Halder, former Chief of the Army General Staff.<sup>1</sup>

We have already examined the British overestimation of the capacity of bombers to find and destroy their targets as well as the overestimation of the number of casualties per ton. Consequently it would appear that Chamberlain did not save Britain from the "knock-out blow" because Germany did not have the inclination or the capacity to inflict damage on anything like the level predicted by the Air Staff.

Particularly since it is clear that the prediction of a German "knock-out blow" was a miscalculation, it is interesting to examine the effect of the estimates of enemy attack on the British Government. Churchill, for one, has suggested that the effect was quite important.

Before the war we were greatly misled by the picture they [the Air Staff] painted of the destruction that would be wrought by the air raids. This is illustrated by the fact that 750,000 beds were actually provided for air raid casualties, never more than 6,000 being required. This picture of air destruction was so exaggerated that it depressed the Statesmen responsible for the pre-war policy, and played a definite part in the destruction of Czechoslovakia in 1938.<sup>2</sup>

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<sup>1</sup>I.M.T., Nuremberg, X, p. 509.

<sup>2</sup>Min. Churchill to Portal, Oct. 7, 1941, quoted in Webster and Frankland, Vol. I, p. 184.

Churchill was not specific about what he believed the "definite part" was.

Wheeler-Bennett, author of one of the best diplomatic histories of the period, was somewhat more precise.

The fear of this new type of warfare, in which there would be no distinction between the civilian and the soldier, impelled the British public to subscribe freely to Defence Loans which would provide them with protection, but it also tended to make them endorse almost any policy which would prevent the necessity of this protection being called into effect.

There is no doubt that this widespread hatred of the thought of war, which he himself so keenly shared, materially affected Mr. Chamberlain in the formulation and execution of his policy, and also contributed to its failure. He made considerable and realistic efforts to build up Britain's armaments, but he was so deeply, so desperately anxious to avoid war that he could not conceive of its being inevitable. He was so confident, so hopeful, of the success of his policy of appeasement that his very confidence and hope blinded him to the greater realities of the situation. And Britain shared his difficulty. Like a boxer who 'cannot work himself into the proper psychological and physical condition for a fight that he seriously believes - and hopes - will never come off,' the British people could not think themselves into the necessary state of mind for real preparedness because they hoped so dearly that they would never be called upon to fight.<sup>1</sup>

The estimates of the "knock-out blow" made war look so horrible that instead of preparing in the best manner possible, the Government concentrated all its efforts on the prevention of war, virtually regardless of cost.

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<sup>1</sup>Wheeler-Bennett, p. 269.

Rather than rearming, which might have had the effect of deterring war, the Government spent its time trying to appease an insatiable appetite. Of course it may be said that no one could be sure appeasement would not work. While there is some truth in this, if the dangers of war had been more accurately portrayed, a firm policy might have been more appealing.

Because of their horror of the concept of war as the ultima ratio regnum, Britain and France had reduced their armaments and neglected their defences. . . . In the name of peace and appeasement they condoned injustice and aggression on the part of Germany because they believed themselves too weak to oppose her and because they hoped against hope that - in accordance with the Führer's promises - each act of depredation would be the last.<sup>1</sup>

Churchill felt that the fear of air attack "had become obsessive in men's minds. . . . Ministers had to imagine the most frightful scenes of ruin and slaughter if we quarreled with the German dictator."<sup>2</sup> This must surely have affected their reasoning. Writing before Munich Churchill believed "all the unknown, immeasurable threats which overhung London from air attack would be a definite and compelling factor in all our decisions."<sup>3</sup> It appears that his prediction was fulfilled.

A. J. P. Taylor put the matter bluntly when he wrote:

<sup>1</sup>Ibid., p. 6 (Italics added).

<sup>2</sup>Winston Churchill, The Gathering Storm, pp. 132-33.

<sup>3</sup>Ibid., p. 115.



"Chamberlain went to Munich . . . to save the British from air attack."<sup>1</sup> This was certainly the feeling in Britain at the time.

Writing in 1939 Lord Rothermere, although an opponent of Government rearmament policy which he regarded as far too slow, reflected the popular conception of Britain's extreme vulnerability to air attack. "No other country on earth is so exposed to devastating air attack."<sup>2</sup> Sir Arthur Salter asked: "What was the position in the last fateful days of September? The vulnerability of London and the great cities . . . must have been one of the most serious factors in the decisions of policy."<sup>3</sup> Genevieve Tabouis believed that Britain and France in 1938 were in the process of being blackmailed by the threat of war.<sup>4</sup> "Public opinion takes the point of view that war would involve the utter ruin of our civilization."<sup>5</sup> She concluded that because of this the public favoured every possible concession to gain time. . . Since many in the

<sup>1</sup>A. J. P. Taylor, The Origins of the Second World War (Harmondsworth: Penguin Books, Ltd., 1964), p. 228.

<sup>2</sup>Lord Rothermere, My Fight to Rearm Britain (London: Eyre and Spottiswoode, 1939), p. 47.

<sup>3</sup>Sir Arthur Salter, Security, Can We Retrieve It? (New York: Regnal and Hitchcock, 1939), p. 190.

<sup>4</sup>Blackmail implies that Germany consciously played on this fear. The evidence available seems neither to confirm nor deny this possibility.

<sup>5</sup>Genevieve Tabouis, Blackmail or War (Harmondsworth: Penguin Books, 1938), p. 8.

Government and Air Staff felt the same way about the threat of air attack, this fear could only act to reinforce the policy of appeasement. Even if there was some possibility that appeasement might not work, trying was better than risking the "knock-out blow." Liddell Hart feels that the predictions about the "knock-out blow" and the staunch support that they received from Kingsley Wood, the Air Minister, "had a strong influence on Chamberlain's course at this time." The consequence was to make Chamberlain "more susceptible to Hitler's bluff, and paved the way into a trap."<sup>1</sup>

A number of observers have suggested that British weakness was justification enough for the Munich settlement. Liddell Hart, for one, has written:

In sum, it might be said of the Air Force last September (1938) that while the state of equipment and training was dangerously inadequate, the state of adaptation to new conditions of air warfare was dangerously doubtful. This condition of deficiency and inefficiency formed the chief justification for the British Government's part in inducing the Czechs to accept [sic] Germany's uncompromising demands. But it could hardly be termed an excuse, since that Government had been in office seven years.<sup>2</sup>

A similar position is taken by Harold Balfour (now the Earl of Inchrye) who was from 1938 to 1944 Parliamentary

<sup>1</sup>Captain Basil H. Liddell Hart, The Memoirs of Captain Liddell Hart, Vol. II, pp. 170-71.

<sup>2</sup>Liddell Hart, The Defence of Britain (London: Faber and Faber Limited, 1939), pp. 156-57.

Under-Secretary for Air. "The year of Munich saved Britain from defeat. . . In the summer of 1938 the Royal Air Force would have been overwhelmed by the Luftwaffe. In 1939 the R.A.F. were able to face the enemy."<sup>1</sup> Balfour does not condone the foreign policy of appeasement or the failure to rearm. He does believe that Germany had a great advantage over Britain in 1938, not so much in numbers but in the quality of her latest aircraft. We shall see, however, that there was no reduction in the expected consequence of attack in 1939.

The fear of air attack interacted with and served to complement other factors acting on Chamberlain. There can be no question that Chamberlain was genuinely a man of peace. The exaggerated ideas of the consequences of war and especially of air attack may have resulted in a decision that there must be peace at any price. Regardless of the concessions, war must be avoided.

Such an urge for peace can play into the hands of international blackmailers like Hitler who will make exorbitant demands knowing the threat of war is his most valuable weapon. While there were limits to what the appeasers would give up to have peace, their bargaining position was undercut by their supreme desire to have peace. To say "peace at any cost" assures the cost will be high.

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<sup>1</sup>Balfour papers.

Some authors have suggested the Government unwittingly played into German hands. George Fielding Eliot sees the Czech crisis as a result of international blackmail.<sup>1</sup> He believes that the crisis was prolonged by Germany to take advantage of the rising fear of air attack on London and Paris and that certain of the measures taken by the British Government were intended to prevent "any possible flaring of public resistance to the policy upon which the governments had determined."<sup>2</sup> In particular he cites the fact that people were roused at 3 a.m. to be given gas-masks and the placing of an anti-aircraft gun on Westminster Bridge. The measures were purposely taken, according to Eliot, to raise the level of fear in the population. Whether or not this assertion is true is hard to say. Certainly, however, measures were not taken to calm the people and restore a feeling of confidence which would have been advantageous if the Government was considering a stiffer line.

Following a similar line of argument Josiah Wedgwood, an M.P. to whom appeasement was abhorrent, thought that "gas masks and A.R.P. were solely invented by this country in order to terrify the old women of this country into welcoming our strong silent Prime Minister on his return.

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<sup>1</sup>George Fielding Eliot, Bombs Bursting in the Air: The Influence of Air Power on International Relations (New York: Regnal and Hitchcock, 1939), p. 74.

<sup>2</sup>Ibid.

from supping with the Devil."<sup>1</sup> One may even wonder to what extent Britain was not blackmailing itself. Hitler did not need overtly to threaten a "knock-out blow" for people in Britain were already as frightened as they could be. It appears that the Government played upon the fear of air attack at the time of Munich in order to rally support for its policy. It was hoped that those who thought appeasement of Hitler's demands to be impossible would at least hold their criticism out of a feeling that nothing, such as the support of Czechoslovakia, must be done to provoke the universally dreaded "knock-out blow."

An interesting quotation from Chamberlain's diary advises that:

You should never menace unless you are in a position to carry out your threats, and although, if we have to fight I should hope we should be able to give a good account of ourselves, we are certainly not in a position in which our military advisers would feel happy in undertaking to begin hostilities if we were not forced to do so.<sup>2</sup>

Chamberlain had been advised that Britain could be knocked out from the air. Speaking before the Conservative Party Conference on October 8, 1938, Chamberlain discussed the problem of air warfare in some detail. This was spoken

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<sup>1</sup>Quoted in C. V. Wedgwood, Last of the Radicals (London: Jonathan Cape, 1951), p. 231.

<sup>2</sup>Quoted in Keith Feiling, The Life of Neville Chamberlain (London: MacMillan Co. Ltd., 1947), p. 360.

against the background of the Czech crisis which had just subsided.

Although in neither case has there been any formal declaration of war, yet there are in fact two major wars in progress, one close at hand in Spain, the other far away in China. Both of these wars are being characterized by the use of bombing aeroplanes, and in both cases non-combatants, men, women, and children, are being killed and mutilated by aerial weapons. We are told that they are always aimed at military objectives; then, if that be so, these are not instruments of precision, and no one can guarantee that their effects will be confined to the objects at which they are aimed.

It is a sickening and horrifying spectacle, from which the mind revolts, and it has aroused in many countries the strongest feelings of indignation [owing to] its inhumanity [and out] of sympathy with its helpless victims. Yet one wonders if there is not some danger lest these natural human feelings should miss the real point at which they should be directed. Cruelty and barbarity, the mutilation and death of non-combatants, destruction of property, starvation and misery are the inevitable accompaniments of modern warfare.

The real crime against humanity goes deeper and further back than that. It lies in having to resort to force at all in flat contradiction of engagements solemnly entered into, without even making an attempt to settle differences by peaceful discussion and negotiation.<sup>1</sup>

We can see that Chamberlain was of the belief, as it is put by L. S. Amery, that "another world war [would mean] the end of civilization."<sup>2</sup> There can be little question that this apprehension about the possibility of devastating

<sup>1</sup>The Aeroplane, Oct. 20, 1938.

<sup>2</sup>L. S. Amery, My Political Life (London: Hutchinson, 1955), Vol. III, p. 290.

air attacks served to reinforce Chamberlain's desire to avoid war unless there was clearly no alternative. Even though Chamberlain may have mistakenly thought that he had bought peace at the cost of sacrificing Czechoslovakia, it would seem that this cost was lessened in his mind by the realization that if he failed, German air attack on a massive scale would be a result.

Chamberlain's great aversion to war is clear from all that he wrote and said and it would seem that it was largely a result of his fear of air attack. This fear may be seen to be a consequence of the Air Staff warnings that he could not involve the country in a war since it would be defeated through the use of German air power.

Certainly appeasement was a consequence of a serious misunderstanding of Hitler's intentions and capabilities.<sup>1</sup> This misunderstanding, however, was reinforced by the fear of the "knock-out blow." Had the fear of the "knock-out blow" not been so great, it might have been easier for the appeasers to see their folly in trying to meet Hitler's demands. Fear of the "knock-out blow" made the appeasers even more prepared to accept German demands than they might otherwise have been. The consequences of war were visualized as so awful that almost any cost was worth paying if war could be avoided. "From The Air Ministry poured

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<sup>1</sup>This is well illustrated in Martin Gilbert and Richard Gott's book The Appeasers (Boston: Houghton, Mifflin Co., 1963).

forth the facts and figures that made war seem impossible, the true opiate of the appeasers."<sup>1</sup>

In conclusion the question of the influence of the fear of the "knock-out blow" on British policy cannot be answered satisfactorily. Many politicians active at the time as well as historians seem to think that it was important. The actual impact is not clear. There is little if any evidence to suggest that the policy of appeasement was entirely or even mostly the outgrowth solely of the fear of air attack. Appeasement had much deeper political and psychological roots.

Nor, however, can it be satisfactorily maintained that the Air Staff calculations of the "knock-out blow" were of no importance. Even Chamberlain makes it clear that one of his main concerns was the fear of air attack. When a government is told war will mean almost certain defeat, any risks of war are not entertained lightly.

It would seem that the "knock-out blow" estimates served to justify and reinforce the policy of appeasement both in the minds of the Government and the general population. This is an important consequence of the Air Staff calculations for it led naturally to a desire for peace at any, or almost any, price. By making war appear

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<sup>1</sup>Ibid., p. 333.



worse than it would be it weighted the Government's choices heavily towards those which minimized the possibility of war even at such high political costs as abandoning Czechoslovakia.

This indicates the importance military appreciations can have on foreign policy; when a Government is told war may mean the end of civilization, not surprisingly this tends to make policy cautious and to inhibit risk-taking. That a population believing it will be decimated by bombing is not bellicose is not very surprising either.

Britain, however, declared war in September 1939. It might naturally be assumed that some new evaluation of the German bombing threat had been produced which indicated that the consequences of attack were no longer viewed as being so disastrous but, as we shall see, this was not entirely the case.

## CHAPTER VI

### THE DECISION TO GO TO WAR: 1939

Many people who supported the Munich settlement in 1938 and others who argue in favour of it in a similar fashion now do so on the grounds that it provided another year for rearmament before the war. Chamberlain, although willing to agree to some quickening of the pace, remained vigorously opposed to full-scale rearmament. While the twelve months preceding war saw some improvement of the British situation, it was certainly not enough to inspire much confidence; yet the decision was made to go to war in September 1939. First we shall examine the actual changes, both perceived and real, that took place between the agreement signed at Munich and the beginning of war one year later.

By December 1938 the Air Staff felt confident of its ability to prevent the "knock-out blow" if, but only if, expansion went ahead as planned.<sup>1</sup> There were public indications of this fact. The Secretary of State for Air,

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<sup>1</sup>Thirty-eighth Meeting of the Sub-Committee of the Home Defence Committee, Dec. 8, 1938, cited in D.H.O. Fighter Squadrons: November 1938 to May 1939, Cat. II H/121, Great Britain, Ministry of Defence, Air Historical Branch.

Sir Kingsley Wood, speaking before the London Press Club on November 18, 1938, said that "developments in recent years have undoubtedly tended to reduce the supremacy of the offensive, and add to the actual strength of the defensive in the air."<sup>1</sup> Although radar was still a closely guarded secret, Wood later hinted that some breakthrough had occurred which had greatly facilitated interception. "There are many limitations of the air weapon, and science and invention may well provide us with means of defeating the bomber, perhaps sooner than many of us realize today."<sup>2</sup>

This new view was based in part on a recent appreciation of the deployment of fighter squadrons.<sup>3</sup> Using a total of 46 fighter squadrons, calculations indicated that 13.8% of the attacking force could be destroyed with the best deployment. To achieve destruction of one-sixth of the attacking force 58 squadrons would be required. This assumed a maximum German bomber effort of 1,000 aircraft against Britain. The calculations assumed that two fighters were required to destroy a bomber and that there was a 66% chance of fighter interception.

If it was possible to inflict an attrition rate of

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<sup>1</sup>Aeroplane, Nov. 30, 1938, p. 695.

<sup>2</sup>Speech on July 24, 1939. Quoted in Aeroplane, Aug. 2, 1939.

<sup>3</sup>"Note on Deployment of Fighter Squadrons," D.H.O. Fighter Squadrons.

sixteen per cent on the attacker presuming he was flying half his total force each day, within two weeks his force would be destroyed. The Air Staff concluded if Fighter Command was at the strength they were recommending, it would be a deterrent to German attacks.

The British were still overestimating Germany's strength. In April 1939 the British estimated that Germany had a total of 3,800 military aircraft. The actual figure was 3,106 of which 2,523 were serviceable. They estimated that the Germans had 1,650 bombers. In fact Germany had 1,226 of which 926 were serviceable. This gave Germany an advantage, however, for in June 1939 the British had only 800 bombers of which 556 were serviceable.

On balance it was considered probable that direct attack on the civil population would not be adopted deliberately by Germany as a primary measure although the possibility of such a course, it was felt, must certainly be faced. It was still believed that the German strategy would be to interfere primarily with food supplies by attacks on docks, shipping, fuel resources and distribution centers. It was also considered probable that attacks would be directed against war industry in general and the aircraft industry in particular.

The Air Staff believed attacks on specific industrial objectives (including docks and distributive centers) would have the same effect as attacks on the civil population in

the vicinity of the objectives concerned. Although the mean error of bombing in war was likely, in general, to be less than 500 yards, attacks intended for specific objectives might, due to errors of selection of target and of navigation, be spread over wider areas. It was thought the greatest intensity of attack would occur in the regions close to the principal objectives. Evacuation and underground protection appeared to be most important in these regions.

If the anti-aircraft defence of industrial objectives proved to be effective, this was likely to have the result of forcing bombers to greater heights where identification of targets could become virtually impossible. In these circumstances, although attacks might be intended for specific objectives, the effect would be the same as indiscriminate bombardment.

If the civil population in general was not well protected by Air Raid Precautions measures holding the confidence of the people, the temptation to attack the population indiscriminately would be greater. For, although in a thoroughly well protected community the prospect of decisive moral effect being achieved as a direct result of bombardment was felt to be very low, the Air Staff believed that it had to be remembered that the ultimate object of all air bombardment was moral effect and that it was only a question of whether moral effect

could be better achieved by indiscriminate bombing or by destroying objectives which would result in moral decay. This marks a change in the estimate of how easy it would be to destroy morale in the event of passive defence measures being adopted.

The Air Staff felt that although the Germans were unlikely to adopt indiscriminate bombardment as a policy, partly because it was unlikely to achieve the desired result and partly for fear of immediately bringing the United States into the war, there was no relief from the necessity of providing a high degree of protection for the civil population. Provision of elaborate Air Raid Precautions arrangements was probably the best assurance against indiscriminate bombardment, just as the universal provision of gas masks was thought to be probably the best assurance against the use of gas.

In a forecast of the future, it was observed first that German bomber squadrons were trained in peace to achieve a high standard of bombing accuracy, secondly that they had been employed in the war in Spain almost exclusively in attacks on military objectives, and thirdly that their standard of accuracy had been very high. The R.A.F. concluded that bombing would probably only become indiscriminate if the scale of defence of the country was so effective that it was destroying the morale of the German bomber crews. Since, however, it was the

British object to destroy that morale, it seemed probable that before the war had been in progress for long, bombing would become relatively indiscriminate despite any German policy to the contrary. Preparations should therefore be made in peace against this possibility.

The Air Staff then proceeded to examine the broader picture of the relative strengths of the two air forces. They assumed the worst case, that as much as possible of the German striking force would be directed against Britain in order to achieve a "knock-out blow."

It was assumed that in April 1939 Germany had 1,650 first-line long-range bombers as against 812 British. In fact at this time Germany had 1,226 bombers of which 926 were serviceable. The estimated proportions were predicted to remain numerically about the same throughout 1940 but the proportional disparity of bomb-lift would be lessened by the coming into service of British heavy bombers. It was assumed that not more than four-fifths or about 1,320 of the German bombers would be directed against Britain. The French forces were omitted on the grounds that they would be offset by the Italians. As to reserves, it was estimated that in April 1939 Germany had 100% against Britain's 33% and that by April 1940 Britain would have caught up in that area.

The fighter strengths of the two countries were thought to be about equal. In active ground defence and

passive defence measures, Germany's preparations were currently superior but the margin would be narrowed or altogether eliminated by 1940.

In summary, the Air Staff review concluded that without passive defence the bombing of London might create an immediate and most serious problem for the country; it was doubtful if a counter-offensive would cause any great reduction in the scale of German air attack on Britain during the early weeks of a war. This was due to the size of Germany and the possibility for dispersal, and also because British bombers would have to fly over much greater distances of hostile territory than German bombers would have to fly across English soil.<sup>1</sup>

The Air Staff was now giving more attention to the problems surrounding mobilization.<sup>2</sup> Plans were being made for what would have to be done immediately in the event of war, such as dispersing aircraft and calling up reserves.<sup>3</sup> Precise orders were given to Fighter

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<sup>1</sup>The preceding summary is of the Air Staff report on the "Deployment of Fighter Squadrons."

<sup>2</sup>Report of the Deputy Chiefs of Staff Sub-Committee of the Chiefs of Staff Committee (D.C.O.S. 80), German Scale of Attack, April 1938 to January 1941, Cat. II H/126, Great Britain, Ministry of Defence, Air Historical Branch.

<sup>3</sup>See D. D. Ops (H), March 20, 1939, "Program of Action in D. D. Ops. (H) in the Event of Sudden Attack on this Country or a Report of a Likely Impending Attack;"



Command about what it should do in the event of attack.<sup>1</sup>

The R.A.F. believed that unless measures were undertaken to protect the population, there would be disastrous consequences in the event of German bombing. Since R.A.F. active defence was improving it was expected that German bombing would necessarily become indiscriminate because the Luftwaffe would be pressed so that accurate bombing would be impossible. The expected scale of attack steadily grew larger so that even with improved defensive measures, consequences of bombing were predicted to be about the same.

#### Psychological Effects of Bombing

Even with the increase in importance given to fighters in Britain, there were some who continued to press for priority for bombers. Trenchard, retired for ten years, was among the most active. In January of 1939 he presided over a lecture on a subject very close to his heart: "The Psychological Effects of Bombing." This was one of the most thorough analyses of this aspect of the expected

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D.C.A.S. Notes to Air Council Meeting March 20, 1939; D.D. Ops. (H). to F.O. 2, March 24, 1939; and Minutes of Meeting held by D.C.A.S. on March 20, 1939, on War Readiness; all in German Scale of Attack.

<sup>1</sup>Minute Air Vice-Marshal R. Peck, Director of Operations to Air Officer, Commanding-in-Chief, Fighter Command, March 25, 1939; Memo. Air Chief Marshal Newall, Chief of the Air Staff, to Major-General H. L. Ismay, Minister for Co-ordination of Defence, March 20, 1939; Ibid.

consequences of bombing. The appraisal was similar to those made in the Air Ministry and by others in the government concerned with the problem. It does not seem that this appraisal was any different from those made immediately after World War I.

Dr. E. B. Strauss spoke at the Royal United Service Institution; he felt certain that in the next war an enemy would direct its strategic air power against the morale of the civil population. After describing the cause and effects of fear, he said that it was necessary to prepare for "air-raid-mindedness," otherwise panic alone might lose the next war. He described two principal types of psychiatric casualties: mobile, meaning those who ran riot, and immobile, or those who were stupefied by shock. He felt that the population should be told the truth about air attack, because although they were frightened, they really had no idea how bad it would be. London would be made untenable, in part because it was the most easily burned city in the world. Air raids would not be conducted against strictly military targets but rather against civilians, the nerve center of the nation. The raids would be continuous and would come without warning.

Strauss felt that one of the principal causes of panic would be the noise of air raids to which air raid sirens would only add. In contrast to the changing views

in the Air Ministry, he had little faith in any form of passive defence, believing for example that underground shelters would produce claustrophobia. There was grave danger of the breakdown of medical services because the thirty-two hospitals earmarked by the Government would probably be destroyed in the first raid.<sup>1</sup> This indicates that even the increased air defence effectiveness was not expected to prevent the "knock-out blow." It is interesting that Strauss did not think much of passive defence measures but as we have seen earlier the Air Staff was changing its views in this respect although they were not yet full-fledged converts.

The annual air exercises were held in 1939 between August 8 - 11. They involved a record number of 1,300 aircraft.<sup>2</sup> Dowding is on record as being very pleased with how things went. He made the almost revolutionary statement that "I confidently believe that serious air attacks on these islands would be brought to a standstill

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<sup>1</sup>The Aeroplane, Jan. 11, 1939, p. 38. The editor disagreed saying that "Bombing would create a panic amongst the lowest classes and among the alien immigrants to this country, but the ordinary solid Englishman becomes sullenly angry when bombed. Actually the bombing in 1916-17 was among our best recruiting agencies. It awoke the people to the fact that it was their war, and not merely an affair of newspapers, Governments and professional soldiers." This, however, was certainly a minority opinion for most people shared Strauss's outlook.

<sup>2</sup>Ibid., Aug. 9, 1939, p. 181.

within a short space of time."<sup>1</sup> The Air Ministry in their statement to the press, said that: "The exercise has shown that the fighter aircraft is more than a match for the raiding bomber, if it succeeds in engaging it."<sup>2</sup> Radar was still secret so only a few people knew that this latter problem was almost solved. The impression was widespread that for the first time the rate of interception was high.<sup>3</sup>

It is vital nevertheless to remember that there was absolutely no change in the expected consequences of attack. The R.A.F. felt that they could achieve a much higher rate of interception, but because of the increasing size of the Luftwaffe this was virtually cancelled. It was still expected that Germany could drop 700 tons a day in 1939 and 950 tons per day in April 1940. The estimated effects of attack were the same; the real change that had taken place was in the expected consequences of attrition on the German Air Force if it attacked England. Churchill, in his final paper for the Air Defence Research Committee on August 10, 1939, wrote:

The main defence of England against air raids is the toll which can be extracted from the raiders. One-fifth knocked out each go.

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<sup>1</sup>Quoted in Ibid., Aug. 16, 1939, p. 207.

<sup>2</sup>Ibid., p. 217.

<sup>3</sup>See also Flight, Aug. 17 and Aug. 24, p. 171.

will soon bring the raids to an end. . . . We must imagine the opening attack as a large affair crossing the sea in relays for many hours. But it is not the first results of the air attack which will govern the future of the air war. It is not child's play to come and attack England. A heavy proportion of casualties will lead the enemy to make severe calculations of profit and loss. As daylight raiding will soon become too expensive, we have chiefly to deal with random night-bombing of the built-up areas.<sup>1</sup>

It was, however, still quite uncertain that Britain could last until attrition began to take its toll of the enemy.

By August 1939 Fighter Command had thirty-nine squadrons as compared with twenty-nine at the time of Munich. The force was much more modern as sixteen were equipped with Hurricanes, ten with Spitfires, seven with Blenheims, four with Gladiators, and only two with the obsolescent Hind and Gauntlet. There were about 300 aircraft in reserve. The radar chain was complete, although not perfected; the low altitude warning system was not operational. The figures, for comparison with the approved scales, are as shown in the table on page 182. While this still indicates a substantial gap, the situation was improved from the days of Munich.

It was still expected that Germany would begin the war with massive bombing attacks on London and other urban-industrial targets in Britain. It was believed

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<sup>1</sup>Quoted in The Gathering Storm, pp. 345-46.

PREPAREDNESS FOR WAR, SEPTEMBER 1939<sup>1</sup>

	Approved Scale	Deployed by out- break of war	Munich
Fighter squadrons	46	35	29
Heavy guns	2,232	695	334
Light guns (barrels)	1,860	253	Nil
Searchlights	4,128	2,700	1,430
Balloons	1,450	624	500

that this greatly increased capability of Fighter Command would enable it to inflict a high level of attrition on the attacking forces and that this would eventually bring the attacks to a halt. There was still the important uncertainty; could Britain survive German bombing as long as it lasted? Owing to the increases in the size of the Luftwaffe, the expected scale of attack had grown and the estimates that had been made in the previous years about the effects of such attacks were apparently unchanged.<sup>2</sup>

The effect of the calculations of the expected scale of enemy attack on the decision to go to war in September 1939 is difficult to analyze precisely. Without reviewing in detail the political history of the period, it is clear that in England there was a very different attitude

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<sup>1</sup>Collier, p. 74, and D.H.O. September 1938 to March 1939 Emergencies.

<sup>2</sup>Interview with Marshal of the R.A.F. Lord Tedder of Glenquin, Nov. 17, 1965, interview with Sir John Slessor, Oct. 13, 1965, and interview with Marshal of the R.A.F. Lord Portal of Hungerford, Sept. 6, 1965.

towards Hitler than that which had prevailed in 1938. In 1938 many people were sympathetic to Hitler's claims and most felt that war over refusing to give way to these demands would have been foolish. It appeared particularly foolish in view of the expected consequences of German air attack.

Hitler had promised that the claim for the Sudetenland was his last territorial demand. He convinced Chamberlain and the British people that he was being honest with them. When he seized the rest of Czechoslovakia in the spring of 1939 many Britons felt their trust had been betrayed. This was taken as a very serious matter by the British, something which Hitler never understood. He had made fools of those who believed him; the believers would never trust him again. It was then only a matter of time, in the British view, before Hitler would make his next demand and that would most probably be Poland. It was now clear to almost everyone that Germany would have to be stopped or else Nazism would be the master of the Continent. This was unthinkable and therefore there was as little opposition in Britain to the declaration of war in September 1939 as there was opposition to the Munich Agreement in September 1938. Opinion both in and outside Government had swung to a determination that Hitler must be stopped.

Chamberlain's abhorrence of war had not been reduced. It was still expected that German air raids

would cause unimaginable damage in Britain, yet the choice between war and an endless succession of surrenders could apparently no longer be avoided. In 1938 it seemed possible to avoid war; in 1939 it no longer seemed possible. The country's frame of mind had drastically altered. War was not seen as any less of a danger than in 1938 but it was seen as unavoidable if Nazism was to be stopped. Appeasement in Poland would only mean a new demand elsewhere. Consequently Britain went to war in 1939 not out of a changed appreciation of the consequences of enemy air attack but out of a changed appreciation of the consequences of the further appeasing of Adolf Hitler. War might still mean the end of British civilization, although, and this is vitally important, people no longer talked about it that way, but without war the greater menace of an expanding Nazi Germany could not be stopped.

It was believed that the combination of radar and fighter defences would exact a high rate of attrition on the Luftwaffe; but there was doubt that Britain could survive bombing long enough for this to be of importance. It was hoped that Britain could withstand German air attack long enough for the effects of attrition to be felt but it was difficult to be very confident about this possibility.

Britain went to war in September 1939 expecting about the same consequences from air attack as had been



predicted for the previous year when the Chief of the Air Staff spoke of British civilization being endangered. The consequences of air attack which had looked so frightening a year or even six months before would now have to be faced. War was thought to be unavoidable in 1939 except by gradually surrendering Europe to Nazism. War then had to be faced for now the alternative appeared even worse.

The British were not confident that they would survive in 1939 but they believed they were in a position where there was no real escape from war. The fear of the "knock-out blow" which had previously served the policy of appeasement so well remained, but it no longer served policy in the same way because of the changed perception of the international situation in September 1939.

It is interesting that accompanying this new interpretation of Nazi Germany came a reduction in what had been almost a preoccupation of the Air Staff with a "knock-out blow." As it became clearer that war was inevitable and German bombing raids would soon take place, people seemed to worry about them less. Calculations of the expected scale and consequences of attack which had previously come to the conclusion that Britain must not become involved in a war because of its vulnerability to German bombing were no longer made. Although the expected consequences of air attack were unchanged, the attitude,

both of the military planners and the civilian population,  
had become one of stoicism.

## CHAPTER VII

### CONSTRAINTS ON STRATEGIC BOMBING: 1939-1940

#### Misplaced Anxieties

Stoicism marked the British attitude towards war in general and air attack in particular in September 1939. There was no doubt in the minds of the vast majority of Britons that German bombing would commence with the outbreak of war.

Only a week before war began Josiah Wedgwood, a Member of Parliament, made a wager of five pounds that there would be no bombing of London for six months. So rash a prediction made headline news.<sup>1</sup>

Minutes after Prime Minister Chamberlain had announced that Great Britain was at war for the second time within a generation, the warbling note of the air raid warning signal was heard in London and many other parts of England and Scotland. This did not occasion any surprise, for the British people were prepared, at least psychologically, for the great air attack with which they had been told time and again that the next war would begin.

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<sup>1</sup>Martin Gilbert and Richard Gott, The Appeasers (Boston: Houghton Mifflin Company, 1963), p. 333.

Accordingly many Londoners donned their gas-masks and made preparations as best they knew how for the impending attack.

Churchill describes his thoughts on the first night of the war while waiting for the attack in his shelter after the air raid sirens had been sounded:

As I gazed from the doorway along the empty street and at the crowded room below, my imagination drew pictures of ruin and carnage and vast explosions shaking the ground; of buildings clattering down in dust and rubble, of fire brigades and ambulances scurrying through smoke, beneath the drone of hostile aeroplanes. For had we not all been taught how terrible air raids would be?<sup>1</sup>

But no German bombers arrived that night to attack London; in fact they did not come for almost a year. This failure of the Germans to begin an air attack provoked both surprise and apprehension. No one was able to understand why the "knock-out blow" had not been launched and the people feared an even more horrible fate.

Civil defence planners in London were so startled that, among other things, they forgot to sound the all-clear until the next morning. After a few hours Londoners went back to bed feeling rather uneasy and, if anything, more worried than ever. Many actually wished that the attack would come - they were still certain it would sooner or later - so that they could "get on with it," to settle any doubts about the consequences of German bombing. As

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<sup>1</sup>Winston Churchill, The Gathering Storm, p. 364.

it turned out the warning was occasioned by the unannounced approach of a plane-load of French diplomats and military staff who had come to commence long overdue talks on Allied war plans.<sup>1</sup>

All the Air Staff plans which had been premised on a German bombing offensive and the British retaliation had to be temporarily put aside. Britain had gone to war despite the threat of the "knock-out blow" but then changed her war plans. The plans for the strategic offensive against Germany were not used because the Air Staff and the Government felt that to put them into effect would enlarge the targets of the air war and that for the time being this would not be to British advantage.

The war took a form which no one at senior levels in the R.A.F. had taken seriously. Many could still not understand why Germany had not attacked as everyone had been so sure it would. Air Chief Marshal Dowding repeatedly urged the Air Ministry to resist demands from the French for more aircraft so that he could build up his strength to withstand the "knock-out blow" which he was still sure was going to come. He emphasized that if the country was knocked out from the air, neither Bomber Command nor the Army in Europe could do anything to reverse the situation. The Air Ministry was only partially willing

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<sup>1</sup>Interview with Marshal of the R.A.F. Lord Portal of Hungerford, Sept. 6, 1965.

to listen to these objections for it wanted to build up Bomber Command and felt bound to support the Franco-British armies in the field to the best of its ability. They did agree to give Dowding most of the Hurricanes.<sup>1</sup>

On September 2, 1939, in answer to President Roosevelt's appeal, Great Britain announced that any bombing by the R.A.F. would be carefully restricted to targets of military importance; Germany announced its formal acceptance of similar limitations on September 18.<sup>2</sup> Such evidence as is available indicates that the decisions not to engage in strategic bombing for the time being had been made by both sides before Roosevelt's appeal. Most people in Britain were not anxious to start a campaign in which they were certain they would come out second best. There were significant exceptions, such as Air Vice-Marshal Douglas, who advised the Chief of the Air Staff to begin immediate bombing of Germany.<sup>3</sup> This group, however, was outnumbered by those who saw a need to conserve and expand Bomber Command.<sup>4</sup> To waste strength by initiating strategic

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<sup>1</sup>Collier, The Defence of the United Kingdom, p. 89.

<sup>2</sup>Webster and Frankland, Vol. I, p. 134.

<sup>3</sup>Interview with Marshal of the R.A.F. Lord Douglas of Kirtleside, Sept. 15, 1965, and D. of Plans Memo., Sept. 7, 1939, quoted in Webster and Frankland, Vol. I, p. 135. Douglas was not concerned about the possibility of retaliation.

<sup>4</sup>Interview with Marshal of the R.A.F. Sir John Slessor, Oct. 13, 1965.

bombing at that point in the war, it was thought, would compromise the future of the force as well as encourage German retaliation.<sup>1</sup>

Hitler had three possible reasons for not wanting to start strategic bombing. In the first place, neither he nor his advisers thought a strategic air offensive independent of a land attack was a way to win wars. Hitler believed that the proper role for the Luftwaffe was close or tactical support of the Army. Secondly, he still hoped that a peace settlement could be arranged; a major bombing campaign would have made this task more difficult. Thirdly, he did not want to invite British bombing of Germany which he believed might cause considerable damage. Thus the Roosevelt proposal for no city bombing fitted in well with the requirements of both sides.

Reviewing the situation after the first ten days of war, the British Chiefs of Staff noted that "entirely contrary to our expectations," no air action had been taken against England and furthermore there was no definite proof that the German Air Force had attacked other than military targets. It was felt that the Allies had more to gain from continuing the limitation on bombing, and they recommended that Britain should not seek to break the mutual constraints.<sup>2</sup> They felt that even if Britain did

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<sup>1</sup>See also Webster and Frankland, Vol. I, pp. 134-35.

<sup>2</sup>Interview with Lord Balfour of Inchrye, Sept. 5, 1965.

adopt strategic bombing, she would always observe the principle of "refraining from attack on civilian populations as such for the purpose of demoralization."<sup>1</sup>

Some have seen the British reluctance to engage in strategic bombing largely as a continuation of appeasement.<sup>2</sup> On September 5 the Polish Air Attaché in London took a message to the Air Ministry asking for immediate action by British bombers against German airports and industrial areas. It was believed this action would relieve pressure on the Poles. L. S. Amery, a staunch critic of appeasement, asked Sir Kingsley Wood, the Secretary of State for Air, what the Government was going to do. Mr. Amery mentioned the currently popular plan of setting the Black Forest alight with incendiary bombs. "Oh, you can't do that," said Kingsley Wood, "that's private property. You'll be asking me to bomb the Ruhr next."<sup>3</sup> Amery reports that there was no question of bombing the Essen munitions works or the German lines of communication for, since they were private property, "American opinion would be alienated."<sup>4</sup>

The role of the Luftwaffe in the September campaign in Poland was primarily one of close support of army units

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<sup>1</sup>Quoted by Butler, p. 20.

<sup>2</sup>Martin Gilbert and Richard Gott, pp. 327 ff.

<sup>3</sup>E. L. Spears, Prelude to Dunkirk (London: Heinemann, 1954), pp. 31-32.

<sup>4</sup>L. S. Amery, My Political Life (London: Hutchinson, 1955), Vol. III, p. 330.



and attack on the airstrips of the Polish Air Force. Although attacks were made on the city of Warsaw during the first week of the war and again during the siege, orders were issued to all crews in the first raids to aim carefully at communications targets and bridges, and the bombings during the siege were explained as close tactical support against resisting enemy positions. According to German Field Marshal Kesselring, Stuka dive bombers were used because of the better target discrimination they offered instead of the more economical bombers.<sup>1</sup>

In an analysis of German air operations during the first four years of war, the German Air Historical Branch in 1944 listed the following objectives of the Luftwaffe in Poland:-

- 1) the destruction of the Polish Air Force with its ground and maintenance organization;
- 2) support of the Army in order to bring about a breakthrough and rapid advance;
- 3) attack on the defensive installations and munitions factories of Warsaw.<sup>2</sup>

This accords quite well with the action of the Luftwaffe in the German offensive against Poland. In the first part

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<sup>1</sup>Butler, p. 20; Collier, p. 79; Albert Kesselring, A Soldier's Record (London: William Kimber, 1953), p. 45.

<sup>2</sup>German Air Historical Branch (8th Abteilung), Sept. 21, 1944, A Survey of German Air Operations 1939-1944, trans. by British Air Ministry AHB 6, June 4, 1947, No. VII /28.

of the battle the targets selected were primarily Polish air fields. Polish deployment was hindered by systematic attacks on railway stations, goods yards and lines. By the destruction of bridges and crossings over the Vistula, the withdrawal of the Polish Army was so delayed that it was encircled. The attacks on Warsaw were designed to speed the advance of the Army; if, however, this involved striking targets where civilians would also be killed, it was of no concern.

On the Western Front German operations were limited during the early period to reconnaissance flights and to minelaying and attacks on coastal shipping. The orders that were given to the Luftwaffe virtually precluded any attack which might result in bombs falling on British or French soil.<sup>1</sup> The extent to which Germany wished to maintain the constraints on strategic bombing is clear from the reception to a proposal for the future of air warfare against Britain made by the German Intelligence Division of the Operations Staff on November 22, 1939.<sup>2</sup>

Discussing the constraints on bombing, the German Air Force Staff noted that "Britain has, in the near future,

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<sup>1</sup>See Werner Baumbach, Broken Swastika (London: Robert Hale, 1960), pp. 69-70 and Adolf Galland, The First and the Last (New York: Henry Holt, 1954), p. 19.

<sup>2</sup>General Schmid, German Air Force Operations Staff (Intelligence), Proposal for the Conduct of Air Warfare Against Britain, Nov. 22, 1939, trans. by British Air Ministry A.H.B. 6, June 21, 1947.

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no interest in seeing an alteration in the present situation, in which both sides are withholding their forces."<sup>1</sup> The German Operations Staff believed that Germany must defeat the British attempt to impose an economic blockade which should be done through attacks on shipping and harbour installations. Emphasis was given to the view that Britain must not in any event be given the excuse to begin strategic bombing.

The conduct of operations envisaged by the German High Command will be completely within the rules of humanity. Attacks will not therefore be made on civilians.<sup>2</sup> It must, however, be pointed out that Germany will treat as war targets all ships and harbour installations. Should the British Government wish to protect the civilian population of certain harbour towns, ample time for evacuation will be available before the coming into force of this order.<sup>3</sup>

The Germans thought that "the U.S.A. will probably judge our action from a moral point of view" and that German bombing would affect "the possibility of the United States entering into the war."

In the proposal of November 22, 1939, the recommended targets were as follows:

- a) British ports;

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<sup>1</sup>Ibid.

<sup>2</sup>This might have been more accurately worded the other way round. Since for military reasons the decision had been made not to attack civilians, Germany would be able to reap the propaganda advantage of abiding by the so-called "rules of humanity."

<sup>3</sup>Ibid.

- b) the British merchant fleet, and
- c) the British Navy.

It was believed that "Britain's only possible counter-measure would be to attack German ports" and that "the effect produced by such operations on our overall situation would . . . be negligible compared to that which similar attacks by the German Air Force could achieve."<sup>1</sup>

The Luftwaffe proposal concluded that if Britain resorted to "terror" measures, for example attacks on towns in Western Germany, the suggestion was to retaliate with similar operations against Britain which would have "even greater effect, due to the greater density of population of London and the big industrial centres."<sup>2</sup>

Even such a limited proposal as this for the conduct of air warfare against Britain was rejected by the German High Command who were reluctant to see any escalation of the war. They felt it was to Germany's advantage to see war continued with the current ground rules. Meanwhile Allied bombers were similarly restricted and conducted only reconnaissance raids, some leaflet raids,<sup>3</sup> and a few

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<sup>1</sup>Ibid.

<sup>2</sup>Ibid.

<sup>3</sup>The so-called "confetti raids" were intensely disliked by Bomber Command crews who felt it foolish that they should have to undergo all the risks of a real bombing raid just to drop paper.

attacks on ships and bases of the German fleet. Care was taken to limit any raids against naval shore bases to targets not co-located<sup>1</sup> with populated areas.<sup>2</sup>

Conflicting Allied Appreciations  
of Strategic Bombing

For the first few months of the war there was no disagreement between the British and the French over the policy of restricting bombing. A divergence arose when the best response to a future German offensive in the West was considered. Even if the Germans were to invade France, the French were most reluctant to take any step that might bring about air attacks in retaliation. This was primarily owing to their appreciation of the capability of the relatively small and obsolete French Air Force and of how easily it could be destroyed by the Luftwaffe. The French were concerned that they might be involved in a strategic air war as a result of the action of their ally. On September 22, 1939, the British Chiefs of Staff noted that, in the event of a German invasion of Holland and Belgium, it would be essential to bomb enemy troop columns and furthermore that such action would require Cabinet approval for it would inevitably involve casualties to Belgian and Dutch soldiers. The Cabinet wished to put off any decision until

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<sup>1</sup>Located near by.

<sup>2</sup>Webster and Frankland, Vol. I, p. 140.

staff conversations were held with the Belgians to reveal more about their plans; these were not immediately forthcoming and the Chiefs of Staff again pressed for authorization. This was at last given on October 13 when the Cabinet concluded that the action which had been proposed "was comparable to the bombardment of towns of military importance which contained citizens and was therefore permissible."<sup>1</sup>

On the following day the Cabinet discussed air policy in a wider context and approved the recommendations of a committee composed of the Chiefs of Staff and several ministers; the recommendations called for the use of British bombers in whatever way offered "decisive results" if Germany initiated a major action against either Britain or France. The Ruhr region containing about sixty per cent of Germany's industry was suggested as being the most promising target; its area was about the size of Greater London and included a large civilian population. It was decided, nevertheless, that an attack on any but military targets "would not be justified unless and until Germany either killed large numbers of civilians by air attack on one of the Allied countries or perpetrated a violation of Belgium."<sup>2</sup> This view was conveyed to the French Generals

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<sup>1</sup>Quoted in Ibid., p. 167. See also Slessor, Ch. 10 for a description of the discussions.

<sup>2</sup>Webster and Frankland, Vol. I, p. 167.

Gamelin and Vuillemin on October 24 with the stipulation that, in the event of an invasion of Belgium, the British Cabinet would have to decide whether or not strategic bombing was to be carried out.

The French Command opposed air bombardment of the Ruhr until the spring of 1940 when they hoped that the disparity between German and Allied air strengths would be reduced. They advocated instead attacks on enemy columns and military targets such as railways and airfields as being the most effective response to a German invasion of Belgium. The British Chiefs of Staff were of the opinion that a German invasion of Belgium would be of such importance that it should be prevented if at all possible, and they believed that an attack on the Ruhr offered the possibility of strangling German industry and seriously disrupting the enemy's lines of communication to the front. While it was acknowledged that such action would almost certainly entail civilian casualties and that this would be contrary to the Cabinet decision that the Germans would have to be the first to assume this responsibility, it was pointed out that the Luftwaffe attacks on Polish factories, power stations, and communications had caused heavy civilian casualties and that this amply justified bombing the Ruhr. In view of the military advantage of attacking the German Army in the early stages of its advance, they asked for discretion to bomb specified military objectives in the

Ruhr the moment that Belgium was invaded and without further reference to the War Cabinet. The Chiefs of Staff recommended "the same action in the event of Holland alone being invaded, if the Belgians invited us in; if the Belgians did not invite us in, we should merely attack from the air such military objectives as would help the Dutch delay the German advance."<sup>1</sup>

This strategic debate with France was conducted in Britain on the grounds that the principal threat was still the "knock-out blow." No one understood why Germany had not started a strategic air offensive. Churchill thought the Air Raid Precautions to be far from satisfactory.

The A.R.P. (Air Raid Precautions) defences and expense are founded upon a wholly fallacious view of the degree of danger to each part of the country which they cover. . . London is, of course, the chief target. . . The people's spirits should be kept up by theatres and cinemas until the actual attack begins. . . Gas masks should be kept at home and only carried in the target areas as scheduled.<sup>2</sup>

The "knock-out blow" however, was not forthcoming and consequently most attention continued to be given to the problem of coordinating bombing strategy with France. On October 23 1939 Air Vice-Marshal Nevill went to France for talks with Generals Gamelin and Vuillemin to whom he presented a policy paper outlining the action that Bomber

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<sup>1</sup>Quoted in Butler, Grand Strategy, p. 168.

<sup>2</sup>The Gathering Storm, pp. 433-34.



Command would take after the lull in the war had ceased. In order to build up the reserve forces as much as possible no action would be undertaken until Germany commenced her Western offensive. If it appeared at any time that enemy action against Britain or France might be decisive, Nevill felt that bombers should be employed in whatever manner appeared to promise the best results. In effect this implied the initiation of full-scale daylight raids on the Ruhr which, it was hoped, might lead to German destruction and defeat. It was inevitable that this would result in large-scale civilian casualties and therefore it was felt that such action would have to be justified by the existence of at least one of three conditions: 1) the initiation of German air bombardment of France, 2) an air attack on Great Britain, or 3) the infliction of numerous civilian casualties by the enemy during an invasion of Belgium.<sup>1</sup>

The French were unenthusiastic for they had an overriding fear of a retaliatory air strike on their vulnerable industry. They also doubted that much damage could be done to the Ruhr and, even if damage was possible, they questioned the effect that this bombing would have on any German progress through Belgium. This view probably resulted more from their great fear of air attack than from an analysis of the situation. General Gamelin

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<sup>1</sup>See Butler, pp. 165-171.

believed that the less bombing that took place, the better would be France's chances for victory.

The reaction in London to the outcome of this conference was one of considerable consternation for it seemed that Bomber Command might be prevented from taking effective action while Germany occupied the Low Countries. Once they had accomplished this the Luftwaffe would be in a very favourable position to launch an attack on England. The task of Bomber Command would be made much more difficult, if not impossible, by a German occupation of the Low Countries. It would be possible to have Luftwaffe fighter support for the German bombers and this might be the decisive factor that would lead to the invasion. Mention of the role of the Luftwaffe in an invasion reflects a vital change in concept from the "knock-out blow." This is really the start of a basic change in strategy owing to a major shift in its underlying assumptions, the full ramifications of which only became clear ten months later. It was becoming increasingly apparent that the principal threat to Britain was not German strategic bombing but an invasion.

On November 13 strategic bombing plans were discussed by the Military Coordination Committee and on the following day by the War Cabinet. It was debated whether or not the invasion of Belgium would be decisive for the outcome of

the war and it was concluded that no decision should be made in advance so that all the facts could be taken into consideration before a strategy was definitely decided upon; this decision was conveyed to the French.

Chamberlain on November 17 expounded the Air Ministry's plan before the Supreme War Council envisaging successive waves of low flying bombers directed against German industrial targets and prepared to accept extremely high rates of attrition (from twenty to fifty per cent).<sup>1</sup> Daladier, the French Premier, disapproved, emphasizing the massive superiority of the German Air Force and the extreme vulnerability of the French factories, though he acknowledged the possibility of a change in this picture in a few months. This acknowledgement was a familiar and constant French gambit; they tried to postpone decisions about bombing in the hope that at a later date they might be easier to make. The British seem to have been less troubled by the possibility of retaliation.

Daladier also doubted that bombing the Ruhr would halt a German invasion of Belgium. Chamberlain did not press the British view and it was agreed that only in the event of the German bombardment of Allied aircraft factories

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<sup>1</sup>When the strategic air offensive finally commenced, more careful calculations were made and according to Lord Portal, it was obvious that no Air Force could accept an attrition rate of ten per cent on each sortie for an indefinite period. Interview with Lord Portal.

or similar objectives would the British bombers, on authorization of the Cabinet but without further reference to the French, initiate a strike at the Ruhr. It was also agreed that even in the event of an invasion of Belgium only military targets would be attacked by the R.A.F. and an attempt would be made to hold the Namur-Antwerp line as the best possible method of preserving as much as possible of Belgium.

On the night of March 19 British bombers attacked the seaplane base at Hornum on the island of Sylt in retaliation for the German attack on Scapa Flow three days earlier.<sup>1</sup> While the attack was not a large one it represented a step in the widening of the air war which the British did not regret.

In April Denmark and then Norway fell to the advancing Germans. The French continued to oppose the British plans for strategic bombing and on April 15 General Gamelin told Sir Arthur Barratt, Commander-in-Chief, British Air Forces in France, that he opposed attacking marshalling yards, oil plants or industry because of the massive retaliation that Germany would inflict. Sir Arthur Barratt told the General that the Germans would begin bombing when it suited them to do so and that Germany would not agree indefinitely to a strategic bombing stalemate just to please the

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<sup>1</sup>Webster and Frankland, Vol. I, p. 211.

Allies.<sup>1</sup>

At an Air Ministry Conference on April 28, 1940, the Vice-Chief of the Air Staff, Air Marshal Richard Pierse, said that the Germans would be able to bomb with four times the destructive power of the Bomber Command and concluded that it would be foolish to provoke such a situation unless decisive results could be promised.<sup>2</sup> Air Marshal Portal favoured the initiation of strategic bombing, but obviously could not promise decisive results. Air Marshal Pierse was strongly supported by Air Vice-Marshal Sholto Douglas, Deputy Chief of the Air Staff; he felt no offensive operations should be undertaken before the beginning of a German invasion of the Low Countries or some other action which appeared as though it might be decisive. This was made the Air Staff view.

By this time even the French had agreed that if the Low Countries were attacked Bomber Command should be used to attack marshalling yards and oil plants in the Ruhr. It was still left for Germany to strike the first blow.

#### The Start of Strategic Bombing

On May 10, 1940, the German Army, preceded and supported by the Luftwaffe, began their offensive against

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<sup>1</sup>Report on Gamelin-Barratt discussions, April 15, 1940, cited by Webster and Frankland, Vol. I, p. 143.

<sup>2</sup>Note of Air Min. Conf., April 28, 1940, Ibid.

the Low Countries on their way toward France. The German operations quickly appeared decisive and the new coalition Government in Britain that had been formed by Churchill was immediately confronted with the question of whether Bomber Command should begin the strategic offensive against Germany. Four days passed in which the War Cabinet hesitated, each day the situation looking worse.

The German bombing of Rotterdam on May 14 indicated that Germany was using air support tactics similar to those employed in the invasion of Poland.<sup>1</sup> The circumstances surrounding this episode are still not entirely clear but it now appears that when the Dutch surrendered, the orders to cancel the German strike on Rotterdam were given. These countermanding orders reached some of the German aircraft in time for them not to release their bomb loads, but for the majority it was too late.<sup>2</sup> Many civilians were killed in the bombing of Rotterdam. The Germans certainly used the psychological effects of their air power to hasten the surrender of Rotterdam by both threatening and being willing

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<sup>1</sup>See Collier, pp. 569-70 for the best analysis available. The German view is presented in The Effects and Results of the Use of Elements of the Strategic Luftwaffe in Direct Support of the Army, Dec. 24, 1943, prepared by the German Air Historical Branch (8th Abteilung), trans. by the Air Ministry, London, A.H.B., Oct. 1, 1946, No. VII /1.

<sup>2</sup>David Irving in his book The Destruction of Dresden (New York: Ballantine Books, 1965), has weighed the available evidence. See Ch. 1 passim. See also Field Marshal Kesselring's memoirs, p. 58.

to carry out a policy of destruction of the city. That this might result in civilian loss of life was hardly a deterrent. Even though indiscriminate bombing did occur, it still was used in support of the Wehrmacht.

Also on May 14 the French lines were broken at Sedan and on the next day all Dutch resistance, except for a remnant at Zeeland, collapsed. The same day the British War Cabinet authorized Bomber Command to attack targets east of the Rhine and that night ninety-nine bombers were despatched to attack oil and railway targets in the Ruhr.<sup>1</sup> This marked a major change in the limits on strategic bombing and indicates that Britain was now willing to risk retaliatory strategic bombing by attacking German industry. Clearly the fear of a German "knock-out blow" was receding.

There is little doubt that part of the reasoning that led to the British decision to bomb the Ruhr stemmed from the fact that Fighter Command had meanwhile become convinced that it would not be possible to defeat the Luftwaffe over the Continent; they therefore felt that it would be desirable to entice or provoke the Germans into daylight battles over England where the R.A.F. fighters with their radar aids would have an advantage.<sup>2</sup>

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<sup>1</sup>War Cab. Mtg., May 15, 1940. Bomber Command Operations Record Book, May 15-16, 1940, cited by Webster and Frankland, Vol. I, p. 144.

<sup>2</sup>Interview with Lord Portal. See also Irving, p. 28.

The British were convinced that an escalation of the air war was to their advantage. Even though it meant that Germany would probably take some action to counter the British bombing of the Ruhr, the feeling was that on balance Britain had more to gain by widening the war. It was hoped that gains would come from the effects of destroying the targets in the Ruhr as well as from luring the Luftwaffe into battles over Britain. The air war did not escalate because of some mysterious or inexorable force but rather due to a calculated judgment by one of the participants that this was the best way to counter the enemy.

A position of numerical inferiority did not deter the British from pursuing their policy of strategic bombing. In the period up to the French surrender on June 17, 1940, raids were alternately conducted on German ground forces, on the German synthetic oil industry, and on communications links from Germany to the front; the targets all had obvious military significance. Attacks were conducted at night because of the heavy losses that daylight bombing would have entailed; another reason was to spare civilian lives but due to inaccuracy and co-location of military targets with population centers a number of civilians were killed. No raids were conducted against Berlin or any other cities in the east of Germany. Although some



restrictions had been removed and limited escalation had taken place, the British were still reluctant to do anything that might provoke a German attack on the major urban areas of Britain.<sup>1</sup>

A few German raids were made on Britain during this period and these were usually confined to R.A.F. fighter bases in the southeast of England.<sup>2</sup> By June 1940 London and the other large British cities had not yet been bombed and those cities of Germany which had been bombed had not yet been heavily attacked. The restraints that had been observed by Germany indicate the continuing German desire to avoid if possible a strategic bombing campaign, at least for the time being. Hitler probably still had hopes for ending the war through a negotiated settlement and realized that a bombing campaign with no restraints would make any reconciliation much more difficult than it otherwise would be. He saw no military requirement for bombing and felt that there would be no advantage to Germany to begin attacks on urban-industrial targets.

#### German Strategy

In a talk before his military chiefs on May 23, 1939, Hitler had said:

Luftwaffe attacks on England will not force

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<sup>1</sup>Webster and Frankland, Vol. I, p. 148.

<sup>2</sup>Collier, p. 156.

her to capitulate. But if the fleet is annihilated instant capitulation results. There is doubt a surprise attack might lead to a quick decision. . . . The moment England is cut off from her supplies she is forced to capitulate. Imports of food and fuel are dependent on naval protection.<sup>1</sup>

He, like the British Air Staff, had thought of cutting off British food supplies but Hitler felt that this could be done best through the use of sea rather than air power.

Hitler's intention to use the Luftwaffe in close support and not to commence immediately strategic bombing against Britain is clear from his Top Secret Directive No. 1 for the Conduct of the War prepared on August 31, 1939.

The Air Force is, in the first place, to prevent the French and British Air Forces from attacking the German Army and the German Lebensraum.

In conducting the war against England, preparations are to be made for the use of the Luftwaffe in disrupting British supplies by sea, the armaments industry, and the transport of troops to France. A favourable opportunity is to be taken for an effective attack on massed British naval units, especially against battleships and aircraft carriers. Attacks against London are reserved for my decision.<sup>2</sup>

On September 3 in his Top Secret Directive No. 2 for the Conduct of the War Hitler asserted:

The German war objective remains for the time being the speedy and victorious conclusion of the

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<sup>1</sup>Documents on German Foreign Policy 1918-1945, Series D, 1937-1945, Washington: U.S. Department of State, V, pp. 847-54. This is not the actual text of Hitler's speech but is from the minutes taken by his adjutant, Lieutenant Colonel Rudolf Schmundt.

<sup>2</sup>Ibid., VII, pp. 477-79

operations against Poland. . . In the West the opening of hostilities is to be left to the enemy. . . Against Britain naval operations are permitted.

The Luftwaffe was not to attack even British naval forces unless the British opened similar attacks on German targets - and then only "if prospects of success are particularly favourable."<sup>1</sup>

Germany's desire to limit the targets of strategic bombing is indicated in the following plans produced on November 22, 1939.

The possibility of beginning attacks against military and essential industrial targets in Britain has arisen due to the temporary postponement of the offensive in the West.

The aim of these attacks must be to increase the already existing unrest in the country, to hinder the flow of imports, and thus to dislocate the whole enemy supply system. This can best be achieved by carrying out attacks in widely separated areas by day and by night. These operations will usefully supplement those of our navy, which has already virtually succeeded in paralyzing the British East coast ports . . .

The selection of targets must be governed by the principle that we must avoid giving the impression that Germany is opening unrestricted strategic aerial warfare. For should this appear to be the case, the British would promptly reply by attacks on open towns in Germany, and if the defence of these becomes necessary, the result will be a marked decline in the assistance which the Luftwaffe can give in the event of an offensive being launched. . . As long as the possibility exists of an offensive in the West, our air attacks must be on a limited scale, and restricted to attacks on vital military

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<sup>1</sup>Ibid., II, p. 133.

targets.<sup>1</sup>

### A Modified British Appraisal

In Great Britain very important changes were taking place in the Air Staff appreciation of the principal danger confronting the country. The concern about the "knock-out blow" had by this time virtually vanished. In part this was a result of progress in civil defence and more particularly in air defence owing to the increasing numbers of Hurricanes and Spitfires and to the further development and deployment of radar. Current estimates indicated that although the effects of air bombardment would be serious, they would not be so catastrophic as had been assumed for so long.<sup>2</sup>

More important, however, was the now overriding concern about an invasion. It was only after the overrunning of the Low Countries that the possibility of invasion began to be taken seriously.<sup>3</sup> It became clear that the main threat to British security was not the "knock-out blow" as had been assumed for so long. The enemy might simply aim at air superiority over a stretch of coast where raiding forces were to land, or where full-scale invasion would

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<sup>1</sup>Plans for Air Warfare on England, Nov. 22, 1939, trans. Air Ministry, London, A.H.B.6, May 20, 1947, No. VII /26.

<sup>2</sup>Butler, p. 211.

<sup>3</sup>Collier, p. 103.

take place at some later date and the defeat of the country could come about without any strategic bombing of Britain. Few held much hope of defeating Germany in the event an invasion succeeded in landing German troops on British soil.

The Air Staff judged that a seaborne invasion was "not a practical operation of war" unless Fighter Command was first defeated.<sup>1</sup> They therefore turned their attention from the "knock-out blow" to the air assault which would be a necessary prelude to any German invasion. It was planned that British bombers should begin to strike enemy air fields, aircraft production plants and, if possible, at the embarkation points for the invasion as well as at the ships being used in the actual crossing.

The thinking of the Air Staff had switched from a pre-occupation with the "knock-out blow" to a pre-occupation with a possible invasion.<sup>2</sup> Portal has said that no one in the Air Staff believed by the summer of 1940 that Germany could win the war through attacks on the civilian population of London. Yet there were no new calculations about expected scale of German attack or predictions of the number of casualties to indicate the impossibility of a "knock-out blow." Concern about the "knock-out blow" had

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<sup>1</sup>Collier, p. 138.

<sup>2</sup>Interview with Sir John Slessor. See D. of Plans to D. of O, April 6, 1939, D.H.O. Fighter Squadrons for evidence of the extent to which the Air Staff was pre-occupied with the "knock-out blow."

vanished without fanfare.<sup>1</sup>

Invasion, something which had always appeared to be a rather remote contingency, now was clearly the prime danger. The reason for this was not that the problem of a German strategic air offensive was now calculated to be any less dangerous, for it was not. The early-warning system was almost ready in the south and east, but it was far from completion in the west and in parts of Scotland. There were grave shortages of balloons and anti-aircraft guns. The number of aircraft being produced was fairly satisfactory but the output of trained pilots was far behind schedule.<sup>2</sup> Yet the threat of the "knock-out blow" for which all plans and preparations had been made for so long did not seem so serious in view of the newly seen threat of invasion.

A group in the Air Staff headed by Air Marshal Portal continued to press for a British air offensive on Germany.<sup>3</sup> They were not particularly concerned about German retaliation; the role of the Luftwaffe in the German assault on Rotterdam gave strong indications that German bombers would one day be used in a similar way against Britain.

The degree to which thought was swinging away from

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<sup>1</sup>Interview with Lord Portal.

<sup>2</sup>Collier, p. 154.

<sup>3</sup>Webster and Frankland, Vol. I, p. 244.

the fear of the "knock-out blow" is indicated by the growing size of the group pressing for the start of British bombing; they reasoned this would draw the Luftwaffe away from ground support where it was so effective to strategic bombing where it was presumed the effect would be considerably less. Hopefully this would ease the pressure on ground forces and bring into the war R.A.F. fighters which had to be held in Britain for air defence.<sup>1</sup>

Not only was the idea of a German air offensive against Britain becoming less worrisome but it seemed preferable to a continuation of the present situation. Berlin should not be attacked in the hope that London might also be left untouched. This was a convenient restraint for the British because Bomber Command strikes against Berlin would have been rather difficult in view of the long distances involved.

The British wanted the war to be fought at the level which they believed to be most advantageous for themselves; although they had decided to initiate strategic bombing, stringent constraints were to be maintained. The primary targets of Bomber Command were the German airships in France and German shipping in French ports opposite the English coast. Raids on a much smaller scale were to be conducted

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<sup>1</sup>Fitzgibbon, p. 42; Richards and Saunders, Vol. I, p. 122.

against targets in the Ruhr and northwestern Germany.<sup>1</sup>

Between June 17, the date of the fall of France, and July 10, the intensity of German raids on Britain was relatively low and the principal targets were British air bases. From July 10 to August 12 the attacks were much heavier and the principal target was coastal shipping. On August 12 the massive attack began on the fighter bases and, for the first time, on the British aircraft industry.<sup>2</sup> Until the 24th of August the targets were quite carefully selected to achieve the objective of air superiority over the R.A.F.<sup>3</sup> London and most of the other population centers were left untouched and the Luftwaffe raids were conducted with some effort being made to minimize civilian casualties.

#### The Battle of Britain: A New View

The fear of air attack on cities seemed less and less serious the more Britain was faced with the real danger of an invasion. The raids of the Luftwaffe against R.A.F. bases, the prelude to an invasion, were showing results which appeared to be almost decisive; the communications system on which the R.A.F. depended to compensate for its numerical inferiority was seriously

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<sup>1</sup>Webster and Frankland, Vol. I, p. 148.

<sup>2</sup>Collier, pp. 450-59.

<sup>3</sup>Wood and Dempster, p. 220.



threatened with destruction.<sup>1</sup> If enough Sector Stations were destroyed, Germany could achieve superiority over the coast where an invasion force could be landed.

On August 23 the Luftwaffe conducted a night raid in which no more than a dozen bombers were directed to strike aircraft factories and oil tanks on the outskirts of London; the daytime raids still focused on crippling the R.A.F.<sup>2</sup> Apparently as a result of a navigational error a perfume factory was destroyed by the few bombs which were dropped.<sup>3</sup> This attack has been cited by Churchill as moral justification for his ordering the Berlin raid of the next day, and as a cause of the almost complete breakdown of constraints on bombing.<sup>4</sup>

The raid on London was not a large one, however, and might easily have been treated as an accident. It could not be certain that massive attacks on London had commenced as the next stage of Hitler's carefully worked out strategy of widening the air war so as to defeat Britain, though Churchill clearly implies this.

The early German operations sought to engage

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<sup>1</sup>Drew Middleton, The Sky Suspended (London: Seeker & Warburg, 1960), p. 148. Peter Wykesham, Fighter Command (London: Putnam, 1960), p. 114.

<sup>2</sup>Collier, p. 203; Richards and Saunders, Vol. I, p. 171, and William L. Shirer, The Rise and Fall of the Third Reich (New York: Simon and Shuster, 1960), p. 777.

<sup>3</sup>Collier, p. 207.

<sup>4</sup>Churchill, Their Finest Hour, p. 293.

our air forces in battle over the Channel and the south coast; next, the struggle was continued over our southern counties, principally Kent and Sussex, the enemy aiming to destroy our air-power organization; then nearer to and over London; then London became the supreme target . . . [Hitler] took, of course, full advantage of our reprisal on Berlin and publicly announced the previously settled German policy of reducing London and other British cities to chaos and ruin. "If they attack our cities," he declared on September 4, "we will simply rub out theirs."<sup>1</sup>

There would seem to be a good deal more to what happened than this explanation would indicate. First, there was not the slightest question in Churchill's mind that "our fate now depended upon victory in the air. The German leaders had recognized that all their plans for the invasion of Britain depended on winning air supremacy above the Channel and the chosen landing places on our south coast."<sup>2</sup>

Secondly, the battle for air supremacy was not going at all well for the British. Thirdly, the existence of Fighter Command was more important than preserving London as a sanctuary from German bombing. In his memoirs Churchill notes:

In the fighting between August 24 and September 6, the scales had tilted against Fighter Command. During these crucial days the Germans had continuously applied powerful forces against the airfields of South and Southeast England. Their object was to break down the day fighter defence of the capital, which they were impatient to

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<sup>1</sup>Ibid., pp. 292-93 (italics mine). It should be noted that Hitler's statement was made on September 4.

<sup>2</sup>Ibid., p. 273.

attack. Far more important to us than the protection of London from terror-bombing was the functioning and articulation of these airfields and the squadrons working from them. In the life-and-death struggle of the two air forces, this was a decisive phase. We never thought of the struggle in terms of the defence of London or any other place, but only who won in the air. There was much anxiety at Fighter Headquarters at Stanmore, and particularly at the headquarters of Number Eleven Fighter Group at Uxbridge. Extensive damage had been done to five of the group's forward airfields, and also to the six sector stations. Manston and Lympne on the Kentish coast were on several occasions and for days unfit for operating fighter aircraft. Biggin Hill Sector Station, to the south of London, was so severely damaged that for a week only one fighter squadron could operate from it. If the enemy had persisted in heavy attacks against the adjacent sectors and damaged their operations rooms or telephone communications, the whole intricate organization of Fighter Command might have broken down. This would have meant not merely the maltreatment of London, but the loss to us of the perfected control of our own air in the decisive area. . . . It was therefore with a sense of relief that Fighter Command felt the German attack turn on to London on September 7, and concluded that the enemy had changed his plan. Goering should certainly have persevered against the airfields, on whose organization and combination the whole fighting power of our air force at this moment depended. By departing from the classical principles of war, as well as from the hitherto accepted dictates of humanity, he made a foolish mistake. . . . The night attacks on London for ten days after September 7 struck at the London docks and railway centres, and killed and wounded many civilians, but they were in effect for us a breathing space of which we had the utmost need.<sup>1</sup>

Dowding, at the time Commander-in-Chief of Fighter Command, wrote:

The damage done to fighter aerodromes and to their communications and ground organization was serious and has been generally under-estimated. Luckily the Germans did not realize the success of their efforts and shifted their objective before the

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<sup>1</sup>Ibid., pp. 283-84. (italics mine).

cumulative effect of the damage done had become apparent to them.<sup>1</sup>

He concluded that "if the fighter defence had failed. . . England would have been invaded."<sup>2</sup>

But was it just luck? Dowding has said that the Germans were working to a timetable or schedule and that it is just fortunate for Britain that a switch was called for when Fighter Command was almost defeated.<sup>3</sup>

Lord Balfour, who was in the Cabinet during this period, has written that as soon as Germany made civilians their primary target "we knew we were 'home and dry.' The enemy would never win the war by trying to break the British people's morale through terror bombing."<sup>4</sup> The statement reflects the completely different view from that of a year or even six months before. It was not, however, apparently based on any new calculations about the effects of German bombing.

The facts are therefore clear. There is little doubt that Fighter Command was in serious danger of being annihilated.<sup>5</sup> If the Germans had kept up their pressure for much longer they would have had command of the air. It

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<sup>1</sup>Balfour papers.

<sup>2</sup>Ibid.

<sup>3</sup>Interview with Air Chief Marshal Lord Dowding of Bentley Priory, Dec. 6, 1965.

<sup>4</sup>Balfour papers.

<sup>5</sup>Virtually no one except Douglas questions this judgment. Interview with Lord Douglas.

was the German decision to start bombing London that gave the R.A.F. its vital "breathing space." This "breathing space" provided the narrow margin between an invasion and a victory in the Battle of Britain.

Churchill's decision to bomb Berlin on August 24 can be interpreted as an intentional attempt to draw the Luftwaffe away from the R.A.F. bases and on to the cities. Although he did not tell any of his senior officers of his line of reasoning, if it was as we are suggesting, Portal, at the time Commander-in-Chief of Bomber Command, has concluded this hypothesis may well be true.<sup>1</sup> Certainly the few bombs falling on London were not in themselves sufficient reason for the raid on Berlin of almost 100 bombers which would force Hitler to retaliate against London. Certainly the Government and the R.A.F. were both pleased when Germany switched its attacks from the air bases to London.

There is no question that Hitler's change in strategy was made only after the raid on Berlin. It took two weeks for the Luftwaffe to begin the blitz of London because they did not have war plans for this contingency and this is the reason the raids continued on the R.A.F.

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<sup>1</sup>Interview with Portal. An interview with Lord Dowding confirmed that if Churchill had decided to try to lure the Germans away from Fighter Command he did not tell the Commander-in-Chief of Fighter Command of his strategy. Dowding in fact opposed the bombing of Berlin although this turned out to be an important factor in the British victory in the fall of 1940.

bases for this period. Hitler ordered the G.A.F. to prepare to attack London the day after Berlin was bombed by the R.A.F. and this decision to change the targets of German bombers was a direct result of the British attack.<sup>1</sup>

Bomber Command's attacks on Berlin did in fact draw the Luftwaffe away from the fighter bases. The interesting question remains whether this was a bait purposely laid by Churchill. While the evidence for this is purely circumstantial, it does fit the facts very well and offers a possible as well as plausible explanation for the British raid on Berlin after the relatively trifling attack on the perfume factory by the Luftwaffe. It is also, of course, possible that the raid was ordered to seek revenge or perhaps out of frustration. Churchill may have even been misinformed about the size of the German attack on London and consequently really believed that Hitler had started a campaign directed against British cities.

Certainly the Government did not want to see cities attacked any more than it did in May 1940, but the incentive to draw the Luftwaffe away from the air bases

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<sup>1</sup>Shirer, pp. 778-80 and Wykesham, pp. 127-28. See for positive confirmation of this The Course of the Air War Over Central and Western Europe, A Study Prepared by the German Air Historical Branch (8th Abteilung) trans. by British Air Ministry A.H.B. 6, Nov. 21, 1946. No. VII /10. For conclusive evidence that Germany had no war plans for a strategic air offensive see The Course of the Air War Against England July 7, 1944, a study prepared by the German Air Historical Branch and translated by the Air Ministry, London, A.H.B. 6, May 20, 1947 No. VII /26.

had been considerably raised. One way of doing this, and perhaps the only way, was to start bombing German cities. It would then be very hard for Germany not to respond in kind. The British Government ~~already had~~ had some experience with the reaction of the population to its leaflet bombing of Germany and probably realized that even in Germany the inevitable public pressure to bomb British cities if German cities were bombed would have to be met.

The Luftwaffe had not been aware of the critical state of Fighter Command's communications because the destruction of the Sector Stations had been largely an incidental result of their co-location with the airstrips and hangers.<sup>1</sup> The Luftwaffe was drawn away from its attacks on the British active defences just when it was close to success. In short, even if this was not done by actually inducing Germany to bomb British cities instead of the air bases, this indicates the vast change that had occurred in the Air Staff and the Government as a whole in their appreciation of the expected consequences of air bombardment generally, and particularly air bombardment of cities. Regardless of whether the hypothesis that Churchill intentionally provoked Hitler is accepted or not, a major change had taken place since the days of the primary concern about a "knock-out blow."

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<sup>1</sup>Alexander McKee, Strike from the Sky (Boston: Souvenir Press, 1960), p. 152.

Great damage was still expected from air attack, for "our outlook at this time was that London, except for its strong modern buildings, would be gradually and soon reduced to rubble."<sup>1</sup> Yet Churchill apparently did not think that this would result in a "knock-out blow." Estimates of physical destruction were still exaggerated, but the behaviour of the population under conditions of bombing was viewed in vastly different terms. Much credit was given to shelters but, more important, the possibility that the British people might not be able to take the pressure of air attack was now almost completely discounted.<sup>2</sup>

The reasons for this change are unfortunately not as clear as might be desired. One of the sources for this difference in expectations was the experience of the first year at war. The possibility of precision bombing and the assumptions about the effectiveness of bombing were still overestimated, although certainly the error was less, but the Government had developed a deep faith in the capability of the people to withstand massive air attack.

The other major factor which cannot be overlooked

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<sup>1</sup>Churchill, Their Finest Hour, p. 300.

<sup>2</sup>Ibid. Also according to Lord Portal. See also Air Marshal Sir Robert Saundby, Air Bombardment for further confirmation of this hypothesis.



is the different position of Britain in September 1940 in comparison with the two previous Septembers. In 1938 and again in 1939 the principal danger appeared to be a massive air attack. In 1940 the major fear was that of an invasion; this is clear from Churchill's memoirs. This modified situation envisioned a worse conceivable disaster than a massive German air attack: an invasion. With the danger of invasion predominant, cities and civilians might have to be sacrificed.

This resulted in a further breakdown of the constraints on strategic bombing, continuing the process begun in May 1940; again this was a product of a revised British appreciation of the threat of enemy air bombardment. Before the war the Air Staff had been so sure Germany would begin the war with the bombing of British cities that it gave no thought to Britain taking the initiative. After Germany failed to begin air attacks it was calculated that Britain would have more to gain from mutual restraints on bombing than from a lack of such restraints. This judgment changed in May and again in August. In each case the change was associated with a new evaluation of the threat to British national security. The possibility of Britain being defeated by a "knock-out blow" was far from the minds of the Air Staff during the summer and fall of 1940. It was so far away, in fact, that Britain may have tempted the enemy to try a

"knock-out blow," the act the Air Staff had feared most of all before the war. Even if the Germans were not intentionally provoked, there is no question that German bombing of London came as a relief to the Air Staff.

The basic assumptions about the principal threat to national security had been altered. The threat of the "knock-out blow" which had been a major, if not the major, theme in British defensive planning since the end of World War I had evaporated.

## CHAPTER VIII

### R.A.F. WAR PLANS AND THE OFFENSIVE AGAINST GERMANY

#### Pre-War Plans

In the preceding seven Chapters many of the factors that resulted in the exaggeration of the threat of the "knock-out blow" have been analyzed. From an examination of the Air Staff pre-war plans for an air offensive against Germany it is possible to gain a clearer idea of why the R.A.F. so vastly underestimated the scale of attack and degree of technical proficiency needed to assure destruction by bombing. Many of the same errors were involved in both the offensive and defensive calculations such as, for example, excessive optimism concerning navigation and bombing accuracy.

Many of the Air Staff's ideas of what Germany could accomplish by bombing Britain came from their own expectations of the damage they could inflict in a bombing offensive against Germany. While the R.A.F. at no time before the war felt they could deter a German "knock-out blow," paradoxically they were optimistic that they would be able to inflict high levels of destruction.

In part the R.A.F. underestimation of the difficulties involved in strategic bombing came from conclusions drawn from the few actual combat operations of the inter-war period. The experience that the Royal Air Force had in Iraq, Somaliland, and the North-Western Frontier of India produced excessively optimistic ideas as to the ease with which targets could be located and destroyed. A Report of a Committee on Coast Defence noted on May 9, 1932, that "we were informed by the Chief of the Air Staff that accuracy of aim has improved so much that on the North-West Frontier of India aircraft are able to bomb a house of a particular sheikh."<sup>1</sup> With such accuracy it was assumed that the R.A.F. could certainly precisely bomb targets in a war with Germany.

The first detailed war plans for Bomber Command were prepared in 1937. It was readily apparent that there were only hazy ideas of what was operationally feasible. While the Air Staff doubted that any significant damage could be done to Germany until considerable expansion of the bomber forces had taken place, they were confident that after an expansion R.A.F. bombing would be very effective.

The Western Air Plans called for precision bombing of relatively small targets such as Luftwaffe bases, road,

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<sup>1</sup>Quoted in Webster and Frankland, The Strategic Air Offensive Against Germany 1939-1945, Vol. I, p. 60.

rail and canal communications, and German war industry including oil.<sup>1</sup> By 1938 trials on the Salisbury Plain indicated bombing was not as precise as had been anticipated but that it was still accurate enough for a strategic offensive.<sup>2</sup>

The Air Staff concluded in 1938 that the most profitable target for British bombers would be the German war industry. If the bombing force expected in 1939 concentrated its attack on nineteen power plants and the twenty-six coking plants, it was calculated that these could be put out of action by 3,000 sorties with a loss of 176 aircraft. As a consequence of these raids it was expected that Germany's war machine would grind to a halt.<sup>3</sup>

Calculations were also made which indicated the Mohne and Sorpe dams could be destroyed with equal or less effort. It was also thought possible to cripple the transportation system of Germany with the 1939 or the 1940 force of bombers.<sup>4</sup>

In view of the great difficulty Bomber Command

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<sup>1</sup>Peirse (D.O.1) to Ludlow-Hewitt, Dec. 13, 1937, Ibid., p. 94.

<sup>2</sup>Letter of Ludlow-Hewitt to Air Min., Aug. 30, 1938, Ibid., p. 96.

<sup>3</sup>Letter and Appreciation Bomber Cmd. to Air Min., July 28 and May 1938, Ibid., p. 97.

<sup>4</sup>Air (Targets) Intelligence Memo., Sept. 8, 1938, Ibid., p. 98.

experienced in destroying these target systems during World War II the planning factors which the Air Staff adopted for their calculations are of considerable interest. First, they assumed that the number of hits obtained in war would be half those obtained in peace exercises. Secondly, it was assumed that fifty per cent of the aircraft that took off on a raid would actually bomb their targets. The basis for this assumption was a World War I average of 55.5 per cent.<sup>1</sup> Thirdly, it was assumed ten per cent of all bombs dropped would fail to explode. Fourthly, when targets were in highly defended areas only high level bombing would be possible. If targets were not in heavily defended areas it was thought that fifty per cent of attacks would be delivered at 1,500 feet or below. High precision bombing at night was acknowledged to be impossible. One of the Air Staff's weakest moments came when they assumed that it would be possible to carry out daylight raids.<sup>2</sup>

The calculations estimated the average area of targets such as electricity generating stations, coke-oven works, and coal distillation plants. They then estimated the number of hits with 500 pound bombs required to put

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<sup>1</sup>Jones, The War in the Air, Vol. VI, p. 163 n.

<sup>2</sup>Minute of Deputy Director of Plans (Slessor), Nov. 3, 1938, War Plans: Policy and Assumptions, 4th Dec. 1938 - October 1940, Cat II A/2/9, Great Britain, Ministry of Defence, Air Historical Branch.

the objectives out of action for two to three months. It was thought that an electricity station with an area of 10,000 square yards would require three hits. Coking, aluminium, zinc, and coal tar distillations plants were estimated to be about 40,000 square yards and each would consequently require twelve direct hits.<sup>1</sup>

Slessor, the Deputy Director of Plans, was not satisfied that the planning process was as good as it might be and recommended that the responsibility for considering the operational aspects of war planning be shifted from Bomber Command to the Air Ministry. His recommendation was accepted even though Ludlow-Hewitt, Commander-in-Chief of Bomber Command, was opposed.

Slessor wanted more information on the penetration capabilities of Bomber Command for both day and night bombing. He specifically wanted to know what proportion of bomber crews might be expected to find their targets. He desired more precise information on the accuracy of high and low level bombing, both by daylight and at night. He was not at all satisfied that the planning factors were realistic and wanted to see a more systematic treatment of the problem.

Ludlow-Hewitt resisted any organizational changes and felt that Bomber Command should make its own plans. On Slessor's recommendation a conference was held on November 30,

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<sup>1</sup>Ibid.

1938, in the Assistant Chief of the Air Staff's office. Slessor proposed a series of questions that should be discussed on penetration and accuracy against various target systems in Germany.<sup>1</sup>

With Air Vice-Marshal Sholto Douglas presiding at the meeting, Sir Edgar Ludlow-Hewitt began by disagreeing with Slessor's view that a detailed plan for bombing should be prepared. All he wanted to be given was a directive listing the most suitable targets and he then felt qualified to judge on the basis of his experience how best to execute the attack. Slessor replied that he felt a more systematic consideration of an attack would be useful.<sup>2</sup>

Changing the focus of discussion, Ludlow-Hewitt said that he was not prepared to send his missions deep into enemy territory at the outbreak of war. He felt that such a course might end in a major disaster. Everyone was "in the dark" as to what would happen in a major war and he proposed "to feel his way." This would mean starting with targets fairly close in and gradually penetrating further and further unless the casualty rates became too high. The first thing to do was to work out the perfect plan and then targets should be graduated

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<sup>1</sup>Agenda for a Conference to be held on Nov. 30, 1938, in A.C.A.S.'s office to discuss the assumptions required for planning for war, War Plans: Policy and Assumptions.

<sup>2</sup>Minutes of the Conference, Ibid.



according to their distance from the frontier; the best targets to attack would be selected within the limits of penetration ruling at the time.

Slessor suggested that two important limitations covering the selection of targets would be the scale of attack and the accuracy of bombing. He wanted a discussion at the conference of the planning factors that should be used. It was agreed to accept the following standards of accuracy as assumptions for future war planning:-

<u>Type of Attack</u>	<u>Average Error</u>
High level attacks (day)	300 yards
Low level attacks (day)	75 yards
Shallow dive attacks (day)	200 yards

It was also agreed that it would not be feasible to engage in precision night attacks. When all types of bombers were capable of attacking both by day and night, and assuming that the objectives were precise targets, it was thought that seventy-five per cent of all attacks would be in daylight and twenty-five per cent at night. Most of the calculations which followed the conference assumed bombing entirely in daylight.

It was agreed to assume the number of aircraft which would bomb their objectives by day would depend upon the depth of penetration, and that it might vary as follows:-

<u>Depth of Penetration</u>	<u>Proportion Bombing Target</u>
80 miles	80%
150 miles	60%
200 miles	40%

Against area targets at night, seventy-five per cent of the attacking force might be expected to bomb their targets accurately. Low day attacks would be essential for decisive results against small precision targets, and the proportion of low to high would be about even.<sup>1</sup>

The conference provided the assumptions necessary for detailed planning to take place. The planning factors that were agreed upon led to the conclusion that high level precision attacks would be feasible. Consequently a list of sixteen war plans for a strategic air offensive against Germany was produced; most required accurate precision bombing.

By 1939 there was general agreement within the Air Staff that the most profitable target system consisted of the electricity generating stations, the gas producing plants, and the coking plants in the Ruhr. Second priority would go to the Ruhr railways and selected inland waterways. It was believed that "a comparatively small weight of attack on the more vulnerable points of the system of communications in the Ruhr might lead to dislocation of rail transport, and might by this means accentuate the dislocation of industry which attack of electricity and gas power is designed to effect."<sup>2</sup> It was thought that

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<sup>1</sup>Ibid.

<sup>2</sup>Quoted in the Report of the British Bombing Survey Unit, The Strategic Air War Against Germany 1939 - 1945, p. 2.

even a relatively light attack on the railway system might slow a German advance through the Low Countries. "It is upon dislocation," the plan read, "not destruction, that air action against communication relies for its effect."<sup>1</sup>

Just before the start of the war in September 1939 the Air Staff was thinking in terms of no more than a few days or at most a week or two to destroy these major target systems. The advocates of the oil plan and of the plan for attack on industry rivalled each other in predicting how quickly the objectives of their particular plan could be achieved.<sup>2</sup>

On October 16, 1939, a new proposal was made for the oil plan on the basis of a calculation showing that its operational feasibility was four to seven times as good as that of an attack on industry.<sup>3</sup> The calculations assumed an average low level error of 75 yards and a high level error of 300 yards. It was thought that forty per cent of all aircraft which took off on a mission would fail to attack their allotted targets as a result of enemy action

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<sup>1</sup>Ibid.

<sup>2</sup>Plans 2, "Note on the Course of Action to be adopted from the point of view of the 'Air' war as soon as 'Gloves off' Policy is approved by the Government," Sept. 10, 1939 and D. D. Plans (OP), "Summary of Plans for Action by the Air Striking Force Against Enemy War Industry," Sept. 17, 1939, War Plans: Policy and Assumptions.

<sup>3</sup>Plans 2, "Note on the Relative Merits of Oil and Power as Objectives for Air Attack," Oct. 16, 1939. Ibid.

or operational difficulties.

These calculations went one step further than those of November 1938 for after estimating the number of direct hits required to assure destruction of each type of target system, calculations were made about the number of sorties needed. The weight of bombs necessary to destroy an electricity plant was raised from the original estimate of 1,500 pounds to 2,000 pounds. Coking plants, now assumed to be 160,000 square yards in area, were calculated to require 16 tons. It was estimated that an oil refinery plant of 2,500 square yards could be destroyed with 1,000 pounds of bombs and a synthetic oil plant of 160,000 square yards with 4 tons.

Estimates were made of the percentages of direct hits likely to be obtained by both low and high level attack. This varied from almost nil with high level attacks on electricity or oil refining plants to 100 per cent for low level attacks on synthetic oil plants. The number of sorties of heavy aircraft required to take off for the attack in order to obtain the required number of direct hits, allowing 40 per cent failure, was then calculated. The results varied from a minimum of five for low attacks on electricity and oil refining plants to a maximum of 77 on coking plants. The number of sorties required to destroy the entire oil target system of twelve refineries, nine synthetic oil plants, and one tank farm was then calculated

to be 259 at low level or 726 at high level. This would take a maximum of thirteen days but more probably only three to seven days.

On the other hand the calculations for the attack on the Ruhr would have required 1,009 low level sorties or 4,430 high level sorties. The number of sorties required to destroy the electric power plants and aqueducts at a low level and the coking plants at a high level was calculated to be 2,644. Therefore, the industrial target system would have needed five to eight weeks to be put out of operation, considerably longer than oil.<sup>1</sup>

The calculations indicated oil to be the preferable target system. Plans made a further estimate which apparently indicated even more clearly that destroying the oil targets in Germany was the most certain of success. It was based on the assumption that there were really only four refineries that needed to be destroyed in all of Germany and that by high level attack it would be possible to paralyze the German war machine by cutting off its oil as a consequence of only one day's bombardment. In fact just one-third of the total force would be required for this operation which would defeat the Germans if low-level attack was possible.<sup>2</sup>

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<sup>1</sup>Ibid.

<sup>2</sup>Minute from Plans 2 to D. D. Plans (OP), Oct. 17, 1939, Ibid.

Subsequently in the fall of 1939 the Air Staff produced a detailed comparison of the scale of effort necessary to destroy a larger variety of target systems.<sup>1</sup> Their assumptions on bombing accuracy were unchanged and they still assumed all bombing would be done in daylight. They believed that 80 per cent of all sorties would attack the target; this was 20 per cent higher than in previous estimates but unfortunately the reasons for the change are not known.

The method of calculation was similar to that used in the past. After estimating the size of the target, the number of direct hits required to destroy it was reached. The number of bombs that should be delivered on the target in order to ensure the required number of hits was based on probability statistics. This led to the required number of sorties to destroy each target system.

It was concluded that any of the following could be accomplished by Bomber Command in just one week: 1) fourteen unflammable industrial targets could be put out of action for one to six months; 2) fifty-three inflammable industrial targets could be put out of action for one to six months; 3) five railway traffic centers could be seriously dislocated for one week; 4) seven railway lines could be put out of action for one week.

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<sup>1</sup>"A Comparison of the Estimated Weight of Attack Necessary to Cause Material Damage to Various Types of Targets," Ibid.

The calculations also indicated the vulnerability of railway bridges and aqueducts and the number of each that could be destroyed in one week. The R.A.F. had assumed that bombers could execute high precision attacks on very small targets such as railway lines.

#### Early Bombing Experience

As a result of the limited air operations which had taken place during the fall and winter of 1939, some senior officers in the Air Staff were becoming less confident of the effectiveness of bombing. Ludlow-Hewitt, Commander-in-Chief of Bomber Command, who had long been optimistic about a bomber offensive became increasingly doubtful of his ability to penetrate German defences. His fears were confirmed when over half a force of Wellingtons attacking German warships in the vicinity of Heligoland were destroyed in December.<sup>1</sup>

Portal also understood the difficulty of precision bombing. In the light of this knowledge calculations and plans had to be modified considerably. It took time for the calculations to take into consideration the actual results of bombing. In part this was because bomb-damage assessments were not indicating the actual results of raids. After so many years of high expectations for

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<sup>1</sup>Bomber Cmd. Report Dec. 22 and 28, 1939, cited by Webster and Frankland, Vol. I, pp. 193-97.

precision bombing it was difficult to believe how ineffective it was.

The changes taking place in the assumptions for plans were important. In November 1939 calculations about night bombing had assumed that bombers would reach an area around the targets measuring ten miles by ten miles, and that within that area they would succeed in identifying some prominent landmark.<sup>1</sup> It was thought this degree of accuracy would be achieved by astro-navigation which involved fixing position by stars. "It was not considered unreasonable to assume that this size target area could be reached because it was felt that by the time the necessary illumination aids to precise bombing had been developed, improvements in navigation would enable a target area of the size indicated to be made good."<sup>2</sup> It was furthermore assumed that a timed run from the landmark to the target would result in night bombing "as accurate as if the target itself were visible."<sup>3</sup> This assumption, however, was not borne out even under trial conditions for in exercises carried out in January 1940 the average bombing errors after three runs at 6,000 feet from only ten, fifteen, and twenty

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<sup>1</sup>Notes on Bomber Cmd. Conf., Nov. 6, 1939, cited by Webster and Frankland, Vol. I, p. 209.

<sup>2</sup>Memo. Coningham to Bomber Cmd., Oct. 11, 1939, Ibid.

<sup>3</sup>Ibid.



miles away were respectively 1,200 yards, 4,840 yards, and 5,280 yards.<sup>1</sup>

On January 28, 1940, Ludlow-Hewitt sent a new appreciation of the Ruhr plan to the Air Ministry based on revised computations done by his staff. He doubted the destruction which a force of 170 to 180 daylight bombers, the most that could be made available, would be as high as the pre-war plans had indicated. He felt that if the attack was executed at a high level accuracy would be unacceptably poor, and if at a low level casualties would be unacceptably high, amounting to 50 per cent of the attacking force. He concluded:

In view . . . of the risks involved and the doubt which must exist as to the possibility of achieving success, I suggest the urgent necessity to reconsider the whole question and in particular to study the possibility of devising some other means of employing the bomber striking force to the best effect without committing the whole force to such grave risks of heavy loss as is involved in the plan under consideration.<sup>2</sup>

It is interesting that this appreciation was based on an unchanged estimate of bombing accuracy for it was still assumed that in moonlight conditions the average night

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<sup>1</sup>Report of the trials on Jan. 18, 20 and 26, 1940, Ibid.

<sup>2</sup>Letter Ludlow-Hewitt to Air Min., Jan. 28, 1940, Bomber Cmd. Appreciation of Ruhr Plan, Jan. 27, 1940, quoted in Webster and Frankland, Vol. I, p. 139.

bombing error would not exceed three hundred yards.<sup>1</sup> This was the same error that had been used before the war for high level day bombing.<sup>2</sup> Thus it was still thought, as Air Commodore Coningham put it, that "the accuracy of night bombing will differ little from daylight bombing."<sup>3</sup>

This appears even to be a change from at least some of pre-war planning which believed night precision bombing to be impossible. In any case no pre-war plans took the possibility that there would be much night bombing very seriously. In fact the first few months of war showed that only night bombing was possible if very high casualty rates were to be avoided.<sup>4</sup> Consequently the Air Staff still planned on attacking the same targets but at night instead of by daylight. The leaflet raids over Germany began, however, to give indications of the problems of navigation, particularly night navigation, over enemy territory.

The first attack by Bomber Command on a land target, the night raid of March 19 attacking the seaplane base at Hornum on the island of Sylt, produced minimal damage.<sup>5</sup>

<sup>1</sup>B. Ops. 1 Review, April 5, 1941, Webster and Frankland, Vol. I, p. 216.

<sup>2</sup>Mins. of Air Min. Conf., Nov. 30, 1938, Ibid.

<sup>3</sup>Letter Coningham to Groom, Feb. 19, 1940, Webster and Frankland, Vol. I, p. 216.

<sup>4</sup>Min. Ludlow-Hewitt to G/C Training, March 8, 1940 and Min. Bottomley to Ludlow-Hewitt, March 16, 1940, Ibid., p. 140.

<sup>5</sup>Bomber Cmd. Reports, April 10, 1940 and March 19 and 20, 1940, Ibid., p. 211.

The crews reported considerable destruction but subsequent photographic reconnaissance indicated all buildings appeared to be intact. This was a matter of concern to Bomber Command for it indicated the operational infeasibility of their plans. The plans were not yet revised, however, and in the spring of 1940 possible attacks on oil and power were considered as contingency plans in the event of orders being given for a British strategic bombing offensive.<sup>1</sup>

The estimates of what was required to destroy objectives in Germany were still not much different from those made before the war even when night bombing was being considered. The Air Staff believed that with 240 heavy bombers of which half would be serviceable on any given day, dropping twenty-eight tons each sortie on oil refineries, marshalling yards, and vital plants, all objectives in the Ruhr could be destroyed in 11 to 18 days. They believed it wise, however, to be prepared for six to eight weeks to allow for bad weather and other such contingencies.

The R.A.F. were still quite optimistic about the effectiveness of bombing targets in Germany once they were given orders to go all out. This opportunity would come shortly.

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<sup>1</sup>Report of the British Bombing Survey Unit, The Strategic Air War Against Germany, p. 2.

### The Strategic Air Offensive

After the start of the strategic bombing offensive in May 1940 changes in the estimates were finally made. In October 1939 it was estimated that sixty-four 500 pound bombs would be needed to destroy an aircraft factory. On July 13, 1940, the estimated number was one hundred and forty 500 pound bombs.<sup>1</sup> Daylight attacks in February 1944, using all the navigational and bombing accuracy aids which had been developed at that time, were to show that "the tonnage required to achieve this level of structural damage was at least ten times as much."<sup>2</sup>

The realization that Bomber Command was not operationally capable of carrying out the directives calling for precision attacks at night came at least to Bomber Command a few days later. Sir Charles Portal, now Commander-in-Chief of Bomber Command, stated that of the ten primary aircraft industry targets

. . . only three can be found with any certainty in moonlight by average crews. Expert crews may be expected to find the remainder on clear nights with a full moon, and average crews will sometimes find them after a good deal of time has been spent searching. Moreover, most of the targets are so far in the east as to give very little time for finding and attacking them and then returning beyond the German fighter zone before daybreak.

He also felt:

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<sup>1</sup>Dir. Douglas to Portal, July 13, 1940, App. 8 (V), cited by Webster and Frankland, Vol. I, p. 149, Vol. IV, p. 120 and Report of the British Bombing Survey Unit, p. 3.

<sup>2</sup>Report of the British Bombing Survey Unit, p. 3.

Since most all of the primary first priority targets are isolated and in sparsely inhabited districts, the very high percentage of bombs which inevitably miss the target will hit nothing else of importance and do no damage, and the minimum amount of dislocation and disturbance will be caused by the operation as a whole.<sup>1</sup>

Although Portal continued to be pessimistic about the operational feasibility of high precision attacks, this had little effect on the directives given to him.

A memorandum from Portal on December 29, 1940, made an estimate of the number of sorties required to destroy the seventeen major synthetic oil plants in Germany. It was assumed that 400 five hundred pound bombs should be aimed at each target. The total number of sorties required, assuming fifty per cent of those detailed fail to attack their primary target, was 3,400.<sup>2</sup>

The estimates of November 1938 had indicated that four tons would be sufficient for each synthetic oil plant; this could be delivered by fifteen sorties of heavy aircraft. These new estimates called for one hundred tons which would require two hundred sorties for each plant.

Although considerably increased, these tonnages were still far from adequate. The Photographic Interpretation Section circulated a report on December 28, 1940, of the results of the raids four days earlier on the two oil plants.

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<sup>1</sup>Letter Portal to Air Min., July 16, 1940, quoted in Webster and Frankland, Vol. I, p. 150.

<sup>2</sup>Memo. from Portal, Dec. 29, 1940, Ibid., p. 159 n.

at Gelsenkirchen. Evidently this report did not reach Portal in time to be taken into account in his estimates. In the December 24 raids the plants had been attacked by 162 aircraft carrying 159 tons of bombs (plus incendiaries) and the other had been attacked by 134 aircraft carrying 103 tons of bombs (plus incendiaries). The conclusion of the report was that in neither case had any major damage been done.<sup>1</sup> The raids represented an average scale of attack fully thirty times above that planned before the war and twenty-five per cent above that assumed to be sufficient by the Chief of the Air Staff at the time.

Portal realized that bombing was not having anything like the effects imagined for it and he applied for an expert who could advise him on the progress and results of the bombing of the oil industry. D. A. C. Dewdney who was chosen for the job made a set of calculations upon which he concluded that the progress of the oil offensive was quite satisfactory.<sup>2</sup> Even though photographic reconnaissance had not indicated that much damage was being inflicted, Dewdney was nevertheless confident; "however little damage appears in a photograph, an objective must have suffered in proportion to the weight

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<sup>1</sup>Photographic Interpretation Report, Dec. 28, 1940, Ibid., p. 164.

<sup>2</sup>Report and covering letter Dewdney to Portal, Sept. 4, 1940, Ibid., p. 223.

of bombs dropped over it.\*<sup>1</sup> He was still using an estimated average bombing error of 300 yards.

Few people realized how sensitive these calculations were to the assumed average bombing error. On April 5, 1941, the Directorate of Bomber Operations delved into this problem in some detail. It was calculated that if the average bombing error fell from 300 to 1,000 yards, the number of direct hits fell from 30.8 to 5.96 of a total of 400 bombs dropped. Bomber Operations also estimated damage in terms of percentages of annual output of oil lost and saw that a degradation in bombing accuracy from 300 yards to 600 yards meant damage was reduced 52.7 per cent. To achieve the same level of damage with an average error of 600 yards would require 2.32 times the number of bombs needed with an average error of 300 yards. With an average error of 1,000 yards the number of bombs required was over five times as great.<sup>2</sup>

Bomber Operations also realized that in many cases crews would not be able to aim at a specific target but would have to drop within a general area. If the recognition area was 740 yards square, 27.6 bombs out of 400 dropped would be direct hits on the oil plants. If the area was two miles square, the number of direct hits fell to only 1.96, and if the area was three miles square,

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<sup>1</sup>Report Dewdney to Portal, Sept. 4, 1940, Ibid.

<sup>2</sup>Ibid., Vol. IV, pp. 458-59.

the number of direct hits was only 0.87. It followed from this that with a three mile square recognition area, to accomplish the damage which could be done by 400 bombs in an area 740 yards square, thirty-two times the number of bombs would be required.<sup>1</sup>

These calculations indicated the sensitivity of bomber planning to the factor of accuracy. Before the war no one had even thought of average bombing errors any higher than 300 yards. In April 1941 it was realized that unless crews could reach high levels of accuracy the damage achieved would be quite low.

By April 1941 the estimated average bombing error was raised to 600 yards. It was still assumed that seventy-five per cent of all aircraft would actually attack the target.<sup>2</sup>

Pre-war planning had called for three tons to be dropped on each railway traffic center. By July 9, 1941, a new calculation indicated that five times as much or fifteen tons was actually needed. It was believed that this scale of attack would lead to complete stoppage of traffic for at least one week as well as widespread dislocation and delay.<sup>3</sup>

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<sup>1</sup>Ibid.

<sup>2</sup>Ibid., Vol. I, p. 172.

<sup>3</sup>Ibid., Vol. IV, p. 140. See also Report of the British Bombing Survey Unit, p. 5.



There was little idea of the density of attack needed to assure destruction of the target. Until 1944 and 1945 an attack of 25 tons per square mile was regarded as heavy. This appreciation was revised after the spring of 1944 when under ideal tactical conditions densities from thirty to fifty times this were achieved by Bomber Command.<sup>1</sup> These densities started to achieve the results first predicted by the Air Staff but such attacks involved ten times the offensive striking force used in the pre-war estimates.<sup>2</sup> Not only were there more aircraft dispatched but the average weight of bombs dropped per aircraft of Bomber Command had risen by forty times.<sup>3</sup>

Some idea of the navigational and accuracy problems that were encountered during the early part of the war can be derived from studying the precision attack on the Focke-Wulf factory on the perfectly moonlit night of March 12, 1941. Unfortunately this attack was typical of most precision attacks during this part of the war.

Fifty-four Wellingtons were ordered to bomb the factory while a further thirty-two Blenheims attacked the center of town. Thirty-three of the Wellingtons

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<sup>1</sup>Report of the British Bombing Survey Unit, p. 7.

<sup>2</sup>In 1939 there were 515 bombers available; in July 1944 over 5,000 were available for attacks on Germany most of the time.

<sup>3</sup>Ibid., pp. 41-42.

carrying 132 bombs and 840 incendiaries claimed to have aimed at the factory while the remainder joined in the attack on the town which was the alternate target. Photographic reconnaissance showed, however, that only twelve bombs had hit the factory and that a further twenty-eight had been within six hundred yards. Thus less than one-third of the bombs aimed at the factory had actually hit or fallen within 600 yards of it. Furthermore twenty-one Wellingtons had failed to find the target at all.<sup>1</sup> It was no wonder that bombing was not fulfilling the expectations of the Air Staff when such a low proportion of bombs actually found their target.

#### Unfulfilled Expectations

It was apparent to the Air Staff that bombing was not proving to be nearly so easy as had been imagined before the war. To determine the actual effectiveness of the British offensive Mr. Butt, a member of the War Cabinet, Secretariat working for Lord Cherwell, a close adviser of Churchill's, examined over six hundred photographs taken by night bombers during sorties in July and August of 1941. He also studied the operational records and other documents.

Butt concluded that of all the aircraft recorded as

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<sup>1</sup>B. Ops. 1 Review, April 5, 1941, Bomber Cmd. O.R.B. 1, April 12/13, 1941, cited by Webster and Frankland, Vol. I, p. 245.

having reached their target, only one-third had actually been within five miles of it. The percentages varied with the location of the target, ground defences and the weather. Over French ports the proportion was two-thirds while over the Ruhr it was reduced to a mere one-tenth. In full moon two-thirds of the aircraft reported to have attacked their targets had done so whereas without a moon the proportion fell to one-fifteenth. When there was no haze the proportion was over one-half, but in thick haze it fell to one in fifteen. Intense anti-aircraft fire reduced the number of aircraft getting within five miles of the target by a further one-third.

These proportions applied only to aircraft which had claimed to reach their targets. If the total of all aircraft despatched was considered, the proportion would be reduced by a further third. The area used by Butt for his survey was the seventy-five square miles surrounding the target and consequently Butt concluded that many of the aircraft which were successful in getting within five miles of the target were still bombing open country. Butt admitted that there might be some inaccuracies in his report because of the lack of complete data but asserted that the general picture was true.<sup>1</sup> Using hindsight it appears that the report was largely correct. An extremely

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<sup>1</sup>Butt Report to Bomber Cmd. Aug. 18 1941, App. 13, cited by Webster and Frankland, Vol. I, p. 178 and for the complete report Vol. IV, pp. 205-213.

low proportion of bombs was actually being dropped on the allotted targets.

Further confirmation of the problems of navigation came on the night of October 1, 1941; when the objectives of Bomber Command were specifically in Karlsruhe and Stuttgart, its aircraft were reported to be over Aachen, Eupen, Malmédy, Coblenz, Neuweid, Kreuznach, Frankfurt Am Main, Worms, Trier, Offenburg, Saarfels, Nuremberg, Erlangen, Bamberg, Bayreuth, Coburg, Pegnitz, Aschaffenburg, Schweinfurt, Würzburg, Regensburg, Weiden, and Chemnitz.<sup>1</sup> Many of the crews were not even aware that they were over the wrong target.

The rapid degree to which navigation improved in 1942 was largely a result of the introduction of the navigational aid Gee. For the first time in the March 18, 1942, raid on Lubeck and on the four raids on Rostock commencing April 23, 1942, virtually all aircraft reached and properly identified their targets.<sup>2</sup> Although these raids were exceptionally successful, this marked a turning point in navigation and seldom again were raids as inaccurate as they had been during the first two years of

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<sup>1</sup>Min. A.I.3(c) to D.D.I.3, Oct. 23, 1941, Ibid., Vol. I, p. 185.

<sup>2</sup>O.R.S. (B.C.) Nt. Raid Report, April 11, 1942 and O.R.S. (B.C.) Nt. Raid Reports, May 20-24, 1942, Ibid., pp. 392-94.

the war.

Omitting the attacks made in bad weather, an average of forty per cent of the despatched sorties attacked the target area after the introduction of Gee in early 1942. The figure for the three months preceding had been twenty-six per cent. In the Ruhr area twice the previous proportion of sorties were reaching the target area. It must be remembered, however, that the definition of target area was still a circle with a radius of five miles from the target and so the situation continued to be far from entirely satisfactory.<sup>1</sup>

Not many bombs were yet actually even being aimed at the proper target. The question of bombing accuracy was therefore not the most important one, for so long as such a small percentage of all crews were able to find their targets navigation remained the principal problem to be solved.

Visual navigation was very difficult because during the war the R.A.F. bombed almost completely at night owing to the prohibitive casualty figures which accompanied daytime raids until the Allies achieved air superiority in the last year of the war. Until the end of 1941 the principal aids to navigation were the bubble sextant and wireless fixes and beacons. The extent to which the introduction of the radio-aid Gee increased the efficiency

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<sup>1</sup>O.R.S. (B.C.) Report May 15, 1942. Ibid., p. 395.

of bombing is demonstrated by the effectiveness of the "1,000 bomber raid" on Cologne on the night of May 30, 1942, where the concentration of bombers in time and space was far greater than ever before. Of the original force of 1,046, 898 of the returning crews claimed that they had attacked the target area and in fact most of them had done so. They dropped 1,455 tons of which 540 tons were H.E. and 915 tons were incendiaries.<sup>1</sup> The number of people killed was 474 and 565 were hospitalized out of a total of 5,000 receiving injuries of some sort. A total of 3,330 houses were destroyed, 9,510 damaged in some way, and 45,132 people were rendered homeless, although many for only a short period.<sup>2</sup> This showed an immense gain in large part due to concentration, for during the course of the previous seventy raids in which more than twice the number of sorties had been flown and 400 more tons dropped, only 138 persons had been killed and 277 seriously injured.

The enemy adopted counter-measures against Gee and these were in turn met with anti-jamming devices. The second major step in navigational technology was the bombing radar device known as Oboe. In this system

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<sup>1</sup>O.R.S. (B.C.) Nt. Raid Report, July 15, 1942, Ibid., p. 409.

<sup>2</sup>Statistics are from the Police President's Report and the Report of the Cologne Office of the Ministry of Public Information and Propaganda, Ibid., pp. 485-86.

receiving aircraft re-transmitted a radio signal from a ground station back to the same station, the latter being able to measure the distance to the aircraft. Two sets of apparatus were installed in each bomber so that its position could be fixed by determining its distance from two ground stations.<sup>1</sup>

The increase in accuracy which resulted from these technological developments was remarkable. In the period from August to November 1941 before Gee was introduced, only 20 per cent of all sorties despatched bombed within three miles of the target. Gee was first used in the spring of 1942 and within nine months an average of almost 30 per cent bombed within three miles of target. After Oboe was introduced the figure rose sharply to 60 (April-July, 1943), then to almost 80 (April-July, 1944), and by the winter of 1944-1945 to above 90 per cent.<sup>2</sup> This is a remarkable improvement; it is unfortunate that the technological developments needed to bring it about were not clearly foreseen before the war.

Until the end of 1942 the bomb sight that was in

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<sup>1</sup>Report of the British Bombing Survey Unit, pp. 44-45.

<sup>2</sup>Ibid., Fig. 8 facing p. 46.

greatest use in R.A.F. Bomber Command was the Course Setting Bomb Sight. The height and air-speed of the aircraft as well as the wind velocity had to be set manually and therefore successful performance "depended upon an accurate determination of wind velocity and also, as it was not stabilized in pitch, steady and precise flying."<sup>1</sup> A straight run of  $2\frac{1}{2}$  to 3 miles up to the target was necessary before releasing the bombs. When the Mark XIV bomb sight was introduced at the end of 1942 the percentage of bombs dropped within 1,000 feet of the target doubled from 20 to over 40. The Mark XIV was more fully automated and did not require such a lengthy straight run. Consequently the percentage of casualties suffered by the R.A.F. dropped from over 5 per cent to under 3 per cent.

The Americans were having similar problems; in the first half of 1943 less than 40 per cent of all American bombers dropped within 2,000 feet of aiming point and less than 20 per cent within 1,000 feet. By 1945 these percentages were almost doubled to 75 and 35 per cent respectively.<sup>2</sup>

A . . . remarkable increase in the accuracy of bombing occurred during the spring and summer of 1944, when R.A.F. Bomber Command was mainly operating against targets in France and Belgium. In the first two months of these operations (March

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<sup>1</sup>Ibid., p. 46.

<sup>2</sup>Ibid., Figure 9 facing p. 47.



and April), relative densities of the order of 95 bombs per square mile per 100 dropped, as compared with 1 to 2 for the preceding attacks on German towns, were achieved, and from May onwards the figure for relative density had risen to 250.<sup>1</sup>

An "astounding improvement," in the words of the Bombing Survey Unit.

The extent of the underestimation in the pre-war plans is clearly apparent when one realizes that of the total combined effort of the strategic bomber forces, over a quarter of a million short tons were dropped on the German oil industry and almost half a million short tons were dropped on transportation targets.<sup>2</sup> Calculations before the war provided a mere four tons to destroy each synthetic oil plant and three tons for each railway traffic center. After some experience these estimates were raised to one hundred and to fifteen tons respectively but a far greater effort than this was needed.

Between September 3, 1939, and July 8, 1941, 2,512 tons were dropped by Bomber Command on oil targets and in the entire war 103,047 tons were dropped on oil. The USAAF dropped a further 137,844 tons on oil making a total of 240,891 tons. During a fourteen week period in the summer of 1944, 33,917 tons were dropped on oil targets alone by

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<sup>1</sup>Ibid., p. 47.

<sup>2</sup>Ibid., Fig. 17, facing p. 53.

the USAAF and a further 24,439 tons by Bomber Command.<sup>1</sup>

Only with this intensity of attack were the results on oil production really noticeable. Pre-war estimates had spoken of cutting oil production with five to thirteen days bombing at most. One set of calculations even indicated a single day of attacks would be adequate. Virtually no damage was done to German industry during the first years of the war with scales of attack much larger than those contemplated by the planners before the war.<sup>2</sup>

Even with the heavy attacks that were made, German production of synthetic oil increased until the last stages of the war. The effects on production generally are hard to assess because industry was not producing at full capacity until 1944. By various methods the United States Strategic Bombing Survey and the British Bombing Survey Unit have attempted to fix indices so production could be measured against potential. The conclusion reached was that production had been slowed but certainly not halted. Only in 1944 did the estimated loss of production exceed ten per cent of the Annual Reich production (17%).<sup>3</sup>

The Allies dropped two million tons of bombs on Germany during World War II.<sup>4</sup> Approximately one quarter

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<sup>1</sup>Ibid., Tables 7, 8 and 12 on p. 56.

<sup>2</sup>Report of the British Bombing Survey Unit, p. 66.

<sup>3</sup>Ibid., p. 85.

<sup>4</sup>Ibid., p. 65.

of this total, 522,500 tons, was dropped on German industrial towns.<sup>1</sup> This caused about 1,000,000 casualties of whom 305,000 were killed. This scale of attack far exceeded estimates made in 1942; these estimates suggested that at most 1,800 tons would be needed to destroy a city the size of Cologne.<sup>2</sup> Yet even with these increased scales of attack the average monthly output of German armament production more than trebled between the beginning of 1942 and the summer of 1944 when bombing was at its height.<sup>3</sup>

The errors were not only a result of underestimation of navigational and accuracy problems, for by the end of the war the average radial error of Bomber Command was about 130 yards and even this did not produce the destructiveness per ton that had been imagined before the war.<sup>4</sup> The actual damage which had been caused by bombs had been seriously exaggerated. It was not until late 1941 that experiments conducted by Professor Solly Zuckerman<sup>5</sup> indicated the assumed lethal pressure for man

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<sup>1</sup>Ibid., p. 68.

<sup>2</sup>Air Vice-Marshal N. H. Bottomley (Deputy Chief of the Air Staff) to Air Marshal J. E. A. Baldwin (Acting Air Officer Commanding-in-Chief, Bomber Command), Feb. 14, 1942, cited by Webster and Frankland, Vol. IV, p. 148.

<sup>3</sup>Report of the British Bombing Survey Unit, Fig. 18. See also Burton Klein, Germany's Economic Preparations for the War (Cambridge: Harvard University Press, 1959), passim.

<sup>4</sup>Report of the British Bombing Survey Unit, p. 166.

<sup>5</sup>Later responsible for the British Bombing Survey Unit.

of five pounds per square inch should be questioned. By detonating 500 pound General Purpose bombs among live goats staked out at various angles in a deep pit he concluded that the lethal pressure for man was between 400 and 500 pounds per square inch. This cross-checked with information derived from raids on British cities.<sup>1</sup>

It is difficult to determine the correct figure for the overpressure required for direct blast fatalities. It has recently been estimated that death in human beings would require peak overpressures as high as 80 to 300 (or more) pounds per square inch.<sup>2</sup> Fatalities are usually given in terms of probability for a given overpressure. It is uncertain if Zuckerman assumed 50 per cent or 99 per cent fatalities or some other figure for his computation.

Another factor in the British overestimation of bombing was the failure to realize the ability to recover from air bombardment. Nor was it realized that when a factory was hit the effect was to collapse the roof on top of the machinery which was often left essentially undamaged. Consequently when the debris was removed and relatively minor repairs made, the factory would once again be producing. This too contributed to the underestimation of the scale of attack necessary to destroy a given target

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<sup>1</sup>Irving, The Destruction of Dresden, p. 37.

<sup>2</sup>Samuel Glasstone, ed., The Effects of Nuclear Weapons (Washington: U.S. Government Printing Office, 1964), p. 557.

system.

### The Miscalculations Analyzed

Until two years before the war both the operational and technical aspects of the strategic offensive were largely neglected by the Air Staff. Even as late as 1939 the Air Staff did not realize the tactical problems inherent in their adopted strategy. There were a number of reasons for this state of affairs, one of which was the haste with which the R.A.F. had to be expanded as a result of many years of neglect. The primary objective of the build-up was to obtain more aircraft and inadequate attention was paid to problems of crew training and actual operations.

This was not true of Fighter Command which had ordered and received two types of aircraft, the Hurricane and the Spitfire, capable of executing their objectives. Fighter Command actively sought a solution for their primary operational problem, that of interception, and by the time war broke out radar was operational. Sir Hugh Dowding gave his complete support to the project and assisted its progress in every way he could.

In many ways it was more difficult for Bomber Command to foresee all their problems. It was impossible in peace-time, for example, to fly over foreign territory in order to test the influence of a hostile environment on bombers. The small size of Britain made it difficult to simulate bombing raids. Furthermore Bomber Command was not

given even the limited amount of training necessary to discover the best methods by which a bomb could be dropped on a target.<sup>1</sup>

In addition to the skill required of the pilot, a successful bomber mission was contingent upon accurate navigation. For a long time the belief persisted that the pilot was capable of navigating as well as flying. The special training and equipment necessary for accurate navigation were not acknowledged. Only in 1941 was it realized that a full-time navigator was essential. Even when the importance of navigation was becoming increasingly obvious in 1938 and 1939 officers trained in navigation were few since the facilities for instruction were meagre. The problems of navigation in England had been relatively simple because most flying was done in the vicinity of air bases where visual identification of land-marks was rather easy.

In particular when the weather was not good or at night, in order to navigate at great height an accurate course had to be set for the plane. This required knowing the wind velocity and direction, a major task with the equipment of the day. Stars would be used at night as well as radio fixes when these were available. Large scale

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<sup>1</sup>See Webster and Frankland, Vol. I, pp. 107 ff and for more detail Flying Training, Vol. I, Policy and Planning issued by the Air Historical Branch in 1952 and also the R.A.F. narrative Aircrew Training 1934-42 also prepared for A.H.B. and cited by Webster and Frankland.

exercises indicated that many planes became lost and there were large numbers of forced landings and not infrequent serious accidents. On May 17, 1939, the Air Officer Commanding 3 Group reported that Dead Reckoning navigation by day when above cloud could be expected to bring an aircraft only to within about fifty miles of its target.<sup>1</sup> This fact did not appear to be taken into account in the Air Staff's appreciation of the effectiveness of R.A.F. bombing.

Night flying presented many problems. It was difficult to create conditions of war when it could be expected that no lights would be showing on the ground to aid navigation. In an attempt to simulate war-time conditions, blind flying masks were put over the windows of aircraft but these were in short supply and required an advanced state of training before they could be used with safety. Flying over sea was dangerous because the bombers often lacked the necessary safety equipment. There were not nearly enough directional radio beams for all squadrons and many air fields had no night lighting or what they had was inadequate. Although all squadrons did some night flying the number of hours was minimal. In the three years before the war the hours of flying in

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<sup>1</sup>Report Thomson (A.O.C. 3 Group) to Bomber Command, May 17, 1939, cited by Webster and Frankland, Vol. I, p. 112.

Bomber Command were:<sup>1</sup>

	<u>Day</u>	<u>Night</u>
1936	41,644	2,990
1937	129,794	8,773
1938	148,458	14,615

One of the major shortcomings of the Air Staff planning was not to recognize that daylight bombing would be impracticable because of the casualty rates involved and consequently that virtually all bombing would have to be done at night. While the plans show some night bombing was anticipated, it was assumed that most bombing would be by day.

Although a scientific committee was set up to study problems of navigation, it did not establish the same working conditions and cooperative atmosphere as the original committee considering air defence. There does not appear to have been much enthusiasm in Bomber Command for making use of their advice.<sup>2</sup>

The problems of penetrating enemy defences were not appreciated before the war. Until 1937 the only armament that the bombers had was the same type of guns as were used in World War I. Even with the adoption of the .303 Browning the bombers were outranged and outweighed in fire power by enemy fighters. Power-operated turrets were

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<sup>1</sup>Bomber Cmd. Annual Training Report for 1938, Ibid., n. p. 113.

<sup>2</sup>Letter Tizard to Freeman, Nov. 8, 1938, Ibid., p. 114.



introduced in 1939 but the training to make use of the equipment was lacking. The idea of armouring the bombers was also abandoned.<sup>1</sup>

Bomber Command and Fighter Command were not brought together in operations from which they both might have benefited for anything more than the occasional large-scale exercise. Although the war plans were based on the assumption that the bombers could hold their own against the defending fighters, nobody including Ludlow-Hewitt believed this would happen.<sup>2</sup>

The problem of determining the proper tactics to hit the targets was considered by a Bombing Committee which was established in January 1934 under the Deputy Chief of the Air Staff. Exercises were held and bombing competitions between various squadrons were organized. To deal with such problems as that of estimating the capability of the enemy anti-aircraft fire, a center for experiments was badly needed but not obtained until 1938.

The bombing trials in peace-time were often made from heights which would be impracticable in war against defended targets. They took place in daylight and in good weather and the problems of night bombing and the effects

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<sup>1</sup>Note by Plans Division, Feb. 28, 1935, p. 116.

<sup>2</sup>Letter Ludlow-Hewitt to Air Min., July 17, 1938, Ibid.

of adverse conditions were largely neglected.<sup>1</sup> Under these conditions some squadrons were able to reach a high degree of accuracy but by 1938 it was realized that "the results recorded at Training Camps bore no relation to bombing under war conditions."<sup>2</sup> Yet it was not realized just how difficult it would be to hit targets during war-time and how little relation the exercises would bear to war operations.<sup>3</sup> It was difficult to obtain permission to hold bombing exercises of any kind. Civilian protests effectively quashed any idea of a permanent area in which bombers might practise.

Among other neglected problems that might be noted were those of having a good bomb sight and having an aerial reconnaissance capability for pre- and post-strike observation. Developments in both these areas were slow before the war but picked up speed in 1938 and 1939 so that they were of great value during the bombing offensive. The problem of illuminating the target had long been realized but only a few trials had taken place due to the cost of the flares and civilian protests if they were used over land. Some trials took place near air bases or bombing ranges but in both cases the target

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<sup>1</sup>Interview with Portal.

<sup>2</sup>Mins. of the Sub-Committee on Bombing Policy, March 22, 1938, quoted in Webster and Frankland, Vol. I, p. 117.

<sup>3</sup>Interview with Lord Tedder.

was already familiar to the crews.<sup>1</sup>

The most useful exercises took place in the Middle East under Air Commodore Arthur Harris who was later to lead Bomber Command. He concluded that targets of a small size could not be sufficiently illuminated from a high level to permit accurate bombing and from a low level a flare attack was very dangerous for the pilot who might well fly into the ground.<sup>2</sup> This was the basis for his personal feeling that only area bombing was practicable until technological advances had been made, and that the plans which had been drawn lacked operational feasibility and could not be executed. Most of the Air Staff, however, did not question the feasibility of precision bombing at that time.<sup>3</sup>

Some fairly advanced trials were held in 1939 in Britain and these indicated the difficulty of precise bombing. An attempt to bomb parked aircraft on an air base on Salisbury Plain met with little success. Efforts were made to bomb railway track but they did not really indicate whether or not this was a feasible operation. Experiments also made in 1939 indicated some of the defects

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<sup>1</sup>Report of Ludlow-Hewitt to Air Min., April 14, 1938, cited by Webster and Frankland, p. 123.

<sup>2</sup>Note Harris to Willcock (D.S.D.), Feb. 1, 1939, in a file termed "Trials of Parachute Flares for Night Bombing," cited by Webster and Frankland, Vol. I, p. 124.

<sup>3</sup>Interview with Marshal of the R.A.F. Sir Arthur Harris, Dec. 9, 1965.

of incendiaries. Still there was very little information available on the effect of the bomb on the target and although small adjustments were made about tonnages required to assure destruction in the plans, operational feasibility continued to be vastly overestimated.

In short, since the end of World War I all the strategic thinking of the Air Staff had been based on the assumption that the next war could not be won without strategic bombing; when war finally broke out, however, Bomber Command was incapable of inflicting anything but minor damage on the enemy using precision bombing as planned. Under the direction of Sir Solly Zuckerman the British Bombing Survey Unit has analyzed the reasons why the pre-war plans could not be carried out with the equipment which had been assumed to be necessary. The plans were

characterized by a failure to appreciate the technical and operational limitations which existed at the time. Not only were the effects of the explosion of relatively small bombs exaggerated, and pari passu the resistance of targets depreciated; the plans were also coloured by optimistic views about the capacity of aircraft to find distant targets without the help of special navigational aids, and about the bombing accuracy which could be achieved under operational conditions. On these matters the planners were dependent for guidance on the operational and technical staffs, who had to tender advice without having had the opportunity of studying either full-scale trials or the results of bombing carried out under operational conditions. Figures of likely aircraft losses in operations were of necessity

also largely guess-work. As a result of the unrealistic technical background, estimates of the strength which would be required to deal with targets were, by today's standards, extremely low. . . One has to remember that the plans usually assumed that operations would be carried out by day, and that they were adopted for night attacks without full consideration, because of the pressing circumstances, of their relevance to the different conditions.<sup>1</sup>

Marshal of the R.A.F. Sir John Slessor, in his analysis of planning before the war for a bomber offensive, concluded:

A legitimate criticism of the Air Staff before the war is that we paid insufficient attention to the technique of bombing. Our almost passionate faith in the efficacy of the bomber offensive as a major war-winning factor was in the long run vindicated by results. But there is no doubt that we did underestimate the technical difficulties of modern air bombardment, and might have been more far-sighted in our efforts to develop the major weapon of air-power, the bomb. . . . Our inexperience of air warfare is not sufficient explanation.<sup>2</sup>

Slessor cited a number of reasons for these shortcomings. First was the "almost revolutionary transition in the whole technique of military aviation."<sup>3</sup> Secondly, he felt that the Air Staff was "suffering from a hangover from the Geneva Disarmament discussions."<sup>4</sup> He concluded that "the practical means of putting the strategic principles

<sup>1</sup>Report of the British Bombing Survey Unit, p. 1.

<sup>2</sup>Slessor, The Central Blue, p. 203.

<sup>3</sup>Ibid.

<sup>4</sup>Ibid.

into effect was sadly lacking.<sup>1</sup>

He then enumerated the errors which had been made:

We in Plans were too optimistic on many counts - on the ability of the offensive to reduce the enemy air attack at its source; on our ability to bomb unescorted by day or to find and hit targets at night; on the bombing accuracy to be expected; on the effects of a hit by the small bombs of the day and on the numbers required to ensure a hit; and on the results both moral and material to be expected from bombing of industrial objectives.<sup>2</sup>

Slessor also noted the insufficient attention given to the development of navigational and bombing aids, the inadequate number of trials, and the lack of experience of long range navigation under adverse conditions.

One of the reasons that the plans had these shortcomings was a result of the Government's implacable opposition to the making of any plans at all for the use of bombers until 1937. When permission was finally granted to make plans for a bomber offensive, Slessor and those under him were not permitted to speak to other Government departments about what they were doing. Perhaps the Government thought the making of plans might appear aggressive. In any case this meant that Slessor was not able to consult experts in other branches of the Government on, for example, electrical power to determine what weight

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<sup>1</sup>Ibid., p. 204.

<sup>2</sup>Ibid., p. 205. In an interview Lord Douglas stressed how much more vulnerable bombers were than was anticipated before the war.

of attack might put a power station out of action.<sup>1</sup>

The source of many of the planning factors used in overestimating the scale and consequences of enemy attacks on Britain was the assumptions that were made about the capability of Bomber Command. While in some circumstances they may have given the Luftwaffe unreasonable advantages, generally they did not assume the Germans could do anything they themselves could not do. There was one caveat, of course, and this was that since the R.A.F. was weaker than the Luftwaffe, its effectiveness would be commensurably less until substantial expansion had taken place.

The Air Staff's assumptions on the scale of attack that would be necessary to destroy such targets as the London docks was based on their calculations of what damage Bomber Command would need to inflict on a similar target in Germany in order to destroy it. Their exaggerated ideas of the effectiveness of British bombing therefore led to similarly exaggerated ideas of the effectiveness of German bombing.

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<sup>1</sup>Interview with Air Vice-Marshal E. J. Kingston McCloughry, Dec. 8, 1965.

## CHAPTER IX

### CALCULATIONS, PLANS AND POLICY

#### In Retrospect

Concern about a "knock-out blow" may have played a major part in British policy during September 1938. Yet Britain went to war in 1939 expecting the "knock-out blow" and not at all confident the country would survive. It had been regarded as a virtual certainty that Germany would attempt to defeat Britain through strategic bombing. R.A.F. war plans were entirely formulated on this basis but were changed after the start of war.

Germany did not attempt the "knock-out blow" and consequently the British decided to do nothing to provoke it. After several months of war British expectations started to change. New calculations about the danger of air attack were not the cause. The reason must be found in the changing setting of British security, just as the reasons for the decision to go to war must be found in the same source.

Britain went to war in 1939 despite the concern about the "knock-out blow" because there did not appear to be any other choice. In 1938 it appeared that the surrender of the Sudetenland to Hitler might satisfy his



demands. In 1939 no one thought that Poland might be anything but one of an interminable number of demands made by Hitler for territorial aggrandizement. When one was granted, it was believed that Hitler would just push on to the next.

The country had no choice other than war for gradual surrender was unacceptable and since that was the case, war had to be faced with stoicism. There was of course no disappointment when the Luftwaffe did not attack; on the contrary it seemed to the British that Germany was missing a real opportunity.

As the Wehrmacht was successful in the west it became increasingly obvious that the primary threat was one of invasion. With the German attack on the Low Countries, Britain felt attacks on the Ruhr should begin because this might slow the German advance. It was hoped that London might be spared in retaliation for R.A.F. attacks on the Ruhr but there was a risk that it might not be.

By the time of the Battle of Britain the Air Staff and the Government realized they would prefer attacks on London to a continuation of the German raids on Fighter Command. We have seen how Churchill may have intentionally tried to provoke Hitler to switch his attack to British cities. In any case the blitz was the consequence of the raid on Berlin.

The evaluation of the threat had changed so much that attacks on London or an attempted "knock-out blow" were now clearly preferable to an invasion. The Government did not believe that Germany would be successful in its policy of defeating England through strategic bombing. The principal reason for this may have been revised expectations of civilian reaction to bombing. In 1938 and 1939 the Government was not at all sure that the people could take the massive raids that were expected; in 1940 there was little doubt that they could withstand heavy German air attacks. Calculations about such contingencies as a German attack on the docks completely disappeared after the start of war and were never mentioned. The reasons for this are unknown. Undoubtedly radar and the new fighters were important but there was no apparent change in the expected weight or material consequences of attack.

Using the great advantages of hindsight that the passing of over twenty-five years can give, we may summarize the analysis of the R.A.F. errors. The Air Staff seriously misinterpreted Luftwaffe strategy. Germany was buying aircraft best suited for close-support operations rather than long range bombing. The German Air Force did not believe that strategic bombing would win wars. While the R.A.F. certainly were correct in considering the possibility of Germany attempting a "knock-out blow," they

focused their attention on this contingency to the exclusion of all others.

The Air Staff overestimated the possible weight of German attack. They exaggerated the bomb carrying capacity of the German bombers. The German night raids on Liverpool from August 28 to 31, 1940, were considered by the Luftwaffe to be their heaviest possible scale of attack. Yet the average number of bombers was only 157 and the average weight of high explosives was but 114 tons, far under the 700 tons per day estimated by the British one year earlier; moreover by this time Germany had full use of bases in France.

Part of the reason for the overestimation of the Luftwaffe capability was a British exaggeration of the size of the German Air Force. In the Table below we may compare the British estimates of German aircraft frame production with the actual figures as reported by the United States Strategic Bombing Survey.

COMPARISON OF BRITISH ESTIMATES AND ACTUAL  
GERMAN AIRCRAFT PRODUCTION

Year	British Estimate	USSBS	% Error
1933	40	31	+ 29
1934	140-175	164	- 10
1935	200-270	265	- 11
1936	270-320	426	- 31
1937	500	467	+ 7
1938	595	436	+ 37
1939	850-1,000	691	+ 34

While initially overestimating German production in 1933, the British estimates for the next three years progressively underestimated production until they reached a peak in 1936 with an underestimation of 31 per cent. The next year saw the most accurate estimate that was made but in subsequent years estimates swung too far in the opposite direction by more than one-third. By the outbreak of war Germany was producing about 750 aircraft per month whereas the British credited them with approximately 1,000.<sup>1</sup>

It is difficult to be certain how these errors were translated into exaggerated estimates of actual German air strength because unfortunately there are no figures available on the size of the Luftwaffe for the period between December 1934 and August 1938. We have seen that in December 1934 the Air Staff estimated a total of 2,300 German aircraft of all types, military and civilian, when the actual figure was 1,888. The British estimated a total military strength of from 600 to 1,000 when the actual figure was 565, a number of which lacked engines or other equally necessary components.<sup>2</sup>

It is possible to be precise about German strength

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<sup>1</sup>A.D.I. (K) Report No. 333/1945 Interrogation of Field Marshal Milch. Air Historical Branch Report, n.d.

<sup>2</sup>Chapter II.

after August 1938 since the Luftwaffe Quartermaster General's statistics are available. Unfortunately there are no reliable figures for the intervening period.

COMPARISON OF BRITISH ESTIMATES AND ACTUAL GERMAN STRENGTH:  
OCTOBER 1938-SEPTEMBER 1939

Date	British Estimate	German Strength	Serviceable Aircraft
<u>Total Strength</u>			
Oct. 1938	3,250	3,036	2,738
Apr. 1939	3,800	3,106	2,523
Sept. 1939	4,320	3,652	3,069
<u>Bombers</u>			
Oct. 1938	1,350	1,120	1,005
Apr. 1939	1,650	1,226	926
Sept. 1939	N/A	1,180	1,008

It is clear that during 1938 and 1939 the Air Staff overestimated both the total size of the Luftwaffe and the strength of the bomber force by between 5 and 25 per cent.<sup>1</sup> The figures for serviceable aircraft are particularly significant for they indicate the true operational strength of the Luftwaffe. The R.A.F. did not realize the relatively

<sup>1</sup>The overestimates of German strength continued until the Singleton Enquiry in the Spring of 1941 after which Air Intelligence's estimates were reckoned on the basis of Initial Equipment only (9 aircraft per Staffel initially, increased later to 12 and then to 15). The difference this made is remarkable. It can be seen by comparing intelligence estimates with actual German strength before and after the enquiry.

	<u>German Strength</u>	<u>British Estimate</u>
March 1941	4,508	5,710
June 1941	4,322	4,540

From the middle of 1941 to the end of the war British estimates were very accurate, usually within one or two per cent of actual German strength.

high percentages of aircraft unserviceable at any one time. This would have considerably reduced the size of the force that could be used in any attempted "knock-out blow."

Further constraints would have been imposed by the lack of available crews. In October 1938 there were only 744 fully trained bomber crews. By September 1939 the figure was 1,080. This factor would have become particularly important in the event Britain was able to impose a high attrition rate on attacking bombers. The possibility of crew constraints was apparently not studied by the Air Staff until 1939.

We have already discussed constraints on the German use of air power against England that would have been imposed in 1938 by the attack on Czechoslovakia. Similarly in 1939 most of the Luftwaffe was tied down in the east in support of the aggression against Poland. Since the primary mission of the Luftwaffe was tactical support of the Army, any strategic bombing against Britain would have been severely constrained.

The Air Staff did not think through the cumulative effects of attrition on the Luftwaffe. It would have been impossible for the Luftwaffe to maintain one thousand bomber raids unless there was a very large reserve or production of aircraft was extremely high.

Just as the R.A.F. had little idea of the navigational

problems it would encounter in attacking Germany, so they had an inadequate conception of the difficulties of German bombers attacking England. The assumption that most bombing would be by day was one of the major factors in the miscalculation of the effectiveness of bombing.

The assumption that the average aiming error of bombardiers would be only a few hundred yards proved to be badly wrong during the war. Many of the crews were aiming at the wrong targets so their average error did not matter a great deal. It took considerable technological development before average bombing errors reached the pre-war estimates.

The Air Staff had an inadequate conception of bomb dispersion as indicated in the calculations of the attacks on the docks. The problems of target hardness and the effects of bombs were also not fully appreciated. The effects of the 250 pound bombs on which much of the planning was based were very limited during the war.

One of the most critical estimates was the assumption that the morale of the British population would collapse under bombing. This was partly a function of the overestimate of the number of casualties per ton based on too small a sample in World War I and not one which was clearly representative of a future war. The morale of the population might have broken with casualties at the level the Air Staff predicted; it is difficult to say.

The results of bombing in Spain were often cited but a careful study of the bombing of Barcelona showed no evidence of panic among those being bombed.<sup>1</sup> Similarly in China there was no evidence of panic after quite severe bombing.<sup>2</sup>

The expected number of casualties was based on the assumption that the casualty per ton ratio would remain constant for an indefinite period. This was unlikely owing to evacuation and bombs falling in previously destroyed areas. The population density would be reduced and consequently the casualty per ton ratio would decline.

When compounded, all these errors led to a considerable exaggeration of the threat of German attack. It is striking that all the errors were made in the same direction of overestimating and that there was no tendency for errors to cancel each other out. This fact served to produce the exaggerated estimate of 175,000 casualties in twenty-four hours and almost two million casualties in two months. The R.A.F. estimates of the casualties resulting from a twenty-four hour air attack on England in 1938 were equal to the actual results of German bombing during the entire Second World War.

There were 59,628 civilians killed by enemy action

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<sup>1</sup>N. de P. MacRoberts, A.R.P. Lessons from Barcelona, pp. 5, 90 et passim.

<sup>2</sup>The Times (London), Feb. 11, 1938.



in the United Kingdom from 1939-1945.<sup>1</sup> This was the number expected in one day alone in the estimates made at the time of the Newall memorandum in 1938. The Air Staff calculated that 3,500 tons would be needed. Germany required 71,270 tons and six years of air attack. Whereas the Air Staff predicted a ratio of casualties per ton triple that of World War I, in fact the ratio fell in London to under one-half and in the entire country to under one-quarter of the World War I values.

#### Perspectives on the R.A.F. Calculations

One conclusion that should not be drawn from this study is that the British Air Staff were the only ones to miscalculate at this time. The French made almost identical calculations and came to the same conclusions. By the time of Overlord<sup>2</sup> the British and Allied plans that were being drawn up under Air Vice-Marshal E. J. Kingston McCloughry were very good indeed.

The Germans made their share of miscalculations as well. As just one example, in the summer of 1940 when the Luftwaffe was asked to prepare plans to overcome the British air force, it grossly overestimated its effectiveness. The German High Command properly considered that before an

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<sup>1</sup>Report of the Chief Medical Officer of the Ministry of Health, cited by O'Brien, Civil Defence, p. 677.

<sup>2</sup>The code name for the Allied invasion of Europe.

invasion could be effected it would be necessary to defeat the R.A.F. The German Air Staff, recognizing that the Royal Air Force would not be defeated in a day or two as previously had been estimated, proposed in July that it would devote all of four days to destroying the fighter defences south of a line from London to Gloucester, and four weeks to defeating the entire air force.<sup>1</sup> Their biggest error was in thinking so little of the radar chain; although they were aware of its existence, their formal surveys made no mention of it.<sup>2</sup>

Another conclusion that should not be drawn from this study is that we are today overestimating the threat of enemy attack. This by no means follows from an analysis of the R.A.F. miscalculations. Nuclear attack on Britain or any other country would produce very high levels of casualties and destruction.

Sometimes a miscalculation is unavoidable. Sir John Slessor who was Director of Plans before the war feels that the Air Staff calculations about the "knock-out blow"

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<sup>1</sup>Collier, p. 160. See also the Top Secret Directive signed by Jodl and agreed to by Keitel on July 7, 1940, trans. Air Ministry (London) A.H.B. 6, VII/21, Feb. 28, 1947, Jodl's directive to C. in C. Air Force, July 30, 1940, Ibid., and Jodl's Situation Report, Aug. 13, 1940, Ibid.

<sup>2</sup>Collier, p. 162.

were as accurate as could possibly be made at the time.

"It is easy to say now that Hitler would not have attacked us; but that comforting certainty was very far from being present at that time."<sup>1</sup> He feels:

It is difficult to blame the Air Staff for assuming that we might find the whole air power of Germany directed against this country very early in the war. That was not impossible and we should certainly have been blameworthy if it had occurred and we had uttered no warning of the possibility or taken steps to guard against it.<sup>2</sup>

Although the Air Staff may have misjudged the reaction of Londoners to air attack, he feels that no one could have been certain of their endurance before the war.

We may have been wrong about the knock-out blow; I still do not believe that anyone is justified in saying we were certainly wrong there. Right or wrong, that was our view and it was our duty to express it.<sup>3</sup>

Although the Air Staff "did alarm ourselves and our political chiefs unduly . . . by visions of the "knock-out blow" . . . he would have been a pretty bold military adviser who assured the Government of the day that it certainly would not be."<sup>4</sup>

Pre-war planning is far from being an easy task. We have seen how aware Slessor was of having good planning

<sup>1</sup>Slessor, The Central Blue, p. 150.

<sup>2</sup>Ibid., p. 151.

<sup>3</sup>Ibid., p. 152.

<sup>4</sup>Sir John Slessor, The Great Deterrent (London: Cassell & Co., Ltd., 1957), p. 140.

factors and that it was this deficiency which played a large part in the exaggeration of the "knock-out blow." Ideas about factors such as navigational and bombing accuracy were not adequate for planning purposes. But it is much easier to see all this now with twenty-five years' hindsight.

Any system is only as good as its weakest link. The Air Staff concentrated on the most ostensible aspect of the enemy capability but failed to note the other necessary conditions such as the required number of crews or bombing accuracy for a scale of attack at the level of effectiveness which they estimated to be possible. The R.A.F. computations were sensitive to a number of assumptions that were not fully analyzed.

The R.A.F. expected, rather unquestioningly, that the Luftwaffe would adopt the same strategy as the British had done. They did not make the error of imputing to the enemy their preferred strategy for him; on the contrary the R.A.F. assumed a very malevolent enemy. Instead they failed to conceive of an enemy with a different doctrine of air power, one which indicated that strategic bombing was not the way to win wars. This was not an intelligence gathering failure; indeed, it seems that no intelligence was gathered about German strategy at all for there was never any doubt what it would be.

The R.A.F. had developed an "obsession" with one kind of attack - the "knock-out blow."<sup>1</sup> While there is no question that the Air Staff should have concerned themselves with the possibility of such an attack, the excessive concentration on this one type of attack was blinding to other possibilities. The certainty was so deep-rooted that there was great astonishment when the Air Staff's expectations were not fulfilled by a German bombing offensive after the start of war in September 1939.

Although it might seem best to be on the safe side and assume the enemy will do his worst, on closer examination this is not necessarily so. As Schelling has noted, "the worst he can do to us is not necessarily the best that he can do for himself."<sup>2</sup> The expectation about a German strategic bombing campaign against Britain illustrates this point well, for although the Air Staff may have calculated that the "knock-out blow" was the worst conceivable attack on England, from the German point of view this was not seen as their best strategy.

With hindsight we have seen that one of the most important failures of the British was not to take sufficient account of operational problems when their

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<sup>1</sup>D. of Plans to D. of O. April 6, 1939, D.H.O. Fighter Squadrons.

<sup>2</sup>T. C. Schelling in E. S. Quade, Analysis for Military Decisions, p. 199.

plans were being made. Their planning did not take into account how difficult accurate bomber navigation would be over unfamiliar and unfriendly country. These were factors which were hard to assess during peace-time because of the difficulty of simulating a war-time environment.

Calculations can often be sensitive to one or more questionable assumptions. In the Air Staff calculations one of the sensitive points was the assumed accuracy of bombers. Before the war the R.A.F. had thought that almost all aircraft, British and German, could readily find their targets in daylight and that the average bombing error would be only a few hundred yards at most. When it turned out that only 10 per cent of the aircraft were getting to within five miles of the target over Germany, the consequences of bombing were much less than had been estimated.

One factor that was never considered in the estimates of the German scale of attack and to which these estimates might have been very sensitive was the available supply of bombs. With the size of raids the British assumed, this might have operated as a severe constraint.

The R.A.F. seem to have largely ignored the question of uncertainty. They were very positive about their predictions of what strategy the enemy would follow.

Their estimates and predictions of enemy strength were only seldom given in ranges; more usually they were presented as precise numbers. While they might not have been absolutely certain of the numbers they were using, presentation of a single set of figures gave the impression that the Air Staff had great confidence in their figures.<sup>1</sup>

In any sort of prognostication and planning there is always the possibility of some major technological change which might invalidate basic assumptions and cause drastic changes in formerly accepted calculations. This sort of development is hard to allow for.

One of the most interesting aspects of this study was the inability of the planners to conceive of a major technological change or "breakthrough" that would radically alter the basis of their estimates. In this case the "breakthrough" was the increased effectiveness of defence through the development of radar and the eight-gun fighter. In 1934 the idea of radar was confined to a very small group of scientists, no more than a half-dozen, including laboratory assistants.<sup>2</sup> Active work on radar began in

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<sup>1</sup>Sir Edward Ellington feels that there was never any problem about getting accurate estimates of German strength and was extremely confident of his figures. Interview, Oct. 18, 1965.

<sup>2</sup>This and some of the following information were given the present author by Mr. Harold Larnder, one of

May 1935 but early exercises during late 1935 and 1936 were a great disappointment. By 1937 fair results were being obtained from radar, but not integrating it successfully into the fighter command and control system. The technical possibilities had been practically demonstrated, however, and it was realized by the scientists working on the project that it would only be a matter of time before radar was operational.

Since a very heavy cloak of secrecy had been hung over the project those not directly involved had little or no idea of the potential of this new development. Thus old ideas about the invulnerability of the bomber remained long after they should have disappeared. This problem has two aspects. First, because of natural security precautions all the Air Staff was not aware of the development of radar. This points to a real difficulty, for had the knowledge of radar been spread more widely, the probability that it would have leaked to the Germans would have been higher. The other aspect of this problem is the implicit assumption that was made in the 1920's and much of the 1930's that since the bomber was then invincible, it would always be invincible. There was a certain definiteness and misplaced determinism in estimates of the supremacy of the offensive.

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the pioneers in the use of Operational Research in England, in a personal letter dated March 4, 1965, as well as many talks.



Few R.A.F. personnel appreciated the value of radar until very late.<sup>1</sup> This includes the Chief of the Air Staff, Sir Edward Ellington, who was opposed to letting fighter crews be trained in using radar until 1937 when he was effectively overruled by his Minister, Lord Swinton.<sup>2</sup> Radar, if successful, would have meant the end of the dominance of the bomber, something which was psychologically distasteful. "Why," said one high officer, "if [detecting and locating aircraft fifty miles away] is possible, the whole plan of Air Defence will be revolutionized."<sup>3</sup>

A major source for data upon which the Air Staff calculations were made was the air exercises which were held between the wars. The exercises were not, however, held under conditions which would approximate war. Bombing was carried out in daylight with few conditions imposed on how crews could attack targets. The bombers practiced time and again and lined themselves up from several miles away for their run. This produced great accuracy and although it was realized that in war-time accuracy would

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<sup>1</sup>Interview with Kingston McCloughry. He also feels that civilians working in traditionally military areas were looked upon with suspicion.

<sup>2</sup>Interview with Swinton.

<sup>3</sup>Ronald Clark, Tizard (London: Methuen, 1965), p. 129.

not be this good, it was not realized how poor it would in fact be. Bad weather and night flying were avoided and this too contributed to the failure to appreciate the operational difficulties of bombing.

Another factor which contributed to erroneous ideas about the relative ease of bombing was that many of the exercises were held in the form of competitions. This tended to emphasize excellence at the expense of reality. The bombing competitions bore much more relation to a sport than they did to war, for the average errors were often as low as twenty yards.<sup>1</sup>

The R.A.F. organization had become extraordinarily monolithic in doctrine and ideas. There was a wide-spread feeling that unless you were a "bomber baron," your career was in doubt. There was a tendency for everyone to get on the bandwagon of a new and popular idea, in this case the independent bomber force. The calculations that were made acted to support doctrine and since there were so few diverse ideas, there was little incentive to question the calculations. There was a "party-line" in the R.A.F. which led to a rather unquestioning acceptance of the efficacy of bombing whether it be the German "knock-out blow" or the British counter-offensive once Bomber Command was up to strength.

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<sup>1</sup>Ralph Barker, The Thousand Plan (London: Chatto and Windus, 1965), p. 5.

Lastly we might mention the question of inter-service rivalries and the severe lack of funds facing the R.A.F. The older services were very jealous of the air force and for almost the entire inter-war period devoted a great deal of effort to trying to break up the R.A.F. and divide the force between the Army and Navy. The R.A.F. was fighting for its survival. The air force was also desperately short of funds.

It is possible that at times the R.A.F. exaggerated the effectiveness of bombing to try to win their points, both against the Army and Navy on the one hand and the Treasury on the other. They were anxious to persuade others about the revolution in warfare caused by air power as well as the danger of enemy air attack. There is no evidence to suggest any intentional exaggeration of the numbers. When competing for more funds, however, there was a tendency to make their case look as good as possible. The inter-service rivalries and demands by the R.A.F. for more funds may have led towards a tendency to give only the consequences of the worst case of a possible enemy attack and the best case of a British bomber offensive.

There is one paradox which is very difficult to understand. In Chapter VIII it was clear that the R.A.F. felt that by 1939 at the latest it would be possible to do enormous damage to Germany by bombing oil or industrial

targets. While earlier the British capability appeared very small compared to the estimated Luftwaffe size, by 1939 it was calculated that a strategic bombing offensive against Germany might be decisive in only two weeks. Yet for reasons which are not clear the Air Staff did not apparently think Germany might be deterred from attempting a "knock-out blow."

#### Implications for Policy

There were many ways in which the calculations of the dire threat of air attack affected British policy. The Government was influenced by the general fear of a "knock-out blow" in the years before the war and yet undertook a policy of appeasement in September 1938 and war in 1939.

The British were told in 1938 and the years before of the terrible menace of air bombardment. Not surprisingly the Government attempted in its foreign policy to avoid war insofar as this was possible. In September 1939, however, it was believed that war was the best policy yet in the intervening period the concern about the effects of bombing had not diminished. One explanation for this seemingly paradoxical state of affairs is that most people in Britain by 1939 agreed with the evaluation that appeasement was no longer the proper response to the German challenge.

One might conclude from this description that when a country decides war is in the national interest, even though the war may involve tremendous losses, it will support a policy of war. A country can become stoical about what appears to be a war endangering the survival of the national way of life if it is persuaded that there is no alternative other than gradual, although seemingly less painful, surrender.

The British Government and the entire nation were more confident in September 1939 than they had been a year earlier but this was not a result of new calculations indicating a reduced level of damage from bombing. The increase in British defensive capability was cancelled by an estimated increase in Luftwaffe bomber strength so that the expected material results of attack were unchanged. In 1939 the country felt war was the right policy and that somehow they would survive. Such confidence was not a product of a rational appraisal of the situation, for it still appeared serious, but rather came from national pride, a feeling that what is right and honourable must be done; perhaps there was also a feeling that somehow in the end everything would turn out all right. This hope did not turn on anything so specific as confidence that attrition would force the Germans to cease their bombing of Britain.

The consequences of air attack appeared just as

devastating in 1939 but the situation was no longer viewed as hopeless. It was with this hope, not based on any new calculation, that Britain went to war. The British were not certain they would survive the war victoriously, although they now had hope they would, but still chose a policy of war rather than sacrifice Poland, a country even further away than Czechoslovakia.

Britain went to war despite the threat of the "knock-out blow," but then changed her war plans. The plans for a strategic bomber offensive against Germany were laid aside because the Air Staff and the Government believed that to put them into effect would widen the air war and that at the time this was not to British advantage.

Before the war the British had not envisioned a level of violence between peace and unlimited war involving use of all the means available to defeat the enemy. After going to war despite the "knock-out blow" the British changed their air war plans to a less than general war strategy. They sought to limit the war in the ways that seemed most advantageous. While this may sound like the most reasonable thing to do under the circumstances, it involved a major and unforeseen change in war plans.

We have also seen that a nation will enlarge or escalate a war if it appears to be to its advantage even though the risks and costs may be high. Britain was willing to risk the bombing of its factories and air bases

and then London itself when it appeared the benefits outweighed the costs.

The manner in which the strategic air war escalated in 1939 and 1940 shows that escalation does not necessarily occur automatically. There were no mysterious inexorable forces at work. The British successfully called the level of the strategic air war during this period and the stages of escalation were apparent and readily controlled. From the German point of view, of course, escalation was not controllable. One may therefore conclude that in situations involving a possibility of escalation, any widening of the war may well at least on occasion be the consequences of intentional policy decisions of one of the participant states.

We can see the considerable political implications of military calculations. The possibility that the fear of the "knock-out blow" may have influenced the British Government at the time of Munich has been discussed in detail. Predictions indicating that an enemy air attack against which there is no real defence and which might mean the end of the country's civilization are bound to have an immense effect on any sane leader.

The exaggeration of the dangers of German air attack may have had the effect of paralyzing the Government rather than encouraging the speed of rearmament. It may have made the Government search for political solutions out

of the belief that the military situation was hopeless. The Air Staff may have unwittingly played into the hands of the supporters of appeasement. The "knock-out blow" gave a certain respectability and acceptability to the Government's policy.

Overestimating enemy capability may be just as dangerous as the more obvious consequences of under-estimation; an over-estimation of dangers or risks makes balanced judgments about costs and benefits impossible and may lead policy-makers to be excessively cautious.

#### In Prospect

Precisely because many of the R.A.F. analyses were quantitative, it has been possible to see where the errors occurred. It must be remembered, however, that in this case the analysis of the Air Staff calculations has been made much easier through the use of the hindsight given by the experience of more than twenty-five years.

The use of quantitative data where available is invaluable in planning and making choices in defence policy. One of the most important reasons for being as quantitative as possible is that it enables others to check an analysis more easily than if reasoning and planning are performed entirely in a qualitative manner.

Calculations have never been so important as now, for today it may not be so easy as in 1939 to make



alterations in forces and strategy after the outbreak of general nuclear war. There is a very good chance that any such war will have to be fought with the forces in being and the plans in the files at the time of the outbreak. In limited wars not involving a strategic nuclear exchange alterations in plans may be easier to make. It is impossible to make intelligent decisions about force structure or strategic alternatives without accurate calculations of cost and effectiveness. The quality of the pre-war decisions will most probably have a great effect on the outcome of any war.

It is essential to simplify the real world into a necessarily artificial model when making calculations, otherwise there are too many variables to be dealt with and the figures become unmanageable and eventually even meaningless. This reduction of variables must, however, be carried out with great care lest important factors be left out. It is essential to remember that the model that is being employed is, in the end, a model; no model is any better than the assumptions behind it such as, for example, the operational characteristics of its weapons systems. If planning factors leave much to be desired, the analyses will be severely handicapped.

The lesson of this study is not that calculations are dangerous and should not be used; rather, calculations are first of great value and secondly of considerable

importance and should be as well done as circumstances permit. Furthermore calculations are not a new innovation in military decision-making; the military have been making calculations for a long time. While good calculations are not easy to make, they do form an essential part of the decision-making process and every effort must be undertaken to see that they are as accurate as possible.

In conclusion, calculations are very important to policy; they may have a great deal to do with whether or not a country goes to war and at what level of war it chooses to fight. The reasons a country may decide against or for a policy of war are extremely complex and here only certain aspects of the problem have been touched upon; but it has been seen that under certain circumstances a nation may decide to go to war expecting extremely high levels of casualties and damage but then change her war plans.

## APPENDIX

### THE ROLE OF DOUHET IN THE FORMATION OF BRITISH AIR STRATEGY

The doctrine of air power developed by the Italian strategist, Guilio Douhet, was virtually identical with that of the British. Bernard Brodie, Major-General James F. C. Fuller, and J. M. Spaight have all suggested that Douhet had a great impact on the British.<sup>1</sup> It is suggested that Douhet's exaggeration of the effects of bombing may have been an important factor in the British calculations about the "knock-out blow." Many members of the Air Staff, however, deny that Douhet was of any importance and assert that British air doctrine was primarily influenced by Trenchard. Slessor has written:

Under Trenchard's inspiration there evolved the theory of air warfare, based on the supremacy of the offensive, which was to be triumphantly vindicated twenty years later. We were not (strange though it may seem) nurtured on the pure milk of Douhet. I had never heard of him in those days and even now have not read him.<sup>2</sup>

Before coming to any conclusion on this matter it is

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<sup>1</sup>Bernard Brodie, Strategy in the Missile Age (Princeton: Princeton University Press, 1959); Major-General James F. C. Fuller, The Second World War: 1939-1945 (New York: Duell, Sloan and Pearce, 1949), pp. 38-42; and J. M. Spaight, Air Power in the Next War (London: Geoffery Bles, 1938), p. 37.

<sup>2</sup>Sir John Slessor, The Central Blue (London: Cassell and Company Limited, 1956), p. 41.

helpful to look at Douhet's theory in order to see its similarities to Trenchard and the British position.

Douhet believed:

The aeroplane is the offensive weapon par excellence . . . because of its independence of surface limitations and its superior speed. . . The disintegration of nations which in the last war was brought about indirectly by the actions of the armies in the field and by blockade . . . will be accomplished directly by aerial forces.<sup>1</sup>

Thus his strategy called for a "progressive decrease of land and sea forces accompanied by a corresponding increase of aerial forces until they are strong enough to command the air."<sup>2</sup>

He believed that the decisive element in any war would be the strategic bombing campaign. He argued:

the objective must be destroyed in one attack, making further attacks on the same target unnecessary. . . In general, aerial offensives will be directed against such targets as peacetime industrial and commercial establishments; important buildings, private and public; transportation arteries and centres; and certain areas of civilian population as well. To destroy these targets three kinds of bombs are needed - explosive, incendiary, and poison gas - apportioned as the situation may require. The explosives will demolish the target, the incendiaries set fire to it, and the poison gas bombs prevent fire-fighters from extinguishing the fires.<sup>3</sup>

Douhet opposed diverting fighters to active defence

<sup>1</sup>Guilio Douhet, trans. by Dino Ferrari, The Command of the Air (New York: Coward, McCann, Inc., 1942), pp. 18-19.

<sup>2</sup>Ibid., pp. 30-31.

<sup>3</sup>Ibid., p. 20.

although he did favour certain passive defence measures. He believed that the country should be "resigned to the damage the enemy may inflict upon us, while utilizing every means at our disposal to inflict even heavier damage upon him."<sup>1</sup> The state which attacks first has a major advantage and thus for Douhet the supreme factor in air warfare is the command of the air so that one may initiate such bombing at will. Douhet does stress that the attack should be concentrated into a short period of time. Such an attack, he felt, would result in the entire population being panic-stricken and in the breakdown of civil and military authority with a resulting collapse in the social structure.<sup>2</sup>

Douhet assumed that 100 kilograms of high explosives would destroy everything in the area of a circle with a radius of 25 metres. In order to extend the destruction over an area with a diameter of 500 metres, 10 tons would be required which would mean an additional 10 tons of protective metal casing. Douhet concluded that with ten planes each carrying a bomb weighing 2 tons, this would be sufficient to destroy everything within the 500 metre circle. The natural operating size of bomber forces was ten planes; with a total force of 1,000 bombers, each operating every second day, on any given day 50 squadrons

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<sup>1</sup>Ibid., p. 59.

<sup>2</sup>Ibid., p. 58.

could destroy fifty centers. One thousand tons of bombs could destroy London or Paris.<sup>1</sup>

Brodie has pointed out that Douhet's units of destruction are each only one-twelfth of a square mile.<sup>2</sup> Therefore even if Douhet had not underestimated the navigational and aiming accuracy errors the total amount of the city destroyed as indicated in his calculations was a fairly minor portion of any large city.

The similarity of Douhet's exaggeration of bombing to that of the British Air Staff is clear. Whether this was entirely coincidental is a matter worthy of examination. One hypothesis that has not yet been suggested is that the British may have had an influence on Douhet. This is not entirely unreasonable because the Air Staff's views on airpower were public knowledge several years before Douhet's main work The Command of the Air was published in Italy in 1921. There is, however, no firm evidence to indicate that this in fact happened.

The more usual claim is that Douhet influenced the Air Staff. Yet by the time Douhet's book The Command of the Air was published in Italy, the outlines of British strategy were already clear. The British version of the doctrine of the supremacy of the bombing offensive preceded

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<sup>1</sup>Ibid., p. 184.

<sup>2</sup>Brodie, p. 393.

Douhet. Moreover Douhet was not known internationally until after his death in 1930. By this time The Command of the Air had been translated into French, German and Russian, but not English. In the year of his death he also published the fictional War of 19--.<sup>1</sup>

There is no evidence that the Royal Air Force took an interest in Douhet before the 1930's. By this time British air strategy was a well formulated doctrine. Douhet was of natural interest because his views coincided so largely with those already held in Britain and also because they were collected in one major work.

In 1933 an article entitled "The Air Doctrine of General Douhet" was published in the Royal Air Force Quarterly.<sup>2</sup> In 1936 two further articles summarizing the views of Douhet entitled "General Guilio Douhet - An Italian Apostle of Air Power" and "Air Warfare - The Principles of Air Warfare by General Douhet" appeared in the same journal.<sup>3</sup> Neither had any comment attached to the lengthy quotations and summaries from The Command of

<sup>1</sup>The first English edition of Douhet was the translation by Dino Ferrari in 1942 in The Command of the Air (New York: Coward, McCann, Inc., 1942).

<sup>2</sup>"The Air Doctrine of General Douhet," Royal Air Force Quarterly Vol. IV No. 2 (April 1933), pp. 164-67.

<sup>3</sup>"General Guilio Douhet - An Italian Apostle of Air Power" Royal Air Force Quarterly Vol. VII No. 2 (April 1936), pp. 148-51; "Air Warfare - The Principles of Air Warfare by General Douhet," Royal Air Force Quarterly Vol. VII No. 2 (April 1936), pp. 152-68.

the Air. Thus Douhet's thinking was readily accessible to anyone who read the Royal Air Force Quarterly in the 1930's. In 1936 a lecture given by the Russian Khripin on Douhet was translated by the Air Ministry into English and a copy was placed in the library.<sup>1</sup> It is perhaps noteworthy that Khripin felt that Douhet had not taken into account how complex an air offensive would be to undertake.

Douhet's greatest foreign disciple was Colonel Pierre Vauthier who wrote his book La Doctrine de Guerre du General Douhet in 1935.<sup>2</sup> It is not unlikely that this was read by members of the Air Staff. Marshal Petain who wrote the preface to Vauthier's book called Douhet the most brilliant writer of the epoch. In his well-known book L'Aviation de Bombardement, C. Rougeron also dealt extensively with Douhet.<sup>3</sup> It appears that Douhet was much better known in France than in England during the 1930's.

Douhet's impact on the British Air Staff is difficult to measure precisely. Certainly it does not appear that the Air Staff developed all their ideas from Douhet. It is more likely that Douhet's writings were

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<sup>1</sup>Now located at Adastral House, London.

<sup>2</sup>Colonel Pierre Vauthier, La Doctrine de Guerre du General Douhet (Paris: Berger - Levrault, 1935).

<sup>3</sup>C. Rougeron, L'Aviation de Bombardement (Paris: Berger - Levrault, 1936).



used in support of their own thinking in the 1930's after the doctrine of air power was already well established. Students at Cranwell, the R.A.F. College, all read Douhet during the 1930's and knew his theories well.<sup>1</sup> It seems improbable, however, that senior officers, other than those directly concerned with educating the cadets, studied and were influenced by Douhet's writings. After all, Douhet was not saying anything new or particularly startling or even controversial to most members of the Air Staff. He was just another authority confirming what had been known to be true for a number of years.

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<sup>1</sup>For this information I am indebted to Air Vice-Marshal E. J. Kingston McCloughry.

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#### Personal Interviews

Lord Balfour of Inchrye, September 5 and September 12, 1965.

Marshal of the R.A.F. Lord Portal of Hungerford, September 6, 1965.

Marshal of the R.A.F. Lord Douglas of Kirtleside, September 15, 1965.

Marshal of the R.A.F. Sir Dermot Boyle, October 5, 1965.

Sir Solly Zuckerman, October 6, 1965.

Marshal of the R.A.F. Sir John Slessor, October 13, 1965.

Marshal of the R.A.F. Sir Edward Ellington, October 18, 1965.

Marshal of the R.A.F. Lord Tedder of Glenquin, November 17,  
1965.

Sir Christopher Bullock, November 25, 1965.

The Earl of Swinton, December 1, 1965.

Mr. John Nerney, December 4, 1965.

Air Chief Marshal Lord Dowding of Bentley Priory, December 7,  
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Air Vice-Marshal E. J. Kingston McCloughry, December 8, 1965.

Marshal of the R.A.F. Sir Arthur Harris, December 9, 1965.

Dr. Noble Frankland (Telephone), December 10, 1965.

#### Private Papers

Balfour Papers - a selection was loaned to the author by  
the Earl of Inchrye.