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AIR POWER AND ARMIES

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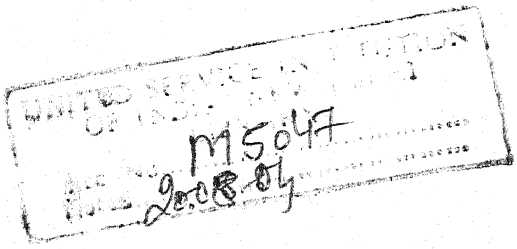
BY

WING COMMANDER

J. C. SLESSOR



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INTRODUCTION

THIS book is based on a series of lectures delivered at the Staff College at Camberley between 1931 and 1934. It deals with the action of the Royal Air Force in one special set of conditions, namely when the Empire is engaged in a war in which it has been necessary to send an Army and Air expeditionary force to fight in an overseas theatre of war. The first and most important commitment of the Royal Air Force is, of course, the defence of Great Britain against air attack; and intimately connected with this commitment is the provision of an air expeditionary force to co-operate with the army in a campaign overseas. And as long as we live in a world which maintains huge national forces numbering millions of men and consisting largely of the traditional arms—infantry, artillery, and cavalry, it is obviously important that all officers, at least of the army and the air force, should understand how the new power of the air is likely to affect the problems of land warfare.

It may be as well to anticipate two criticisms which may reasonably be directed against this book, both of which may arise from the fact that I have drawn largely on the recorded experience of the last war in order to illustrate my points. The first is that many of the comments upon and criticisms of the conduct of air operations in the last war are based on 'wisdom after the event'. They are—quite frankly and deliberately so. But there is no question of blaming anybody for any sins of omission or commission; my sole object has been to draw conclusions on which to base useful lessons for the future. After all, the really important function of any kind of military history is not primarily to serve as interesting material for the general reader, but to enable commanders and staff officers of the future to be wise *before* the event, and to learn not only from the successes but from the failures of their predecessors. There is a great deal in the history of the War in the Air which may serve as a model for the future. But there was inevitably also a certain amount which might have been done better—inevitably because we were all of us amateurs at a new art; and there could be nothing more dangerous than to sit back and assume

complacently that all that we did was good. This book, therefore, is written in no spirit of destructive criticism. I believe that on the whole we had in the last war the best led, best trained, and most efficient air force in the world—with our late enemies the Germans a very good second. Since then we have made great progress in the art of air warfare. The technical efficiency of our aircraft is to-day extremely high, and beyond our wildest hopes in 1918. Our training, and in particular our weapon-training, is of a very high order indeed; and we have to-day in our service manuals and training establishments the fruits of years of study and discussion on the strategy and tactics of air warfare. In the last war our commanders and staff officers had none of these advantages. The great air forces of which we then disposed were a mushroom growth; and the very rapidity of that growth, allied to their relative technical inadequacy, and the natural bent of minds to whom the problems and potentialities of air warfare were entirely new, had the inevitable result that they were not always used to what we should to-day consider the best advantage. Perhaps partly for this reason there is a tendency to forget that our only practical knowledge of air operations in first-class warfare is based on the experience in many theatres between 1914 and 1918; and hence to ignore the many valuable lessons—some of them of a negative order—which emerge from a study of those campaigns.

From this may arise the second criticism which it is desired to anticipate. It will undoubtedly be said that modern developments have altered cases; that the conditions of the last war are unlikely to be repeated; and that a close study of an operation such as that of the Amiens battle of August 1918, contained in Chapters VIII–X of this book, is a waste of time, because its essential characteristics are unlikely to be reproduced. It is obviously true that the sealed-pattern, trench-warfare, infantry and artillery battle on the 1914–18 model will never be seen again. Whether or not warfare on anything akin to traditional lines is altogether a thing of the past is a question to which an answer is suggested in the concluding chapter of this book. It is fashionable nowadays to represent the war of the future as being inevitably an affair of lethal gases and bacilli rained from the air exclusively upon the female and non-combatant sections of the populace in open towns. I would prefer to abstain from

prophecy on that head—further than to suggest that it is dangerous to take for granted that military operations of any nature on the ground are, as yet, only a matter for the reminiscences of a modern generation of Old Kaspars.

In this connexion there is one point in particular which must be referred to, because it is a point of primary importance in British defensive policy.

> 'The reasons why England in the reigns of William and Anne felt constrained to take part in the wars against Louis, are the same reasons that have periodically guided her action in great European crises and colonial rivalry . . . the need to secure the safety of our small island by preventing the predominance of any one Power on the Continent—the Policy known as the Balance of Power; and the imperative demand on behalf of our maritime security that the Low Countries should not fall into the hands of a great military and naval Empire.'[1]

The Policy of the Balance of Power is—theoretically at any rate—out of date in these days of the League of Nations. But if the freedom of the Low Countries has been a cardinal point in our policy for reasons of maritime security in the past, it may be no less vital to us to-day for the added reason of air security. In air defence a first essential is depth, because depth means time and space—time in which to get warning and enable our fighters to reach their fighting height, and space in which to establish our bomber aerodromes well forward in the vicinity of the hostile air bases and vital centres. And although the rapidly increasing ranges of bombers will in the near future diminish the importance of this factor, it will still remain true that a much more intensive attack against this country could be sustained from bases on the Channel coast.

It is difficult, for obvious reasons, to be more explicit on this point. It must be sufficient to suggest that to ensure the integrity of the Low Countries, to prevent the establishment of hostile air bases within fatally close range of these coasts, military operations on the ground—though inevitably of a very different character from those of 1914–18—may again be necessary in the future as they have so often been in the past.

Therefore, since we must assume that military operations on the ground may take place again, of however different a nature,

[1] G. M. Trevelyan, *Blenheim*, p. 107.

it is obviously worth while trying to learn something from a study of the only first-class war in which aircraft have played an important part. If there is one attitude more dangerous than to assume that a future war will be just like the last one, it is to imagine that it will be so utterly different that we can afford to ignore all the lessons of the last one. The interval between the South African War and the Great War contains some interesting examples both of failures and achievements in this respect. For instance, in 1914 our system for the supply of artillery ammunition was based on the policy that it was required to maintain in the field a force of six divisions and one cavalry division 'during a campaign similar to that in South Africa'; the reserve stocks in hand and the system for replacement were based on the conclusions of a Committee which sat in 1904; and those responsible for our military policy did not revise their conclusions in the light of the lessons of the Russo-Japanese War, which was going on while that Committee were sitting. In other words, in 1914 they were making some of their preparations, not for the last war—that would have found them far better prepared than they were—but for the war before that, which was obviously unwise and dangerous, especially in view of the European situation and the war for which the army were almost openly training.

On the other side of the picture there is this to remember. The campaign of 1914 had very little in common with the South African War—though admittedly it was nothing like as different as the next land operations are likely to be from those of 1918. There is discernible nowadays a tendency to make more of the defects of the British Regular Army of 1914 than of its qualities—possibly on account of some admitted deficiencies in its command and direction; but no one can deny that its organization, its training—particularly weapon-training—and its equipment were excellent, and worthy of the splendid quality of its personnel. And the reason that this was so was very largely because the General Staff in the decade following South Africa had studied and remedied many of the defects in direction, organization, training, and equipment which had disclosed themselves in that campaign. So, however different the next war may be, we can probably learn something even on points of detail from the lessons of the last. But the real value of

intelligent and critical study of recent campaigns is that it does give us a sound grasp of the main underlying principles. This is a platitude, of course, and so is the statement that the basic principles of war—which are merely the basic principles of common sense applied to war—do not change; but they are both of them profoundly true. There does arise occasionally the military genius, the born commander who instinctively does the right thing on every occasion as it occurs. But the ordinary man is much more likely to do the right thing if he really understands why he is doing it, and what will probably happen if he does something else; and the best basis for sound judgement is a knowledge of what has been done in the past, and with what results. We in the air force have only one war to draw on for such knowledge; and therefore if a study of the air operations in that war helps us to understand the broad principles such as concentration, security, and offensive action, it needs no further excuse.

So it is in this spirit that this book is written. Not in a vein of facile destructive criticism, but as a reasoned attempt to examine some possibilities of air action in co-operation with an army in the field, in the light of experience of the last Great War; accepting examples from that war as models for the future when they appear admirable; and when they do not, frankly suggesting how they might have been bettered had there been then at our disposal the experience and knowledge which, in however imperfect a form, we have to-day.

It should, however, be clearly understood that the conditions envisaged throughout are those of a campaign on land in which the primary problem at the time is the defeat of an enemy army in the field. Although the great principles remain the same, their application must vary widely with the conditions of the war. And in a war against a great naval Power at sea, or when the principal threat to the Empire at the time is the action of hostile air forces against this country or its possessions, the aim and objectives of the air forces of the Empire will not be the same as those described in this book.

It must be explained that anything in the way of historical research into the operations of the air force in the last war is severely handicapped by the lack of comprehensive documentary records. A very close and excellent liaison existed between

all air force commanders and the General Staff of the formations they served; and by far the greater part of the arrangements for air co-operation was done by personal discussion and verbal instructions, usually unconfirmed in writing. This system, though no doubt it often worked very well at the time, makes things very difficult for the student or military historian after the War. I have been able to consult a few of the commanders and staff officers who were concerned, for instance, in the arrangements for the Amiens battle; but it is notoriously difficult years afterwards to remember the atmosphere in which decisions were made, or to grasp what was in the minds of the men on the spot at the time merely from written records; however full and comprehensive they may be. Subject to these inevitable limitations every effort has been made to ensure that the narrative—even if in some places necessarily incomplete—is substantially accurate on matters of fact. Where suggestions or criticisms are offered on matters of opinion—for which, of course, I bear the sole responsibility—it should be remembered that 'what's done we partly may compute, but know not what's resisted'. And the decision or course of action under review may have been dictated by strong and adequate reasons of policy, military expediency, or the personal factor, known only to the responsible authorities concerned at the time.

When considering the possible course of air operations in the future, and comparing it with the recorded history of air operations in the past, the reader must always keep in mind the immense advance in technique and material efficiency since the War. This is a subject which obviously does not lend itself to detailed discussion in a book of this sort. Since the end of the War aircraft have made a great advance in performance and offensive power; and the next few years will probably see a still greater improvement both in speed and carrying capacity. These improvements in design, together with the development of engines burning heavy oil—which is a more economical fuel than petrol—will undoubtedly mean a very great increase in bomber ranges in the near future, possibly by 100 per cent. or more.[1] This is obviously the most important development in its strategical implications to the security of Great Britain. But apart from this, to overlook the very great increase in such

[1] See Lecture by S.-Ldr. R. V. Goddard, *R.U.S.I. Journal*, August 1934.

factors as bombing accuracy and the efficiency of air armaments, of organization, and of training, since British aircraft were last in action on a serious scale, would be to get a very false picture of the potentialities of air warfare in modern conditions.

Finally, I must acknowledge most gratefully the invaluable assistance of the many officers of the army and air force, and of the Air Historical Branch, whose ideas I have borrowed, and whose criticism and advice have helped me so much.

J. C. S.

QUETTA,
March, 1935.

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PART I
AIR SUPERIORITY

I
THE OBJECT

'The National object in war is to overcome the opponent's will. . . . Since the armed forces are the only instruments of offence or defence, these forces or such of them as are capable of influencing the decision, must be overcome. The aim of the Army is therefore—in co-operation with the Navy and Air Force—to break down the resistance of the enemy's armed forces in furtherance of the approved plan of campaign.'[1]

THUS the object of an army in a land campaign is to defeat the enemy's army; that of the air force contingent in the field is to assist and co-operate with the army in the defeat of the enemy's army, and of such air forces as may be co-operating with it. It is necessary to emphasize this rather obvious truth in order to clear the air of a certain amount of misunderstanding that too often in the past has obscured the issue of this subject. The War of 1914 to 1918 in the air was, for obvious and natural reasons, an 'Army co-operation' war in the narrow technical sense of the term. At the outset, and for many months afterwards, the only important use of aircraft appeared to men's minds to be that of reconnaissance. The potentialities of the aeroplane as a means whereby commanders could obtain information—could see the other side of the hill—were so obvious, and the offensive capacity of aircraft in those days was so slight, that it was only natural that their use as a positive striking force wherewith to influence the decision should be overshadowed. As the War went on and the land forces on either side increased in size and complexity, the demands on aircraft for observation for the ever-growing mass of heavy artillery assumed the position of greatest importance. Air bombardment, particularly against such objectives as the enemy rail communications, was not altogether neglected even

[1] F.S.R. ii, sect. 4. 1.

early in the war, as will be shown later in this book. But it is broadly true to say that up to the end of the war the primary object of all air operations, with one exception, was to secure air superiority over the battle line, to enable our reconnaissance and artillery aircraft to carry on their work of close co-operation. The one exception was the group of units known as the Independent Force R.A.F.; and even in the circumstances leading up to the formation of that force it is possible to see clearly the influence of this idea, this underlying policy that the primary object, the service of first importance that air forces could perform for the land forces, was the purely ancillary service of reconnaissance and observation.

It would be foolish to pretend that the work of close co-operation, of those units now known as Army Co-operation Squadrons, is not of very great importance to the Army. Indeed there will very likely be occasions when to ensure an uninterrupted flow of information, or accurate and unremitting observation for the artillery, will again for a time be the most valuable service that can be performed by the air forces in the field as a whole. Such a service may well be again, as it has been before, a most important factor in the defeat of an enemy. But it is the object of this book to draw attention to the other aspect of air power in land warfare, namely the positive influence which can be exerted by an air striking force in direct attack upon objectives on the ground. It is this aspect that in the opinion of the writer is still seriously underrated in the British Service to-day, although it may have an influence on the course of a campaign out of all proportion to that which can be exerted by the purely ancillary service of reconnaissance and observation.

And this leads up to the point that *in a land campaign* the primary objectives—that is to say those against which action will lead most directly to a decision—will always be the enemy *land forces*, their communications and system of supply. This point perhaps needs some elaboration. For the purpose of this book a land campaign must be taken to mean a campaign, or a stage in a campaign, of which the primary object for the time being is the defeat of an enemy army in the field. Such a stage may occur in a war in which the ultimate aim of the enemy is the reduction of this country by air measures. It has already

been suggested, for instance, that the first stage of an air war against this country may be a struggle on the ground for the possession of bases in the Low Countries, from which an effective air invasion of England can be sustained. In these conditions, until the enemy army has been confined within or driven back to its own frontiers, or to a position which gives sufficient depth for the air defence of this country, the primary object of the combined forces in the field will be the defeat of that army—or at least its expulsion to the requisite distance. And that is what is meant by the expression 'land campaign'.

Once that object is achieved, then the ultimate reduction of the enemy nation may (and very likely will) be undertaken, not by the traditional methods of land invasion, or by continued assaults upon their armies in the field, but by air measures. That is to say it will become an air campaign, and the task of the army will be simply to protect the air bases. When that happens then it is arguable that a decision may be secured by action against enemy air forces—since the complete defeat of those forces would place the enemy nation at the mercy of unrestricted air action. As a matter of fact it is more likely that even in an air campaign action against air forces will remain only subsidiary, and the decision will only be gained by direct action against the hostile vital centres. This, however, is getting on to ground beyond the scope of this book, and for the present purpose it is sufficient to emphasize that in a land campaign all action other than against *military* objectives (as opposed to objectives connected with the enemy air force) is merely secondary.

This does not mean that, even in a land campaign, action against enemy air forces and their system of supply and provision can be neglected as unimportant. On the contrary, it will be absolutely essential for two main reasons: firstly to enable our own air offensive to be directed with the minimum of interference against the objectives best calculated to contribute to the primary aim of the national forces in the field; and secondly to protect our own army and its reconnaissance aircraft from hostile air interference. It is thus a means to an end, an essential measure of security upon which all offensive action must be based. But air fighting in itself, the destruction of enemy air forces, will not give us a decision in a land campaign.

Even to-day we find the tendency to exaggerate the importance of the secondary, negative object of air action reflected in our training manuals. We read, for instance, that 'the first duty of the air force contingent is to create and maintain an air situation such as will assist the army to achieve its object, and will prevent undue interference from enemy air attack'.[1] If this means the first duty in point of time it is arguable that the creation of a favourable air situation may sometimes be a necessary precedent to the attack on the primary objective, though the two processes will more commonly be simultaneous. But it is not infrequently claimed—and the claim finds some support in the manuals—that the maintenance of a favourable situation in the air is the *principal* task of both bombers and fighters in the field. This is definitely not so. Air superiority is only a means to an end and, unless it is kept in its proper place as such, is liable to lead to waste of effort and dispersion of force. Indeed, there is so much confusion of thought on this subject of air superiority in relation to the object in war that it is worth a brief general examination.

The fact is that 'air superiority' has become something of a catchword. It is easy, and sounds convincing, to say briefly 'the job of the air force is to gain air superiority' and leave it at that. But what does it mean? The official definition of the term is 'a state of moral, physical, and material superiority which enables its possessor to conduct operations against an enemy and at the same time deprive the enemy of the ability to interfere effectively by the use of his own air forces'—in other words it means the capacity to achieve our own object in the air and to stop the enemy achieving his. To 'deny to the enemy freedom of action for his aircraft' is only the second, and the negative, half of this meaning. We can learn something from the naval analogy. The object of sea supremacy is the control of sea communications, to secure them for our own use and to deny their use to the enemy. It can equally well be said that the object of air superiority is the control of air communications *firstly for our own use* and secondly to deny their use to the enemy. And the use to which we require to put them is to 'conduct operations against an enemy'; and this, in a land campaign (which is the subject of this book), means to *break down the*

[1] Employment of Air Forces with the Army in the Field. Manual, sect. 8. 1.

resistance of the enemy army, which includes reconnaissance and observation for the army and direct attack by the air force—both directed to the same end.

Another point of similarity with the naval term is interesting. In the proud old days before the War we used to talk of the Command of the Seas. To-day we have dropped that term and speak of control of sea communications—and air superiority, not command of the air. The reason is to be found in the same quality, the capacity for *evasion*, at sea of the submarine, in the air of the aeroplane. Once warfare gets into the third dimension, whether above or below the surface, the cubic area of the battle-fields is so immense that absolute command is hardly ever practicable.

All this must not be taken to mean that we can in fact control the air communications without fighting the enemy air forces. Just as at sea the surest method of achieving the object—control of sea communications—is the destruction of the enemy fighting fleet, so in the air the surest method of securing freedom of action for our own aircraft would be the destruction of the enemy's air forces, if that were possible. But as in naval warfare the most that can normally be secured under modern conditions is the neutralization of the enemy's battle fleet, so also in the air. The unlimited opportunities for evasion have the result that the most we can hope for in a war against a first-class enemy is to throw his air forces on the defensive, to neutralize them, to enable our own aircraft to work with the minimum of interference, and to reduce enemy air action against our own forces to the minimum. And even this limited result can only be secured by hard and continuous fighting.

Note, however, that in both forms of warfare, at sea and in the air, battle with the enemy's sea or air forces is only the means, not the end—or, in 'Staff duties' jargon, the Method, not the Intention. It is of far more than merely academic importance to distinguish clearly between the Method and the Intention, between the objective and the object, between the steps taken to achieve the end and the end itself. It was perhaps some confusion of thought on this head which led even Mr. Winston Churchill, in a memorandum written in October 1917 which was otherwise a masterpiece of strategical foresight,[1]

[1] App. V, Part II, *The World Crisis, 1914–18.*

to state as an axiom the following: '. . . The primary objective of our air forces becomes plainly apparent, viz. the air bases of the enemy and the consequent destruction of his air fighting forces. All other objectives, however tempting, however necessary it may be to make provision for attacking some of them, must be regarded as subordinate to this primary purpose.' Note the confusion—'objective' in the first line, 'purpose' in the last. This confusion may be in part due to the perhaps rather disproportionate amount of attention given to the operations of the fighter aircraft in the last war. For the fighters, but for the fighters alone, the destruction of enemy aircraft may be said to be the primary objective. But the fighters, though an immensely important arm, are nevertheless only one arm of the air forces; and their operations, if they could be considered apart from their effect on those of the rest of the Service, would appear as remote from reality as the jousts of medieval champions. Of course they cannot be so considered, and the influence of their activities is of vital importance—but only as a contribution to the end, and not as the end itself. The point is well explained by Major Sherman, of the U.S. Air Corps, in his able book on air warfare.[1]

'*The basic mission of pursuit aviation*:—with the exception of pursuit, all other branches of aviation have a dual role. Their missions may be of the nature of a service, as is habitual with observation aviation; or they may consist in offensive action against hostile elements on the surface of the earth, which is the proper role of bombardment and of attack aviation. In any case they have a certain duty to perform which arises from other than air considerations. In so far as the latter are concerned, their missions are almost invariably of a defensive character. Whenever consistent with the playing of the first part of their roles they studiously avoid combat. With pursuit aviation on the other hand, air combat is the sole reason for its existence. . . . The study of air warfare *in its most limited sense*,[2] is the study of pursuit strategy and tactics . . . to-day the basic mission of pursuit aviation is the destruction of all hostile aircraft and the protection of friendly aircraft. . . .

'In a certain sense, pursuit aviation may be called an auxiliary to the other branches of aviation, for the criterion of its value is the

[1] *Air Warfare*, by Major W. Sherman, p. 127 et seq. Note: the Americans call their Fighter Squadrons 'Pursuit Aviation'.

[2] My italics.

effect it has on the air situation; and this in turn is of importance only to the extent it affects the operation of attack, bombardment and observation aviation. . . .'

This is the point: the air situation has no importance in any form of war except in so far as it affects the situation on the ground, and the operations of those arms of the air force who are engaged against hostile objectives *upon the ground*—whether by direct attack or by indirect action in the form of reconnaissance and observation. And the fighters are an arm of the Service whose influence is entirely indirect and auxiliary,[1] although, as Major Sherman rightly goes on to point out, 'No mistake could be more destructive in its consequences than to underrate the value of pursuit aviation to air operations as a whole, under any conditions of serious warfare'.

The correct relation between air fighting—attack on the enemy's air forces—and the true object of an air force in war was well understood by Marshal Foch in the closing months of the War. His plans for the employment of the great Inter-Allied Bombing Force of the 1919 programme (of which the Independent Force R.A.F. was the nucleus) were primarily aimed at the dislocation of German war industry and munition supply; and he laid down in some detail, and in order of importance, the various targets to be bombed—such as chemical factories, industrial and commercial centres in the Rhineland and the Saar, and focal points on the railways serving those vital areas. But Sir Hugh Trenchard, who was to command the Inter-Allied Force, was given a free hand to deal as he thought fit with the bases from which enemy aircraft might operate to interfere with his work. His work, the object of his operations, was to bring pressure to bear on Germany by dislocating her centres of war industry and the rail communications serving them. In order to enable his squadrons to carry out this programme they would have to fight their way through the enemy's defensive screen of fighters, and would also have to direct some of their energies to the neutralization of enemy air forces by attack on their aerodromes—Method, not Intention: a necessary step to achieve the object, but not the object.

There thus appears at first sight to be a wide divergence between the object of the army, as stated in Field Service

[1] See p. 20 below.

Regulations, 'to break down the resistance of the enemy's armed forces', and that of the air force, as officially stated, 'to break down the enemy's resistance . . . by attacks on objectives calculated to achieve this end' (although such objectives, for the air force directly co-operating in a land campaign, happen to be the enemy land forces in the field, their communications and system of supply). The air arm seems to miss out what has always been regarded as an essential stage in war, the reduction of the enemy's corresponding armed forces. But actually the difference is more apparent than real, and is mainly a matter of degree. The soldier recognizes that in order to achieve the national object of overcoming the opponent's will it is normally necessary for him ultimately to undertake—or at least to threaten—the occupation of the enemy's country or the interruption of his vital lines of communication and supply.[1] The airman strikes direct at those objectives. And the sole reason why he is able to do so—the first important difference between air forces and armies—is that, within his tactical range, which may be as much as 300 or 400 miles, *he is independent of lines of communication and has no flanks.* To use a simplified illustration: an army setting out to invade a hostile country could not possibly afford to forge straight ahead in the direction of the enemy's capital, ignoring all hostile forces other than those which it actually meets in its path. The essence of war on land is manœuvre, and the army which allows its opponent to turn its flank and get astride its line of communication, on which it must rely for the vast mass of food, ammunition, and other stores essential to its fighting efficiency, is a defeated army. Therefore before an army can pass on to become the instrument of national policy by the occupation of the enemy's country, it is bound first to defeat the enemy's army and thus *secure its own line of communication.* An air force, on the other hand, can reach its objective without prejudice to its own security or its capacity to damage that objective when it does get there, and can return to its base through an enemy *literally astride its line of flight.* It follows, of course, that against a first-class enemy that air force will have to fight such hostile air forces as it encounters on the direct route to and from its objective; and it will often be necessary to divert some proportion of its energy to the neutralization

[1] See F.S.R. ii, sect. 4, 1.

of the enemy air forces by attacking them at their bases, in order to reduce the numbers or the morale of the hostile air forces that it *does* encounter on the way to and from its primary objectives. But the point is that an air force *can* get to those objectives, do its job, and get back again without the preliminary total defeat of the corresponding hostile armed forces—which an army cannot.

The only other important difference, in the strategical sense, between armies and air forces is closely akin to the first, and arises out of the same quality of mobility in the third dimension; and is that *an air force is not committed to any one course of action.* Once a military commander undertakes any course of action he cannot make any fundamental alteration in his plan without incurring great dislocation and delay; he is in fact committed —in an increasing degree as mechanization progresses—to the course originally selected, owing not only to the relatively slow rate of movement inherent in land forces themselves, but even more to the elaborate and cumbrous administrative machinery and system of communications upon which they must rely. Indeed it is a curious and unfortunate paradox that the petrol engine, which it is hoped will restore to modern armies the tactical mobility of which they were deprived by the machine-gun and barbed wire, at the same time must often result in seriously reducing their strategical freedom of action. A mental comparison of a modern mechanized army with Lord Roberts's columns in the second Afghan War, or with Budienny's cavalry divisions in the Soviet-Polish campaign, will confirm the truth of that.

An air force, on the other hand, is not so committed. It can switch, literally almost at a moment's notice, from one objective to another several hundred miles away, from the same base. Recent examples will be familiar to the reader of squadrons engaged in the Mohmand country one afternoon being in action from the same base against objectives in Waziristan next morning. Furthermore, a sound organization and system of aerodromes, which have the notable merit of being inexpensive, confer on an air force the added advantage of being able to change their base with the minimum of dislocation and delay—an advantage that will be still further enhanced by the development of transport aircraft.

A simple illustration will suffice to make this point clear. There was, and is still, a school of thought which held that the B.E.F. in 1914 could best be employed from a base on the Belgian coast against the flank of the German invasion. It was in the event decided to employ that force in direct co-operation with the French army, and once it had concentrated on the French left wing, it was irretrievably committed to that role. An air force under similar circumstances could have been employed at the outset from bases in Belgium against the communications of the German flank armies through Aachen and Liége; and from those same bases could still have been switched, as and when the need arose, in whole or in part, to—say—the direct assistance of General Lanrezac's army about Charleroi, or against German aerodromes in north-east Belgium if the air situation so demanded.

It must then be apparent that air superiority is not a definite condition to be achieved once and for all, a stage to be passed from which the air force can proceed to other forms of activity. It is not a phase to be gone through, a necessary preliminary to be dealt with as expeditiously as possible before the real business can begin, like the minor attacks that were sometimes made in France in order to gain ground to secure a suitable starting-line for a large-scale offensive.[1] Air superiority will be gained and will have to be constantly maintained by striking direct at those objectives which are of first importance to the enemy at the time, whatever they may be; and by persisting in this line of action against opposition and in spite of casualties, assisted in varying degree by diversions in the form of direct attack on the enemy's air forces. The struggle for air superiority is part and parcel of all air operations against a first-class enemy; and though much can be done by superior organization and equipment to provide for the physical and material factors before we go to war, the essential third factor—perhaps the most important of all—the moral factor, can only be secured by an instant and unremitting *offensive* directed against the primary objective, whatever it happens to be at the time. 'Air superiority is only a means to an end.' But it happens that to go straight for the end is the best, in fact the only sure, way of achieving the means.

[1] For the one exception to this rule see p. 39.

II

THE MAIN OFFENSIVE

'Air superiority is obtained by the combined action of bomber and fighter aircraft. The detailed measures to obtain and maintain the requisite air situation must vary with the circumstances of the campaign, but purely defensive measures will rarely be successful.'[1]

In this and the next chapter it is proposed to examine briefly those detailed measures by which we must obtain and maintain the control of air communications for our own use and deny them to that of the enemy. And in order to afford a background for this examination it may be useful to remind the reader of two periods during the Great War, in different theatres and under widely different conditions, which clearly illustrate the influence that a favourable air situation may exert upon the operations of an army. The first example—that of Palestine—provides an exception to the rule that absolute command of the air in a theatre of war is an unattainable ideal. In 1917, before General Allenby's arrival, the German air forces operating in support of the Turkish army had enjoyed a high degree of superiority in the air. The British aircraft on that front were few and of inferior performance, and the consequent unfavourable air situation was a contributory factor in our earlier reverses at Gaza, and had a generally adverse effect on the morale of the troops, none the less potent for being indefinable. One of General Allenby's first acts on assuming command in Palestine was to demand, and obtain, three additional squadrons of up-to-date aircraft. The air situation naturally took an immediate change for the better, a change which was promptly reflected in the victory of Beersheba. Allenby was a master of strategical surprise, and the success at Beersheba—like the greater victory a year later—was largely due to the adoption of various devices to lead the Turks to imagine that the attack was coming elsewhere, on this occasion at Gaza. Says Colonel Wavell in his book on the Palestine Campaign:[2] 'All these devices to mislead the enemy would have been of much less avail had not the new

[1] Manual, sect. 9. 2.

[2] *Campaigns in Palestine*, p. 107.

squadrons and more modern machines received from home enabled our air force in the late autumn to wrest from the enemy the command of the air which he had so long enjoyed in this theatre.'

But if the effect of air superiority was striking in the autumn of 1917, it was far more so a year later, when General Allenby staged his great break-through (incidentally the only break-through which a British army ever achieved in the war) that was to end the campaign in the Middle East. By this time our air superiority in Palestine practically amounted to complete command. Once more the preparations for the attack included the most elaborate measures to deceive the enemy: empty camps, rows of dummy horse-lines, and artificially raised clouds of dust at the Jordan valley end distracted the Turks' attention from the stealthy concentration of the British and Australian mounted and dismounted divisions at the Mediterranean end of the line. To quote Wavell again:[1] 'It was above all the dominance secured by our air force that enabled the concentration to be concealed. So complete was the mastery it had obtained in the air by hard fighting that by September a hostile aeroplane rarely crossed our lines at all.' During the final preparations and on the morning of the attack we had fighter patrols sitting over the enemy aerodromes, which effectively prevented any hostile aeroplane from leaving the ground[2] at all; and both close co-operation pilots and the bomber and fighter patrols that co-operated with the mounted troops in the pursuit, with such disastrous results to the enemy, were able to go about their tasks completely unhampered by hostile air opposition. Superiority on this scale, amounting as it did to absolute command, can rarely if ever be secured in operations against a first-class enemy. But we may note in passing that on this occasion not only did it endow the commander with the invaluable—and otherwise almost unattainable—advantage of strategical surprise, but also enabled an air striking force to make perhaps the most decisive contribution it has ever made to the issue of a battle by direct action against an enemy army.[3] Its effect was summed up by General Allenby in his dispatch

[1] *Campaigns in Palestine*, p. 201.
[2] *Vide* Evidence of German M.O. at Jenin, *History of the Desert Mounted Corps*.
[3] See p. 102 below.

dated June 28th, 1919, in the following words: 'The superiority established by the Air Force over the enemy was one of the great factors in the success of my troops.'

The Palestine campaign is perhaps not altogether a fair example, because in that theatre after the autumn of 1917 we were opposed in the air by an enemy numerically very inferior, whose difficulties of supply and technical maintenance, already difficult enough owing to the distance of the front from Germany, were enhanced by the nefarious activities of the British prisoner-of-war working parties at the Taurus tunnels. But on the Somme in the summer of 1916 we were up against an enemy of the first quality, yet that battle provides an example of a local superiority approximating more closely to absolute command than anything we saw in France before or since.

> 'The beginning and the first weeks of the Somme battle', says von Below, commanding the First German Army, 'were marked by a complete inferiority of our own air forces. The enemy's aeroplanes enjoyed complete freedom in carrying out distant reconnaissances. With the aid of aeroplane observation the hostile artillery neutralized our guns and were able to range with the most extreme accuracy on the trenches occupied by our infantry; the required data for this was provided by undisturbed trench reconnaissance and photography. . . . On the other hand our own aeroplanes only succeeded in quite exceptional cases in breaking through the hostile patrol barrage and carrying out distant reconnaissances. Our artillery machines were driven off whenever they attempted to carry out registration for our own batteries. Photographic reconnaissance could not fulfil the demands made upon it.'[1]

These words of the enemy Army Commander principally concerned describe very graphically the extent to which control of the air for the use of our own close co-operation aircraft, while denying it to those of the enemy, was secured in this great battle. Even in September, when Hindenburg had succeeded von Falkenhayn as C.G.S. and had concentrated more than one-third of the German air force on the Somme front, Sir Hugh Trenchard was still able to report to the Commander-in-Chief that 'A.A. guns have only reported 14 (German) machines as having crossed the line in the 4th Army area in the last week,

[1] Report by General von Below on the First German Army in the Somme battle, quoted in the Official History, *The War in the Air*, Vol. ii, p. 270.

whereas something like two to three thousand of our machines crossed the line during the week'.

So the primary object of the air operations, to secure freedom of action for our close co-operation aircraft over the actual battle area, was attained. But this is not the whole picture. Far over the German side, out of sight of our forward infantry, very intensive air fighting was taking place throughout the whole period of the battle. The Official History describes many examples, particularly of the fighting over our bombers' objectives on the enemy lines of communication leading to the battlefield, where the enemy Fokker and Roland fighters were especially active. There was thus no command of the air corresponding to the situation in Palestine just described. We were, however, able to secure a good working local control of the air *in the area where it was of most importance at the time*, that is where our army co-operation squadrons were engaged in their task of artillery observation and close reconnaissance. And it was our great artillery superiority, itself largely rendered possible by that control, that enabled the New British armies to break in to the most formidable system of field defences that has ever faced an army in war.

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> 'It must now be told how it was possible for the Royal Flying Corps to do its work for the Army little hindered by the German air service. This was brought about in two ways—by seeking out and fighting the enemy's aeroplanes far over his own lines, and by creating such a threat to the vitals of his communications, by incessant bombing, that he was compelled to use up much of his fighting strength in defence.'[1]

The reader who aspires to a detailed knowledge of the air operations during the Somme battle must turn to the excellent account set forth in the Official History. But the opening sentences of that account—quoted above—will serve as a text to a general examination of the methods by which air superiority must be attained and maintained. Indeed, they find an echo in the section of the Manual dealing with air superiority:

> 'where conditions are favourable a temporary advantage in the struggle for air superiority may be obtained by attacking enemy aerodromes. . . . Normally, air superiority is more likely to be

[1] *The War in the Air*, vol. ii, p. 251.

gained by the attack of other objectives with a view to upsetting the plans of the opposing commander, and causing him to divert aircraft for their defence.'[1]

From an analysis of the methods adopted to secure air superiority there emerge two main principles, which for the sake of clarity it may be as well to state early in this chapter. These principles are not merely academic theories of how the situation ought to work out; they are based on actual practical experience of how things really did work out in air warfare on a large scale between first-rate opponents, the British and French against the Germans, in the Great War. They are as follows:

A. Even assuming approximately equal resources on both sides in personnel, training, and equipment, air superiority can be gained and must be maintained firstly by the adoption of a resolute bombing offensive against the vital centres of the enemy. By this means he will be thrown on the defensive in a dual sense:

1. He will be forced to use up his strength in defence, to divert aircraft from their primary *task* which alone can be decisive, so that instead of striking at *our* vital centres, and thus exerting a direct influence in the decision, they will have a passive role thrust upon them.
2. By judicious selection of objectives, he may be forced to divert even these defensive aircraft from whatever may be the really decisive *area* at the time in order to protect those vital centres which—even though not actually in the area of the decisive battle—he cannot for military or political reasons afford to leave unguarded.

This course holds out the traditional advantages of the offensive, in that we grasp and retain the initiative, force the enemy aircraft to meet and fight us under conditions of our own choosing, and thus deprive them of the capacity for evasion.

B. This leads on to the second principle, which is that the offensive against the enemy's vital centres must be supplemented in varying degree by direct action against the enemy air forces. Such action will take two forms:

1. By fighters, seeking out and destroying the enemy air forces in the air, in those areas where they are most likely to be encountered. These areas, owing to the increasing

[1] Manual, sect. 9. 4.

capacity for evasion in the air, will normally be at the enemy's points of departure or of destination. That is to say, the most profitable areas will usually be over the enemy's aerodromes or over the objectives of our bombers; but they may at times be those in which our close co-operation aircraft are operating, or even in certain conditions over the objectives of enemy bombers within our own lines.

2. By bombers, supplemented sometimes by low-flying fighters, attacking the enemy air forces upon the ground, their aerodromes, bases, aircraft depots, and technical establishments.[1]

These broad principles will be considered in some detail in the following pages. But before going farther it seems necessary to make a short digression and attempt a definition. In all the literature of air warfare, official and otherwise, no words are more overworked, or often loosely used, than this convenient expression 'vital centre'. Strictly speaking a vital centre is an organ or centre in a man, an army, or a nation, the destruction or even interruption of which will be fatal to continued vitality. Note that actual *material destruction* of a vital centre is *not* essential in order to be fatal. Thus a man's windpipe is a vital centre; yet it is not necessary to cut it but only temporarily to stop air getting through it in order to kill that man. One or more essential railway junctions may be vital centres of an army in the field; yet it is not necessary absolutely to demolish those junctions, but only to prevent railway trains passing through them for a sufficient length of time, to be fatal to that army. The same applies to the blast furnace producing steel for ships or guns, the docks where military personnel or stores are handled, or the factory producing magnetos for aeroplanes. The point is that a vital centre is some organization of which a stoppage or even a sufficient restriction of output or operation will be fatal. So a convenient definition of the term 'vital centre', within the narrow limits of an actual theatre of war, is 'Any point in the enemy's system of supply or communication of which the destruction or interruption for a sufficient length of time will, either immediately or in due course, be fatal to his continuance

[1] In this chapter we are considering only action against enemy aerodromes and technical air establishments in the field. Bombardment of aircraft factories will, of course, have an important effect on air superiority in the long run.

of effective operations'. But unfortunately we cannot leave it at this—we cannot confine ourselves strictly to the literal interpretation. War is a human activity, and, human nature being what it is, decisions in war are influenced by factors other than those of cold military expediency. The statesman has to consider, and so the soldier must take into account, many factors, moral, political, social, economic—he has in fact to take the national point of view, not merely the military. So that some organization, some centre there will be of which even the total destruction would not be fatal to the continuance of military operations if nations were composed of robots; but which nevertheless is humanly so important that no government can afford to leave it unprotected; which in fact as far as air operations are concerned becomes a vital centre, in that it has to be treated in the same way as a literally vital centre and has equally to be protected against interference.

It is difficult to be more definite about a subject which is necessarily so imponderable. It must be sufficient to quote by way of illustration the example of London in the last war. Despite the importance of Woolwich arsenal and other centres of munitions industry in the London area, there is no doubt that we should not have had to tie up such large numbers of aircraft in the defence of London against the very weak and sporadic attacks directed on it, but for its importance as the capital city and greatest centre of population, commerce, and finance. The bombing of London at that time could not possibly have led to the defeat of our forces in the field, nor of our fleets at sea, but the Government simply could not afford to leave London unprotected or inadequately guarded, in view of the possible social and political results which might follow a serious attack, however unlikely it may have been. So when we use the term 'vital centre' it must cover not only the literally vital centres of communications in the field, or of munition-production in the industrial areas at home, but also those centres which for political or social reasons have to be treated in the same way, and afforded similar protection.

To return to the first principle enunciated on p. 15. 'Air superiority can be gained and must be maintained by the adoption of a resolute bombing offensive against the vital centres of

the enemy.' The moral advantages of an offensive policy in any form of war will scarcely be questioned. And whereas modern small arms and field defences have, at least temporarily, lent superiority to the defence upon the ground, in the air all modern developments—such as cloud flying and very high speeds—are tending more and more to weigh the scales in favour of the attack. This being so, it may be argued that both belligerents will persist ruthlessly in their air offensives, each resolutely refusing to be diverted to a defensive policy and avoiding battle with the opposing air forces, until a sort of deadlock ensues. The problem is one on which it is dangerous to dogmatize. A mere bald-headed unreasoning offensive, simply for the sake of taking the offensive, is unlikely to be any more effective to-day in the air than it was in 1914 on the ground. We have but little practical experience on which to base our conclusions. It is more than likely that each belligerent will begin by an air offensive against the vital centres of the other; and it seems not improbable that the situation may go through a stage of deadlock. It does not, however, appear likely that this will be more than a temporary phase; a variety of factors, physical, psychological, and material, will come into play. National characteristics, the morale and endurance of pilots, the efficiency of aircraft and armaments, the capacity for the replacement of wastage in personnel and aircraft, the qualities of command and direction, all will tend sooner or later to tip the scales in favour of one or the other belligerent. Apart from these factors there is another which may be of even greater importance, especially in a land campaign: A very serious handicap will be imposed upon that side whose essential communications and machinery of administration and supply are most concentrated —which has in fact the *fewer vital centres*, and which is therefore correspondingly more vulnerable to attack on those centres. The extreme example of this is, of course, the army which is dependent upon a single line of supply.

It is difficult to be more definite on this subject. Our experience is limited to the conditions of a past war which will inevitably be very different from those of a future one. It must be sufficient to say that that experience, such as it is, does provide good grounds for the belief that sooner or later the side whose offensive is most intelligently directed, which is superior

in the art of command, and whose morale, discipline, technique, and material efficiency is the higher—not only in the armed forces but in the nation as a whole—will surely, though possibly slowly, begin to impose its will upon the other. The civilian authorities in the towns, munition-factories, and industrial areas at home, and the Transportation and Supply Services on the Line of Communications and at the Base, may quite naturally fail to appreciate that the best way of affording them protection is to persist in some remote offensive; or to understand that, however great a degree of superiority we may enjoy in the air, it is impossible completely to deny the air to a determined enemy. Experience on both sides in the last war clearly showed that it is always difficult and often impossible for a Government or a commander in the field to resist demands from these sources for close protection. The German High Command—no amateurs in the art of air warfare even in those early days—were 'firmly convinced of the great importance of methodical bombing'.[1] Yet at Verdun, and again during the Somme battle, they were compelled by the demands for close protection against the Allied bombing offensive to use their bombing squadrons—and sometimes even reconnaissance units—defensively, on what they called *Sperrefliegen*, or barrage patrols. So the aircraft that might have been hitting us, bombing our vital centres, and intervening effectively in the operations on the ground, were thrown back upon an inevitably ineffective defensive. 'The barrage has precedence over all other work'—so ran the German instructions at the time.

> 'These squadrons (the Kampfgeschwader or Bomber-fighter squadrons) could not be effectively employed at the beginning of the battle of the Somme owing to the extremely difficult tactical situation in the air. . . . A rigid defensive, by means of patrols flying parallel to the front, had proved ineffective; the patrol aeroplanes being unable to prevent the enemy squadrons from crossing the line. These squadrons were thus incapable of having much influence on the aerial war.
>
> 'Further the patrol and barrage duties of the Kampf squadrons prevented them from carrying out their proper duty of bombing. The importance of successful bombing was thoroughly recognized, but the conditions on the Somme made it necessary to desist from

[1] Extract from memorandum supplied by the Reichsarchiv, Berlin. See Appendix VII to *The War in the Air*, vol. ii.

such attacks, owing to the more pressing need for the protection of artillery aircraft.'[1]

In short 'This notion . . . had the most disastrous influence on the methods of use of the airmen', as von Hoeppner has admitted;[2] and the whole story is convincing proof not only of the inherent superiority of the offensive as a policy in the air, but also of the fact that if persisted in and directed upon sound lines it will in the end compel the enemy to resort to ineffectual and uneconomic methods of protection.

It has been argued against this policy that the bomber is so essentially offensive in character that a commander in fact could not use it for defensive purposes even were he so inclined. But this is overstating the case. To begin with, even if we can compel the enemy to divert his bombing activities against *our own aerodromes* we have gone some way to accomplish our end, since the result will be that attack on our more vital centres will be correspondingly reduced. But the history of 1916 has shown that in fact bombers and reconnaissance aircraft have in the past been used actually as fighters. And it is important to remember that the modern high-performance day-bomber or reconnaissance aeroplane makes a very fine fighter; in the last war the most formidable 'aircraft destroyers' on either side were the two-seater fighters, the Bristol and the Hannoveraner, as statistics since the War have shown. In the British Service to-day one basic type of aeroplane is used in day-bomber and army co-operation squadrons, and there are even two squadrons of this same type—the Demon—among the fighters of the London defences. So that there is no doubt that if a commander in the future is compelled to yield to pressure for close fighter protection, he will find the suitable material ready to his hand in the bomber and reconnaissance squadrons.

But there is another, more 'long-term', result of a persistently offensive policy in the air. The only aeroplanes which exert a direct influence on the issue of a land campaign are those which are employed on what may be called *direct action*, either on observation for the army—to enable the other arms to strike—or striking themselves, with the bomb or the machine-gun, against objectives on the ground.[3] Therefore the more aircraft

[1] Appendix VII to *The War in the Air*, vol. ii. [2] See *The War in the Air*, vol. ii, p. 167.
[3] An artillery analogy is the contrast between the field gun—which is a *direct*

we can divert to the indirect role—that is to the protection of the direct action aircraft—the more successfully are we achieving the second part of the definition of air superiority 'to deprive the enemy of the ability to intervene *effectively* by the use of his own air force'. We reduce in effect the strength of the enemy air force in so far as it can influence the operations on the ground. The first manifestation of this principle was, of course, in the beginning of formation flying in war. Before the Fokker period of the autumn of 1915 and winter of 1915–16 nearly all air work on either side had been done by single aircraft. But the result of the technical superiority and offensive tactics of the Fokkers was an order by the R.F.C. Command in January 1916 which 'laid down as a hard and fast rule that a machine proceeding on reconnaissance must be escorted by at least three other fighting machines'—here at once you have a proportion of three indirect to one direct action aeroplane. The Official Historian[1] clearly shows how the result of this change in tactics was equivalent to a shrinkage of effective strength. In the period of German predominance—the Albatross D.V. or Richthofen period—in the spring of 1917,

> 'Fifteen aeroplanes in support of three operating cameras was common. Bombing had to be curtailed. Twelve Fighters—six two-seaters as close escort and six single seaters in formation above—were sent out with a bombing formation of six B.E. aeroplanes. . . . Pilots were too much in demand for more urgent duties to allow of bombing on a scale comparable with that undertaken as an integral part of the air offensive waged during the Somme battles.'

As the war progressed this condition increased in scope and exerted an influence on the programme of building and expansion of both belligerents. The aircraft factories of both sides had an increasing proportion of their energies diverted to the production of fighters instead of direct action types of aeroplanes. For instance, by August 1918, out of a total of 2,385 German aircraft on the Western front 1,326, or about 55 per cent., were fighters, as compared with 771 out of 1,757, or about 44 per cent., on the British side.[2] The fact that the 400-odd

action weapon in that it actually hits the enemy on the ground—and the A.A. gun which is a merely protective weapon and exerts no direct influence on the land battle.

[1] *The War in the Air*, vol. ii, p. 157.

[2] The German figures are for aircraft on establishment, the British for aircraft

aircraft, mostly fighters, locked up in the defence of Great Britain, brought the British proportion of 'indirect action' aircraft up to about the same as the German was of course due to the fact that the vitals of Britain were open to German attack,[1] whereas the great majority of German vital centres were out of range of British bombers. And it can fairly be claimed that the higher proportion of 'indirect action' aircraft maintained by the enemy on the Western front is an index of the value of our consistently offensive policy.

This leads us logically to a consideration of the second aspect of the principle stated on p. 15.

It may, perhaps, have occurred to the reader that this first result of the air offensive—the imposition of a defensive role upon the enemy air force—though effective as a measure of security by protecting our own vital centres or reconnaissance aircraft from serious interference, makes no positive contribution to the interruption of the enemy's vital services, nor increases the efficacy of the means adopted to that end: That although a prolonged defensive attitude must in the long run have seriously adverse effects on the morale of the defending airmen, yet for some time at least a large concentration of defending fighters over the objectives must occasion heavy losses to the attackers, and seriously prejudice the accuracy and efficacy of their bombing. It is not to be denied that a highly organized defensive system will inflict some—and often serious—losses upon the attackers. But the criticism in general does not take into account the fact explained on a previous page that no nation at war—with possibly in some circumstances the unfortunate exception of ourselves—has any one single centre of which the paralysis by an enemy would be fatal. If there were any one single vital centre it might be possible so highly to organize its defences as at least to make the attack so costly that the attacker would not continue to face the losses involved. London is a case in point, and it might be necessary in another European war to concentrate all our resources on the defence

actually serviceable, but this does not affect the proportion. The figures for fighters on both sides include fighters employed on low-flying attack.

[1] Note that the possibility of attack on this country involves the maintenance in peace of a very large force of 'indirect action' aircraft in the Fighter Squadrons of A.D.G.B.

of London and to undertake no other military commitment unless and until its security is assured. But, with this one exception, there are degrees of importance even among 'vital' centres, degrees varying from time to time according to the strategic situation. It is a proper appreciation of this fact that will enable a commander to exploit to the full the unique capacity of air power for effective *diversion*—diversion, that is, which will contain enemy detachments out of all proportion to the effort involved.

It is, perhaps, hardly necessary to elaborate the inherent advantage conferred by extreme tactical mobility upon an attacker in the air. The attacker is in effect always on interior lines. A simplified illustration will suffice: Suppose a bomber force, with a radius of action of 300 miles, to be stationed at such a point that it can cover almost a full semicircle of enemy territory—as for instance a German force based on Roye in the summer of 1918 could have done. That force could reach any point on a circumference of nearly a thousand miles, or in an area of about 70,000 square miles; and elements of it could attack two objectives 600 miles apart simultaneously. It requires no expert geometrician to realize that even if defending fighters had equivalent tactical range, even if they could get information the moment the bombers left the ground, and even if a given number of fighters were a match for the same number of bombers (which is at least open to argument), it would still be necessary to have at least two defending fighters somewhere within the semicircle for every one potential attacker. This is admittedly an extreme case, but the postulated conditions do not, of course, prevail in reality. In actual fact when important issues have been at stake it has been found necessary in the past to have available for the defence far more than double the numbers of potential attackers; nor has anything happened to lead us to suppose that the proportion will be reduced in future —rather the reverse. The classic instance of this in war is that of the German aeroplane attacks on London; these attacks were not originally intended as a diversion, although the German commanders were quick to realize their value as such. They were, indeed, one of the most successful diversions in history, if the measure of success is the size of the detachment involved in relation to the enemy force it contains. At no time did the

German units employed against England exceed 43 aircraft—to which must be added the appropriate small number of training aircraft. That force, based on Belgium, contained in England for home defence about 600 British aircraft, of which nearly 400 were first line, the remainder being in training units. It is true that there was, in addition, the possibility of a revival of the airship raids, but to set against that there is the fact that by no means the whole effort of the German bombing force was directed against objectives in England. As a conservative estimate it is probably fair to say that the proportion of military effort expended by attacker and defender respectively was as one is to eight—a successful detachment if ever there was one. The presence on the decisive front in France of these 400 fighters locked up in home defence could hardly have failed to enable us to sweep the sky clear of enemy aircraft.

Nor is this the whole story. So urgent was the political demand for more adequate protection at home, that in the summer of 1917 at a most critical period, just before the opening of the third battle of Ypres, Sir Douglas Haig actually had to send home from the front in France two of his best fighter squadrons for the defence of London. Supplies of Sopwith Camels—then the newest type of fighter—which were intended for the re-equipment of squadrons in France, where they were badly needed to cope with the new German Albatross fighters, were diverted instead to re-equip home defence squadrons; while in France we were compelled to divert the energies of many bombers from objectives calculated to have a direct influence on the important operations then impending, to attack the aerodromes of the enemy night-bombers at St. Denis Westrem and Gontrode.[1]

So the activities of these few German bombers, miles away from the scene of the battle on the ground, had an effect upon the air situation over the decisive front which, though incalculable, must have been enormous; at least they prevented us from obtaining a degree of air superiority that in all probability would have materially shortened the War. This, perhaps, was an extreme instance, and it does not necessarily follow that the same ratio of defensive to offensive effort will always prevail in the air. The number of fighter aircraft required to afford reasonable protection to a given area is governed mainly by

[1] See *The War in the Air*, vol. v, p. 58 and pp. 152–9.

the size and configuration of that area, and only in a lesser degree by the potential scale of attack. No doubt partly for this reason our own bombers of the Independent Force in 1918, though again they constituted at times a very effective diversion, only drew off from other fronts about five times their own number of German aircraft for the defence of the Rhineland industrial towns. But we as a nation are perhaps unfortunately placed in this respect. This factor of home defence will always be with us in a war on the Continent. Whether the tactical defensive gains or loses in efficacy relative to the power of offence in the air—and at the moment the latter seems more probable—it is certain that we shall never be able to dispatch fighters to assist in the defence of a European ally so long as our own country remains open to attack. As Sir William Robertson has said, 'the requirements of Home Defence, whether on land, at sea, or in the air, will, except perhaps in the case of a great crisis such as that which occurred in March 1918, invariably have to be given precedence over requirements connected with operations abroad'.[1]

The moral is, of course, that an air force commander must deliberately make use of this extraordinary capacity for effective diversion to attain air superiority *at the really decisive point.* He must exploit the extreme flexibility, the high tactical mobility, and the supreme offensive quality inherent in air forces, to mystify and mislead his enemy, and so to threaten his various vital centres as to compel him to be dangerously weak at the point which is *really decisive* at the time. There is nothing new about this: it was done in the War, and the Official History contains several examples—particularly during the battle of the Somme—of operations directed against objectives in Belgium, designed to prevent the enemy from reinforcing his air units on the Somme at the expense of other army fronts. But these incidents, interesting and important though they were, serve only as a bare indication of what now is possible in this direction. The selection of the correct objectives for this diversionary action, those centres which though vital are yet temporarily lower in the scale of decisive influence, presupposes the most exhaustive resources in information and the most meticulous system of day-to-day intelligence—not only military intelligence in the

[1] *Soldiers and Statesmen*, vol. ii, pp. 1–18.

narrower sense but also political and industrial intelligence. The conduct of the offensive calls for the highest qualities of command and the exercise of the nicest judgement, to gauge the minimum number of objectives calculated to achieve the end, to strike the proper compromise between dispersion and concentration, to assess the proper strength of the detachments necessary to exert the requisite pressure on the objectives selected, the degree of importance likely to be attached by the enemy to their defence, and consequently the strength of the forces likely to be contained. And finally the results achieved will be enhanced by real and intelligent co-operation on the part not only of the other Fighting Services but also of other Departments of State, such as the Foreign Office, the Board of Trade, and the Ministry of Propaganda or its equivalent.

In passing, the writer cannot refrain from giving an airing to a favourite bee which buzzes most persistently in his bonnet; namely the unwisdom of maintaining three separate and distinct intelligence branches in the three Service ministries—each too frequently arriving, largely from the same sources, at different conclusions to suit its own particular theory. This question of the selection of objectives is only one of many examples of the crying need for the combination of the three Intelligence branches, together with those of the Foreign Office and the Board of Trade.

So much for the first principle in the conduct of the struggle for air superiority. But before proceeding to an examination of the second, which is that this *offensive against the vital centres of the enemy must be supplemented in varying degree by direct action against hostile air forces*, it is desirable again to emphasize that such action, though vitally important, is yet from the broad strategical viewpoint a diversion. It may be as well to anticipate possible criticism on this head by admitting at once that it is a form of diversion which may—according to the strength, efficiency, and fighting value of the enemy—at times absorb the greater part, if not the whole, of our own air effort. Nevertheless it remains a diversion. It is also true that it is a diversion to which we may frequently be compelled to resort. It has been explained in the previous chapter[1] that air superiority is not a definite tangible condition which, once attained, can be left to

[1] See p. 10 above.

look after itself. In a war of any duration the air situation may be subject to a succession of remarkable—even violent—variations, such as those which marked the war in the air on the western front. All sorts of factors will tend to produce such variations. One side or the other may produce a surprise in the sphere of material—a very superior type of aeroplane, for instance. The effect of this factor has already been noted in the result on the air situation of the arrival in Palestine of the new squadrons of up-to-date aircraft. And it was to a great extent the appearance on the German side of a very superior type of fighter in the spring of 1917 that occasioned, perhaps, the most notable reversal of British fortunes in the air; to the extent that within nine months of our attack on the Somme we had almost completely lost the air superiority we enjoyed in that battle. Another important cause of the German recovery in 1917 was a change of command, with a consequent improvement in the training and higher direction of the German air force.[1] Or again, that very important, though imponderable and mercurial quality, individual morale, may be elevated or depressed by many influences such as a run of bad luck, or the almost legendary prestige and example of a few outstanding individuals like Mannock, Ball, or Guynemeyer on the Allied side, Richthofen or Boelcke on the German. In fact, between opponents of approximately equal efficiency and valour, a definite superiority in the air may never be finally consolidated until one side or the other is able by some means to acquire a great superiority in numbers, such as that which the Allies enjoyed on the western front in the closing stages of the War.

Apart from factors such as these, there is another of a different character by which we may be compelled to divert temporarily even the whole of our air effort to action against hostile air forces. There may be periods in a campaign when our own army is temporarily so vulnerable to air action relatively to that of the enemy, that he may be able to afford to accept inter-

[1] General von Hoeppner was a very able and experienced officer, a member of the Great General Staff, who had been Chief of Staff of an army in the invasion of 1914. His appointment to command the German air force after their defeats on the Somme resulted in an extraordinary change for the better in their training and higher direction. Indeed, his strategical handling of the enemy air force—considering the very limited experience of air warfare then available—could hardly have been better.

ference with his own communications, as being completely outweighed by the importance of the fatal damage he can inflict upon ours. Such an occasion might be, for instance, while our army is passing through some dangerous defile; or while we are operating at the end of a vital single line of communications within range of enemy bombers; or during the final phase of an opposed landing, when the troops are closely packed in crowded transports or in open tows. In such conditions the factor of security assumes the first importance, and it may well be that we shall have temporarily to divert our whole air strength to deal with the enemy air force. Before undertaking a campaign in which conditions of this nature are more than a temporary phase, it will be necessary to face the fact that one arm of our striking force, the air arm, will be permanently compromised. And it should be the aim of our war policy to endeavour, if humanly possible, to avoid getting involved in a commitment in which our combined strategy is subject to such a damaging restriction.

Enough has been said here and in a previous chapter to emphasize the fact that action against enemy air forces in a land campaign is a diversion and a measure of security—and never the object. It has already been suggested that a stage may be reached sooner or later in a war when the defeat of the enemy's army in the field is no longer the primary object, or when his air forces form so large and important a proportion of his total fighting strength that the attainment of a real superiority in the air will, in itself, be sufficient to induce him to accept our terms. But these are not the conditions which it is the object of this book to examine; and in a land campaign as defined on p. 2 it must be obvious that—to put it crudely—one can ultimately only attain the object by hitting the enemy on the ground. And until our air forces can attain such mastery over the enemy in the air as will enable them to direct their attention to hitting the enemy on the ground, they are making no *direct* contribution to the attainment of the object of the national forces in the field.

The really important thing to understand—and the point which the writer is so presumptuous as to believe is rather widely misunderstood—is the method of approach to the problem, the proper relation of action against air forces to the air plan as a

whole. A concrete illustration will best explain the point, and for this purpose it will be convenient to select the hypothetical example quoted in a later chapter[1] of the air plan which might have been made for the battle of August 8th, 1918.

First it must be assumed that the air force commander, from his knowledge of the air situation generally and his experience of operations up to date, is in a position to form a reasonable estimate of the force he is likely to be able to make available for action against objectives on the ground, and consequently of the approximate scope of the task he will be justified in undertaking. Based on this estimate let it be assumed that the object laid down for him by the Commander-in-Chief in this case is briefly 'to isolate the area Bapaume–Le Catelet–Guise–La Fère–Noyon from enemy reinforcement and supply, in order to enable the attack of the Fourth Army to be carried to a complete decision'. The subsequent stages in the evolution of the plan to give effect to that object would be somewhat on the following lines.

Two parallel examinations of the problem would have to be undertaken by the Air and General Staffs in conjunction; they would be going on simultaneously, they are to a great extent interdependent, and in practice cannot be separated into water-tight compartments. But for the sake of clarity they are here set down as two distinct proceedings.

An appreciation has to be made of the situation on the ground as it affects or is affected by the air plan; the detailed objectives are selected and an estimate made of the force required to produce the desired results. This part of the problem is dealt with in detail in a later chapter, and will not be further elaborated here. Suffice it to say for the sake of simplicity that it is decided to cut the railways at five points and to attack enemy columns on the march in the area described on p. 178.

At the same time the air force commander has to ask himself the following question: 'How can I create the necessary air situation to enable me (*a*) to make certain of cutting and keeping cut the railways at those points, and effectively breaking up any columns I find on the roads, and (*b*) to ensure the security of the Fourth Army and its close co-operation aeroplanes against serious interference by the enemy air forces?' This

[1] See p. 179 below.

general problem resolves itself into three more or less distinct subsidiary questions.

(*a*) What objectives are there at a distance from the decisive area, say in Belgium or the Rhineland, attack on which will force the enemy to employ aircraft in their defence? And are those objectives so important to the enemy, that the forces likely to be contained in their defence exceed the necessary detachments from my own force by a margin which will make such detachments worth while?

(*b*) In view of the relative strength and efficiency of my own forces and those of the enemy, to what extent can I depend upon the operations of my striking force against the enemy's communications to impose a defensive attitude upon the enemy air forces, and thus in themselves ensure the security of the Fourth Army against undue interference?

(*c*) (dependent partly upon the answers to (*a*) and (*b*)) What proportion of my force must I divert, and for how long, to direct action against enemy air forces in order (i) to make reasonably certain that my striking force will be sufficiently free from enemy air interference to enable them to perform their tasks effectively and with the minimum of loss, and (ii) to afford the necessary margin of security to the army over and above that which will be afforded by the factor in (*b*) above?

These are formidable problems, requiring the exercise of the nicest judgement. It is fortunate that, to compensate for the extreme difficulty of arriving in advance at an accurate estimate on any of them, we have the advantage of the extreme tactical flexibility of air power; which means that we are not committed to any one course, nor to a fixed allotment of any proportion of our force to any particular task, but can switch our strength or any proportion of it from one objective or task to another as the need arises.

Finally, having arrived at as accurate an answer as possible to the last question, and if necessary having modified the object to conform with the more modest resources which this subsequent examination may have proved to be available for its attainment, the air force commander must then decide the methods he is going to adopt to deal with the enemy air forces, on the lines which the following pages are intended to describe.

III

THE SUPPLEMENTARY OFFENSIVE—THE DESTRUCTION OR NEUTRALIZATION OF ENEMY AIR FORCES

THE strategy of the offensive against enemy air forces is a subject on which it is difficult and more than usually unwise to be dogmatic. The last War provided us with a great deal of experience of air fighting, but the conditions in which that experience was gained were mostly the narrow specialized conditions of trench warfare. The opposing armies were nearly always in close contact, and there was one quite clearly defined and narrowly circumscribed area within which local air superiority was required, the area within a few miles each side of the trench-lines. We have practically no experience of air operations in open warfare; and in particular we have never been faced in war with the difficult problem of the employment of fighters in the vital opening stages of a campaign when the armies are still many miles distant from each other. This is not to say that none of the lessons of the last War are of value or applicable to different conditions; but merely to emphasize the need for imagination, and for the capacity to adapt our methods quickly, if war comes, to conditions for which we have no historical precedent, and which may be very different from what we have imagined them; and this capacity is dependent on a sound grasp of principles. We cannot possibly draw up definite plans, or even evolve any very hard and fast tactical method to meet every possible class of contingency; but if we have a clear idea of the basic principles we shall be able to apply and adjust them to suit each contingency as and when it arises. And for a study of these principles the last War does provide some foundation.

The problem is how to 'deprive the enemy of the ability to interfere effectively by the use of his own air forces'. The ideal method obviously would be to destroy the hostile aircraft, either in the air or on the ground. But since it will usually be impracticable to make certain of destroying the aircraft themselves to a sufficient extent, our efforts in that direction must be supplemented by action to dislocate and disorganize the aerodromes,

workshops, and depots on which they must rely for maintenance, equipment, and supply. The next most effective method to the actual destruction of an aeroplane is to stop it flying for lack of spare parts, fuel, or technical maintenance. So it will be apparent that action against enemy air forces is a joint responsibility of both fighters and bombers. The first part of this task, the destruction of hostile aircraft themselves, is the primary role of the fighters, and will be considered first in this chapter. After that it will be necessary to examine the supplementary action against their ground organization, which is mainly an affair for the bombers—though neither division of the task is exclusively the province of either class of squadron, and the efforts of each class must be supplemented by those of the other, as will appear from the following pages.

Coming now to the actual destruction of enemy aircraft in combat, it is proposed to follow the procedure adopted in the previous chapter, to state certain principles and then to examine them in some detail. The writer has heard it claimed as a property peculiar to air forces that owing to their high mobility and consequent capacity for evasion they can only be brought to battle by consent. This point has even been developed so far as the claim that, like surface fleets in the past, air forces could refuse contact and remain in being, a constant threat to their opponents. This in fact is only partly true; and the attempt to claim for air forces a quality which they can only very rarely possess, and to compare them with naval forces under different —and now largely obsolete—conditions, has to some extent clouded the issue, and created some misunderstanding of the problem which it is the object of this chapter to examine.

In point of fact the *strategical* conditions of air warfare, in the limited sense of combat between air forces, do not differ in any important point of principle from those governing the action of forces on land. It could be claimed that an army can only be brought to battle by consent. An army *could* refuse battle, but by doing so indefinitely it would normally be failing to implement the object of its existence, which is to enforce the national policy. Thus a defending army may decline battle with an invader; it may retire from one position to another, it may so manœuvre as to constitute a threat to the communica-

tions of the invader and compel him to deflect his advance from vital areas—and when this is done it may again retire. Eventually, however, it will almost always be necessary, if vital national interests are to be secured, for the defending army to stand and fight. A belligerent nation may be able to afford to accept damage to the national interests to a degree which is beyond the capacity of the invader to impose, and which still is not vital—as the Russians were able in 1812; or, when the national interests are hopelessly prejudiced, a guerrilla army may for a time continue seriously to embarrass the invader without accepting battle, as the Boers did in the later stages of the South African war. But these partial exceptions do not invalidate the general rule. A defending army which refuses trial by battle more or less by consent can be brought to action by the attacker threatening *either* some objective such as a capital city or industrial area which, for reasons of national policy, the defender cannot afford to lose, *or* the communications, railways, ports, and base depots upon which the defending army itself depends for its continued existence as a fighting organization.

There was in the past one important difference between the conditions of war on land and at sea. At sea it used to be possible for a fleet to refuse combat, and to withdraw into the secure shelter of a fortified harbour—to adopt in fact the strategy of the 'Fleet in being'. But to be effective this form of strategy presupposed the existence of three conditions, none of which ordinarily apply to an air force. Firstly, it could only be adopted by the fleet of a belligerent who had not himself to depend for any vital interest, such as the national food supply, on the continued use of sea communications. Secondly, the enemy must be compelled by the adoption of this policy to 'restrict his operations, otherwise possible, until that fleet can be destroyed or neutralized'.[1] Mahan considered that even in the past 'The probable value of a "Fleet in being" has been much over-stated; for even at the best the game of evasion, which this is, if persisted in can have but one issue. The superior force will in the end run the inferior to earth.' To-day it is probably not too much to claim that the theory of the 'Fleet in being' as an element in naval strategy is a matter of history only, since the advent of the aeroplane has cancelled the third condition upon

[1] Mahan, *Naval Warfare*, p. 243.

which it depended for effect, namely the capacity of the inferior fleet to find complete security in fortified harbours.

From this rather lengthy digression it appears that in fact, contrary to the generally accepted theory, air forces are less able to decline actual combat than are armies or navies. At sea or on land a Fleet in being or an army at large on a flank could make itself inaccessible to attack, and at the same time could—at least temporarily—exert some influence on the enemy merely by constituting a threat. An air force on the ground is merely a mass of inert mechanism whose opponent, having no flanks, is not 'compelled to restrict his operations, otherwise possible' until that air force can be destroyed or neutralized—although this general rule, like all good general rules, has an exception which will be dealt with later.

At the risk of wearisome repetition it must again be emphasized that in this chapter we are only considering the narrower aspect of air warfare, that of direct action against enemy air forces. It has already been explained in a previous chapter that the main bombing offensive can be launched without the preliminary defeat of the hostile air forces; and the subject now under review is only the problem of the necessary supplementary action against those air forces to enable the main offensive to be effectively pursued—the problem in fact of whether air forces can be brought to action against their will, and if so by what means. The foregoing brief outline of some well-known conditions of war at sea and on land is of value in assisting us to formulate certain simple principles of air warfare, for which experience in the air during the last War provides useful confirmation and illustration. These principles can be stated as follows:

1. Air forces can only be destroyed or neutralized effectively by the adoption of an active and persistent offensive in the air—whether the underlying strategical policy is in itself offensive or defensive. Firstly, because of the immense importance of the moral factor in air fighting, and the immediately unfavourable reaction on the fighting value of an air force resulting from a defensive attitude. And secondly, because aircraft have no definite physical stopping-power, comparable to that of fortifications and field defences on land; so great is the capacity for

evasion in the three-dimensional battle-fields of the air, so difficult is it in many conditions of weather even to ensure contact between air forces which may be seeking it, that any system of barrage or line patrols, even though they may be over enemy territory, is always uneconomical and usually ineffective.

2. This active offensive must obviously be intelligently controlled, and attacks must be directed to those areas where enemy aircraft are most likely to be encountered. The most fruitful areas from this point of view will be (in order of importance) the enemy's areas either of departure or of destination. The first and most obvious place in which to seek out the enemy will be over his aerodromes; the positions of these will usually be known, and usually the most certain way of gaining contact with a willing enemy will be by offensive patrols over the enemy aerodromes, on the lines which were such a feature of air fighting in France.

3. On the other hand offensive patrols over his aerodromes may not in themselves be an adequate means of bringing the enemy to action. The principal reason for this form of action being to contribute as effectively as possible to the success of our main bombing offensive, we may find that enemy aerodrome patrols are too indirect and incomplete a form of support to our main striking force. Our fighters may miss the enemy over his aerodromes, or his units may be so well dispersed on the ground that we cannot bring more than a small proportion of them to action, leaving the remainder free to operate elsewhere. So aerodrome patrols may have to be supplemented by others sent to the next most likely place of contact, namely over the enemy's most probable area of *destination*. This opens up a rather wider field. An accurate appreciation of where—other than at his aerodrome—the enemy is most likely to be encountered is obviously more difficult to make, and the solution will vary with the circumstances.

4. If our main bombing offensive is being soundly directed, if it is really hitting the enemy in his vitals, a certain area of destination at least for the enemy fighters will be that area where our bombing force is operating; and the more effectively that main offensive is fulfilling its object the more aircraft are we likely to meet in that area, including ultimately other classes of aircraft being used as fighters. So we can be tolerably certain

of forcing an action by sending fighters to rendezvous with our bombers over their objectives, or, if those objectives are out of range, by escorting the bombers on their outward or meeting them on their return journeys.

5. But there may be special occasions when our bomber objectives are not the most vital areas from the enemy's point of view. He—or we—may, for instance, be initiating some special operation on the ground, and it may temporarily be of the first importance to him to prevent our reconnaissance or artillery-observation aircraft working. If this is so, we can then be certain of meeting him in strength in the area where our army co-operation aircraft are engaged, in the immediate vicinity of the battle-front on the ground. We must be especially careful here not to overstep the mark and yield to the temptation to try merely defensive patrols. The test must be 'Are we most likely to get a fight and destroy enemy aircraft in this area?'; and offensive patrols in the vicinity of the ground battle must be reserved for special occasions, and must be combined with patrols over the enemy aerodromes.

It will be observed that so far we have been considering mainly the methods of bringing to action enemy *fighters*, and such aircraft as may be compelled by the success of our bombing offensive to act as fighters. But, although by destroying enemy fighters our own are most directly assisting in our main bombing offensive, still we have also to consider the very important requirement of protection for our own army and its communications, which involves the destruction of the enemy *bombers*. As already explained, historical precedent gives us some grounds for the belief that if we persist intelligently and doggedly in our bombing offensive we can rely to a considerable degree on the results of that offensive in itself to afford us protection from enemy bombing. But this will need to be supplemented by other means.

6. When the enemy bomber aerodromes are within fighter range—and they sometimes may not be—a mere offensive patrol of fighters 'trailing its coat' overhead is not likely to impel a wise bomber commander to come up and fight them; it is not his job, and he has a great many better things to do with his aircraft than indulging in gratuitous dog-fights if he

can avoid them. Low-flying attack with machine-guns and the small bombs that fighters can carry is, however, likely to achieve important results. Modern conditions, absence of hangars, and due attention to dispersion may obviate serious actual damage to personnel and material; but the effect on morale at least is bound to be bad. So low-flying fighter attack on enemy bomber aerodromes will often be worth while, and may at least have the effect of causing the enemy to shift his bombers' bases farther back and thus reduce their effective range. And it will usually be necessary for fighter action to be supplemented by bomber attacks on enemy aerodromes.

7. The Manual lays down that 'when conditions are favourable a temporary advantage in the struggle for air superiority may be obtained by attacking enemy aerodromes'. There is a tendency common in the Service to underrate the effect of such attacks, which, if well executed under favourable conditions—especially by bombers and fighters operating together—can be well worth while. These conditions, broadly speaking, are those of space and time—space, when aerodromes are few and congested, and especially when the enemy air forces cannot be rapidly reinforced; and time, when the inevitable disorganization—even if only temporary—may have serious results. In point of material damage, reserve depots and parks may be useful objectives, since there dispersion is less easy than on aerodromes of fighting units, and the resulting material damage may be more widely felt.

8. Thus the best method of dealing with the enemy's bombers—as with his fighters—will normally be by the maintenance of an active offensive. On the other hand, it is dangerous to make a fetish of any principle or to become the slave of any tactical doctrine as the French did in 1914. Just as it may sometimes be necessary—as previously explained—to divert temporarily even the whole of our air forces to the *strategically* defensive role for reasons of security,[1] so on occasions we may be compelled for the same reason to divert part of our fighter strength to the *tactical* defensive. This should be avoided whenever possible; it should be the exception and only temporary, and it can never guarantee complete success. We in the British Service pin our faith to the offensive policy

[1] See p. 27 *ante*.

partly for its moral value and partly because as a rule it is only by taking the offensive that we can be tolerably certain of meeting and destroying the enemy in the air. So ordinarily our vital centres in the field must rely for their protection on the results of the air offensive, backed by such measure of direct passive defence by guns and searchlights as we are able to afford them. On the other hand, there may exist temporarily within air range of the enemy some point or centre so exceptionally vital to us that not only is the enemy morally bound to attack it (i.e. it becomes a certain 'point of enemy destination') but also that we cannot possibly accept the risk of failure to afford an adequate degree of protection by the maintenance of our air offensive alone. It will then become necessary to provide, at least temporarily, some measure of direct protection, to send a proportion of our fighters to meet the enemy bombers where they are certain to find them, i.e. in the vicinity of that vital centre. Two examples of such exceptionally vital points are the port of disembarkation while the army is landing in an allied country within enemy air range; and the transports, landing craft, and beaches of an army engaged in an opposed landing on an enemy coast. We could not possibly afford to expose either of them to the risk of unrestricted attack by such enemy air forces as might elude our offensive patrols over their aerodromes. And although any direct protection we could afford is bound to be uneconomical, is almost certain to be unsatisfactory, and cannot possibly guarantee complete immunity, it will fortunately—as in the examples quoted—generally only be temporary.

9. It has already been explained that one important method of forcing an enemy to action in the air is to attack something which is vital to him and which therefore he must defend. There is one situation in which this must be deliberately exploited as the *only* way of getting air superiority, and it is a situation of especial importance, namely the preliminary stage of an opposed landing on an enemy coast-line—a form of operation which has been a feature of almost every major war in British history. In the normal way a belligerent will not attempt to decline combat or to keep his bombers on the ground —for obvious reasons. And (again in the normal way) if he does so, then so much the better, we can get on with our air

offensive unhindered; an air force sitting on the ground can usually be disregarded, for, unlike the 'Fleet in being', it need exert no restrictive influence on our operations, nor does it constitute any threat. On the other hand, in the special circumstances prior to an opposed landing an air force 'in being' would constitute a very definite threat. It is a matter of common agreement in the three Services that to land troops packed in tows from crowded transports on open beaches is a sufficiently delicate operation under the most favourable conditions, but in the face of an unbeaten air force is not a feasible operation of war. And a defending commander, if he were able to maintain his air forces 'in being', either by keeping them out of range or by effective dispersion on the ground, might well make such a landing impracticable without firing a shot or dropping a bomb. Indeed, this situation is the one exception to the previously stated rule that the attainment of air superiority is not a preliminary phase to be gone through before the real business can begin: it is the one occasion on which the enemy air force must be reduced before we can devote our air effort to the main object—which in this case is to assist the troops in getting ashore, and in consolidating their position once they are ashore.

Actually it is almost impossible to imagine any situation of this sort in which the defending commander would in fact be able to afford to keep his air forces sitting on the ground inactive. Direct attack on them at their bases may be impossible or ineffective; but they could almost certainly be brought to action by attacking something which would be vital to them, and in that way forcing them to fight in its defence. For instance, in the Dardanelles the Turks could not have afforded to remain inactive in the face of air action on a modern scale against their bases at Constantinople, the Kuleli Burgas bridge, or their communications with the Peninsula by sea and road—or, if they had done so, then the necessity for landing the army in the face of opposition might never have arisen, since the maintenance of the enemy troops on the Peninsula would have become impracticable. And this in future may be the answer—the defending commander will have to choose between giving battle in the air, and thus weakening his position on the day of the combined landing, or accepting the possibly fatal results of unrestricted, unopposed air action against his vitals.

Now to examine some of these principles in rather more detail. The first, the principle of the active offensive, is one which had many critics in the last War. People in the back areas, on the lines of communication, and at the bases complained of being bombed and, quite naturally, often failed to understand the absence of our own aircraft over them. The fighting troops in the line constantly saw our army co-operation aircraft being shot down; gunners complained that their air observation was being interfered with, and were told that our fighters were away over the enemy lines engaged on offensive patrols—and they not unnaturally wondered. Even in the air force itself the personnel of army co-operation and bomber squadrons sometimes complained of the lack of direct protection; and squadron commanders were left to draw what consolation they could for the loss of valuable pilots and observers, from the lists (published in the official communiqué) of hostile aircraft shot down over their aerodromes by our offensive patrols. These things were the visible effects, and criticism on these lines was natural and inevitable: what the critics, of course, could not see was the result which would have followed if our Higher Command had yielded to the often very severe pressure and fallen back on a defensive attitude. It is true that the detailed execution of the offensive policy was often not on the soundest lines; and that it was often kept up at times when the results to be achieved were not worth the heavy cost involved. But there is not the slightest doubt that as a policy its soundness was incontestable. After all, the proof of the pudding was in the eating. It was true that German bombing in our back areas was a serious nuisance, especially the night bombing which caused more than 4,000 casualties in the last six months of the war; but it was never really anything more, and our lines of communication were not subjected to the constant strain which the activities of our bombers must have caused behind the enemy line in the same period. It is also true that the work of close co-operation was often interrupted, and the corps squadrons went through some very bad periods; but here again in the long run the results unquestionably justified the offensive policy. The testimony on this point of the enemy army commander in the Somme battle has been quoted in a previous chapter; and even in the autumn of 1916, when the enemy was numerically at least equal to us in the

Somme area, the actual work of reconnaissance and artillery observation done by the German air service stood—according to statistics compiled at the time—in the proportion of only 4 per cent. of that done by our own squadrons. Even in the spring of the following year, in the Arras Sector (of evil memory), where the German squadrons, reinforced and re-equipped, were superior to the British both numerically and in technical performance, the tradition of the corps squadrons that no essential work for the army must remain undone stood in the main unbroken.

Fortunately we have not to rely entirely on conjecture for the results of lapsing from an offensive to a defensive policy in the air. The results on the German side have already been dealt with in an earlier chapter. On the side of the Allies we have another example in the history of the air fighting during the defence of Verdun in 1916. At the beginning of that battle, in which, of course, the French army was on the defensive, their air force was constantly offensive, bombing and patrolling far over the German line. As a result the German command fell back on the disastrous close protective barrage system—the *Sperrefliegen* already described. When this system proved ineffective, as it was bound to do, the Germans took other steps, reorganizing their Fokker fighters into separate units and adopting more aggressive tactics—largely owing to the influence of Oswald Boelcke. As an immediate result the French co-operation aircraft began to suffer more casualties, and a cry for close protection went up, to which the French command was eventually induced to yield. The effect was instantaneous.

> 'From that moment the tables were turned. The French air service began to lose its superiority, the French airmen could do very little reconnaissance, and their artillery pilots were compelled to work from inside the French lines. The French did not long acquiesce in this state of affairs. Thanks largely to the efforts made by Commandant du Peuty, they went back to the offensive, regained superiority, and with it all the advantages which they had temporarily lost.'[1]

[1] Official History, *The War in the Air*, vol. ii, p. 166. This volume contains as Appendix IX a memorandum on the offensive policy in air fighting issued by Head-quarters R.F.C. in September 1916; also an interesting letter on the subject from Sir Douglas Haig to the War Office dated Sept. 29th, 1916 (p. 297).

Unfortunately after du Peuty's death the French did not always adhere to his offensive policy. Perhaps owing to their national temperament and to the presence of many politicians in the ranks of their conscript armies, their high command was continually yielding to the demands for close protection, and till the end of the War they were constantly returning to the system of defensive barrage patrols—always with disastrous results.

While, then, the policy of the offensive is unquestionably sound, its execution must be intelligently directed. In the last war it was certainly not always applied as effectively as it might have been. Offensive patrols were often sent off without sufficiently careful planning and co-ordination with other forms of air activity. And, from the sound basis that the actual area in which other classes of squadron were working was not generally the best place to send the fighters, there tended to grow up the quite unsound theory that it *never* was so. This idea was by no means universal, and there were many examples of excellent co-operation between fighters and other classes; but there were also many occasions on which, for instance, bomber squadron commanders asking for fighter support were told that 'there will be an offensive patrol operating in the area at the time'—a fact which often had little apparent effect in reducing the number of enemy fighters encountered. In particular there was a feeling among bomber and corps reconnaissance pilots that offensive patrols over enemy aerodromes tended to become too much a 'set piece'—that they did not by any means always attain their object of meeting and destroying enemy aircraft in the air, and thus affording indirect protection to the bombers and artillery aircraft. On the opening day of the Somme battle, for instance, the offensive patrols found little to do, and in fact only one of them encountered enemy aircraft at all;[1] meanwhile, however, the bombers attacking railway objectives such as the junctions at Busigny and St. Quentin encountered serious opposition and suffered heavy casualties, and the efficacy of their bombing was very much reduced. It is true that the fact of the enemy fighters

Commandant du Peuty was a great air commander, who was wastefully killed commanding an infantry regiment. The barracks of the French Air Force at Thionville to-day bear his name. He was closely associated with Sir Hugh Trenchard in the policy of the air offensive.

[1] Official History, *The War in the Air*, vol. ii, p. 217.

being in strength about these railway junctions meant that the contact patrols and artillery-observation aircraft on the battle-front were able to work comparatively unhampered, which was rightly regarded as being of the first importance at the time. But it was also important to impose the maximum possible damage on Busigny and St. Quentin. And in order to achieve both these ends it was desirable to find and destroy as many enemy fighters as possible. If our offensive patrols sent to the enemy aerodromes at the time when they were most likely to find enemy aircraft there (whenever that may have been) found on arrival that the enemy was not there, then there seems no reason why they should not have had orders to proceed at once to the next most probable place—the enemy's likely area of destination, either over the railway objectives or over the battle-front, whichever was considered more probable. What presumably happened on this occasion—what too often did happen—was that the patrol became a sort of offensive barrage patrol between the enemy aerodrome areas and his probable points of destination. This idea sounds attractive, but in actual practice as often as not it was quite ineffective; such patrols, especially in cloudy weather, encountered the enemy largely by luck, and with a certain amount of patience and low cunning were fairly easy to evade. There were occasions when they were successful, but this was usually when the important area was small and when there were a very large number of fighters available. One such occasion was General Plumer's offensive at Messines in July 1917, which provides an example of the fifth principle stated on p. 36. Messines was a predominantly artillery battle: the overriding consideration in the air was to obtain complete superiority over the battle-front so that the artillery-observation aircraft—which were bound to become the main objective for enemy fighters—could work unhindered. And so in this battle the offensive patrols formed a sort of barrage from the ground to about 15,000 feet, over the enemy balloon line, and the operation was completely successful. But the enemy balloon line opposite Messines was a quite definite and very limited area in which enemy fighters were bound to be encountered; and except in these special circumstances a system of barrage patrols, even though over enemy territory, will usually be uneconomical and ineffective—in future more so than ever, owing to modern

To sum up, offensive patrols over enemy aerodromes are usually the best and surest way of bringing an enemy to action; but they must often be combined with other methods, and they must always be intelligently planned and co-ordinated with other forms of air activity.

IV

THE SUPPLEMENTARY OFFENSIVE (*contd.*)

TURNING now to the next method, the co-operation of fighter squadrons in the bomber offensive: In the British Service a basic principle of bomber training is that squadrons must be capable of looking after themselves by close and steady formation flying, and the resultant mutually supporting fire from the rear guns. We have never favoured a policy of close escort for bomber formations, for usually very good reasons. In the last war the very word 'escort' was officially frowned upon, although in point of fact close escorts were often employed, and were very effective especially when composed of two-seater fighters, like the old F.E. or the Bristol Fighter. And we must beware of making a fetish of what is really a sound general rule; it would be thoroughly unwise to get into the habit of always sending fighters in company with bomber formations, but on the other hand close escorts are by no means necessarily vicious, and in fact are often essential. Each case must be examined on its merits and decided in the light of common sense. What is the problem? The primary arm of the air force is the bomber, and the aim of the bomber is to arrive over his objective and drop his bombs *accurately*. There are a variety of factors which tend to disturb this accuracy, such as anti-aircraft artillery or unfavourable weather conditions; but there is nothing more distracting to the bomber pilot than to find himself let in for a dog-fight over his objective, when all his energies and attention should be concentrated on that accurate use of the instruments which alone enables him to deliver his bombs on or near their target. So it is while he is *actually over* his objective that the bomber primarily requires freedom of action and protection from enemy fighter interference; and if our bombing offensive is being soundly directed and well executed, if the objectives selected are really vital to the enemy, it is precisely at that point that enemy fighters are most likely to be encountered. Therefore, remembering that the aim of the fighter offensive patrols is to find and destroy enemy aircraft, is not this an obvious place to which to send them? Now apart from other reasons which

have been discussed in the foregoing pages, there are two main difficulties in the way of this course. In the last War—as to-day—the vast majority of the fighters were of the single-seater class, which has no rear gun; therefore when a bomber formation set out accompanied by fighters and encountered enemy aircraft on the outward journey, the escort had to turn in order to fight. The bombers obviously could not wait about till the issue was decided, and had therefore to press on without their escort to their objective—where they very often found more enemy fighters awaiting them. Meanwhile the fighter escort, even if the issue of the fight could be quickly decided, had not—and would not have to-day—a sufficient margin of speed over the bombers to enable them to catch up in time.

The second difficulty of course was—and for the moment still is—that the single-seater fighter has a relatively short endurance, with the result that the bombers' objectives were often out of fighter range. With the greatly increased ranges that may be expected within a few years it seems inconceivable that in a land campaign any of the enemy's vital centres, in the narrow sense of the term defined on p. 16, can be out of fighter range; that is to say beyond a range which fighters can attain, and attain with sufficient fuel in hand to allow of them having their fight and getting back again with a reasonable margin. So it will be seen that, as long as all our fighters are of the single-seater type, the problem resolves itself into a choice between two alternatives. The fighters can achieve their aim of meeting enemy aircraft in the air either by accompanying the bombers, with the chance of having to leave them before they reach their objective in order to engage enemy fighters encountered *en route*; or by meeting the bombers over their objective and engaging the defensive fighters at that point. And the decision should be based solely on the double test of which course is most likely to ensure that the bombs fall as near as possible to the target, not only on the actual raid in progress but on future occasions—and this in the long run depends mainly on the question of which course holds out the best chance of meeting and destroying enemy fighters in the air; since he who fights and is precluded for the best of reasons from running away, does not live to fight another day!

It has already been said that it is actually over the objective

that the bomber most needs to be free from distractions. It is true that (if an Irishism may be forgiven) it is no good affording the bomber protection over his objective if he is shot down before he reaches it. But on the outward journey the bombers are not so likely to meet opposition as actually over their objective, and furthermore they are much more capable of looking after themselves. A well-trained bomber squadron flying in tactical formation is a very formidable object for fighter attack, it is not so likely to be forced to wide dispersion by anti-aircraft fire, and there is not the necessity for absolutely accurate and level flying that is essential during the actual attack on the objective. Moreover, the science of blind flying is making great strides to-day, and as this develops hand-in-hand with improvements in the science of navigation it will become easier for bomber squadrons on their outward journeys to rely for protection upon evasion, even to the extent of flying the whole way to their objectives actually in the clouds and only emerging over the target to drop their bombs. This increased capacity for evasion will have the result that interception by any form of defensive barrage patrol is even more ineffective than it has been in the past; and, therefore, that if an air force is compelled to resort to a tactical defensive the defending fighters will have no alternative to really close defence with the object of—at best—getting contact with the attackers over their objective, and at the worst of causing them casualties on their return journey and thus deterring them from further efforts. It thus becomes obvious that the attacker's fighters have the best chance of getting their fight in the immediate vicinity of the bomber's objectives; and with this in view fighter offensive patrols should be timed to arrive at those points a few minutes before the arrival of the bombers, so as to draw up the defending fighters and hold the ring while the raid is taking place.

So much for the condition when the bombers' objectives are within range of single-seater fighters. It is, however, in the nature of things that the single-seater fighter, as long as it exists as a class, will never have the same endurance as the bomber; and thus, even in a land campaign, there may be some objectives, less intimately but no less vitally connected with the maintenance of an army in the field, which are beyond the range of single-seaters. And therefore, as long as all our fighters

are of this class, there will be occasions when close fighter support to bombers over their objective on the lines just described will be impossible. When this is so the bombers may have to be content with the indirect support of fighter offensive patrols over the enemy aerodromes; but there are other methods. For reasons just described, fighters are not likely to get contact with the enemy by flying in company with outgoing bomber squadrons as far as their fuel endurance will permit—though in certain exceptional circumstances, especially in very clear weather, this method need not be altogether ruled out. On the return journey, however, conditions are different, and the operation colloquially known as 'scooping out' may be very effective and afford invaluable relief and support to the returning bombers. There is often a critical period when bombers returning from a raid, having had a running fight all the way back from their objectives, and perhaps having suffered several casualties, find themselves beginning to run short of ammunition in the back guns, the level in the fuel-tanks getting too low to allow of their turning and fighting with the forward guns, and forty or fifty miles to go before regaining the shelter of their own territory. This experience was not unknown to the bomber squadrons of the Independent Force in 1918: many of the objectives in the industrial Rhineland were at very long ranges for the comparatively slow bombing aircraft of the day, and the German fighter pilots—though seldom so ready as our own to come in to close quarters—were adepts at long-range shooting with the front guns. Many a hard-pressed day-bomber formation in the last six months of the War, returning from Köln or Mannheim with several of their number missing, and perhaps a proportion of dead gunners or wounded pilots among the remainder, saw with relief a scooping-out patrol of British or French fighters coming to meet them fifty miles from home.

It will be noted that the main difficulties in the way of really effective co-operation between fighters and bombers arise from the fact that the present fighter is a single-seater with no rear gun and a limited radius of action. This class has another serious disadvantage for use in offensive patrols over enemy aerodromes. As the hostile vital centres are forced farther back, and as the necessity for the defence of those centres to be even closer than in the past increases for the reasons already

described, so an increasing proportion of enemy aerodromes will at least be so far back as to involve a long flight home over hostile territory on the termination of an offensive patrol. Twelve years ago in a memorial essay the present writer put up a plea for the inclusion in the home defence force of a two-seater fighter class for use mainly in offensive patrols over enemy aerodromes. 'The necessity for offensive fighters to be two-seaters is occasioned by the fact that on the termination of their offensive duties they will have to return over long distances of hostile territory, during which they will have to rely for defence upon close formation and covering fire from back guns.'[1] The fighter contingent with an army in the field will have to be drawn mainly from the home defence force; and unfortunately we have in the defence of London a special commitment, for which a very high rate of climb—in which, of course, the aeroplane carrying only one man is bound to be superior to that carrying two—is an essential requirement. For almost any other purpose, however, the two-seater is a superior fighting machine to the single-seater. Many a bomber pilot will have grateful memories of the self-sacrificing gallantry of the several famous squadrons which were armed with the old F.E., that good old general purpose day-bomber-fighter of 1916 and 1917. And statistics prove that, reckoning by the average numbers of enemy aircraft destroyed by different classes of squadron, the Bristol two-seater was by a considerable margin the most formidable fighter in the Service in 1918. Furthermore, the same tables show that the proportion of casualties suffered by squadrons of this class was appreciably lower than among the single-seater squadrons, for the excellent reason that the two-seater has a sting in his tail, and can defend himself while retreating. The fighter-bomber as a class is not being ignored in the British Service to-day; and one of the most important developments from the point of view of the air expeditionary force was the introduction in 1932 of the first squadron of two-seater fighters into the air defences of Great Britain. This squadron is equipped with an aeroplane, the Demon, of the same basic type as that with which the high performance day-bomber squadrons are equipped—and this is a very significant fact. In the field, the only means at present available of dealing

[1] *Gordon Shephard Memorial Essay*, 1923.

with enemy aircraft beyond single-seater range would be in effect to use a proportion of our bombing force as fighters. Whether they are used definitely as two-seater fighters, less their bombs but with the consequent improved performance and more ammunition, or whether they still carry their bombs and deal with enemy aircraft by bombing their aerodromes, is immaterial. The point is that they are being diverted from their proper task in the main air offensive to the subsidiary role of direct action against enemy aircraft. The answer surely is not to retain our present ratio of fast two-seater bombers and single-seater fighters, misemploying a proportion of the former when necessary, but the reverse—to include as high a proportion as possible of two-seater squadrons in our fighter contingent, so that we can use them as day-bombers if and when the air situation permits. We cannot afford to scrap the single-seater fighter altogether; we must always retain a few squadrons of a type which will be faster and have a better climb than the high performance day-bombers of any potential enemy. But these need only be relatively few, and the higher proportion of aircraft we can allot to the air expeditionary force that will be capable of taking their full share in the main air offensive, obviously the better. Therefore, while we cannot afford any modification in our home defence force that will adversely affect its efficiency in the primary role, the defence of this country, we can accept the advent of the first two-seater fighter squadrons in the home defences as a hopeful sign. And we must bear in mind, in framing our future programmes for re-equipment or expansion of the home defence force, that the more two-seater fighters it includes the better equipped it will be to meet its second great commitment, which is to constitute an imperial reserve from which can be drawn the squadrons of the air expeditionary force for an overseas campaign.

Occasions on which the single-seater fighter will remain the most suitable type are those when the employment of the fighters approximates to the tactical defensive, when the factor of interception requires a big margin of speed and a high rate of climb. Single-seaters will therefore perform more effectively the sort of duties outlined in the 8th principle on p. 37 above. It is unnecessary to elaborate this principle in greater detail, but there are two points in connexion with it which

require emphasis. First it is as well to repeat that even local superiority can never be absolute; no defensive system, however strong, whether it is composed of short-range offensive barrage patrols as at Messines, or of definite local defensive patrols, can ensure that no determined enemy will get through. The air force commander who gives any guarantee of immunity should, therefore, be regarded with suspicion. The second point concerns the definitely defensive system, such as that designed to cover the disembarkation of an expeditionary force, and is that no system of defensive patrols or interceptors can possibly afford even a reasonable degree of protection without some system of warning, and without the co-operation of searchlights at night. It is obviously out of the question to expect in the field a system of air defence intelligence comparable to that in the home air defence organization—at any rate in the earlier stages of a campaign. Even in a highly civilized allied country like France, the difficulties of improvising the necessary system of communications upon the basis of a foreign civil telephone service would be insuperable. Moreover, actually in the defence of a base port there is the added difficulty that the wise enemy bomber will obviously make a detour and come in from the seaward side, where not only warning but also any adequate defence lighting is impracticable. Any scheme involving standing patrols is out of the question owing to the great number of aircraft that it would entail; and so it should be understood and accepted that interception of enemy bombers before they reach their objectives will be largely a matter of luck, and the best we can hope for is to distract them while over their objective, and inflict upon them there and on their return journey such heavy losses as may deter them from coming again. Nevertheless, even *some* warning is better than none at all, and we should consider whether it might not be possible to include in our field force some sort of air-defence-intelligence warning unit. It might be possible to organize a unit, which need not contain very many personnel or be very expensive, on the lines of the Observer Corps at home, possibly from the Territorial Army but on a higher standard of readiness for war. A number of observer groups of this sort, equipped with wireless, might be very valuable and very greatly increase the efficacy of any defensive system, by providing at least some warning to enable

the defending fighters to get into the air earlier than would otherwise be possible.

It is officially recognized that attacks on enemy aerodromes by bomber aircraft are a diversion which is only worth while when adequate results may be expected, and when there are no more vital objectives against which such attacks can be directed. This principle has been dealt with in some detail in the foregoing chapters and needs no more elaboration further than to repeat that—certainly in a land campaign—this diversion can only be justified if by undertaking it we increase the efficacy of our main air offensive, or afford to our own army a security which cannot otherwise be attained. It is probably vain to imagine that we shall ever be able to dispense with it altogether; actually, in 1918, out of 666 tons of bombs dropped by Trenchard's force 220 tons, or almost exactly one-third, were dropped on twenty-three different German aerodromes. This represents a very serious diversion, and it is to be hoped—and if we get an adequate force of two-seater fighters it may be believed—that such a high proportion will not often be necessary in the future. But it is quite impossible to attempt to lay down any general rule as to the proportion of bombing effort that may have to be diverted to attack on aerodromes. Obviously it must vary in every set of circumstances. The Independent Force had to meet vigorous opposition by a first-rate enemy in great strength; in the final stages of the Palestine campaign, on the other hand, we had to deal only with a weak and demoralized enemy, and action against his aerodromes was left entirely to the fighters. So it is only possible to say that the extent to which air bombardment of aerodromes will be necessary must depend upon a variety of factors such as the strength, morale, technical efficiency, and fighting value of the enemy, the distance of his aerodromes from our own, and the air situation generally.

On the other hand it is worth examining briefly whether in fact 'adequate results may be expected' from this form of action, and if so in what conditions. In the British Service there is discernible a tendency to underrate the possibly serious results of bombardment of aerodromes on a modern scale. It is claimed that casualties to aircraft and personnel can be reduced

to a negligible quantity by proper dispersion on the ground, and that bomb-holes in the aerodrome itself can be rapidly filled in. There is much truth in this claim. The effects of increased bombing efficacy have been at least discounted by other modern developments such as metal construction and greater independence of hangars; although the ease with which it is possible to recondition an aerodrome which has been well pitted with bomb-holes can be exaggerated. It is not impossible that permanent air bases in the vicinity of European frontiers may be provided with underground bomb-proof accommodation for the aircraft.[1] Nevertheless, apart from the possible effects of gas attack, which must be left to the reader's imagination, it is very dangerous to underestimate the damage and dislocation which might be caused even to-day by skilfully executed bombardment of aerodromes, especially if it is combined with fighter attack. Probably the lack of anxiety with which it is commonly regarded in the Royal Air Force is due to our comparative immunity from it in the War, and it is more than likely that it is held in greater respect in the German Service, and even in the French. There was always a certain amount of sporadic bombing, mostly at night, on or in the vicinity of British aerodromes in France; but it was usually little more than a nuisance, and it was not often that our squadrons suffered as seriously as, for instance, did No. 48 at Bertangles on the 24th of August 1918, when three-quarters of the aircraft were destroyed and the squadron had to be taken out of the line for several weeks to refit. Actually in the last sixteen months of the War there were nine instances of attacks on aerodromes of fighting units, on anything like an intensive scale; and the following little table summarizes the results:

Total number of enemy aircraft engaged (mostly large twin-engined night bombers of the Gotha type)—approximately	74
Total weight of bombs dropped—approximately	40 tons
Material damage, aircraft destroyed	29
aircraft damaged	48
hangars destroyed or damaged	19
and a great deal of M.T. destroyed or damaged	

[1] Even in the last War the Germans had some bomb-proof shelters for aircraft at their Belgian coast bases.

Personnel casualties—killed	26
wounded	82
Enemy casualties in aircraft	3

Actually 21 out of the 29 British aircraft destroyed were lost in two quite minor raids, whereas the most intensive attack—that on Coudekerque on the night of June 6th–7th, 1918—in which 24 tons of bombs were dropped, only destroyed some hangars, and none of the aircraft were lost, because they were all in the air at the time; which shows how largely the element of luck enters into this sort of operation, particularly at night. Nevertheless the average works out at about one British aeroplane destroyed or damaged for every one German aeroplane engaged, and about eight and a half for every raid. Now this scale of loss when it occurs only about once every two months is not very serious, and in an air force about 1,500 strong, with a magnificent service of replacement behind it, is quite negligible. But if it were incurred by a force of only about one-third of that strength, with nothing like the facilities for rapid replacement of casualties, and incurred not once in two months but once in two weeks or still more in two days, it would become very serious indeed. So it is worth investigating whether anything like this scale of casualties is likely to result from the bombardment of aerodromes in the future, or whether altered conditions are likely materially to reduce it. This is a question of fundamental importance in air warfare, and it is essential to be quite clear about it, to understand first what were the conditions in which this scale of loss was incurred, and then to try to make up our minds to what extent modern circumstances have altered cases.

The first and most striking point is that in every one of the raids on the fighting aerodromes in the above table, as well as in those on the aircraft depots mentioned below, the bulk of the damage was caused by *hangars* being wrecked and usually burnt out. In the last War all our squadrons were housed in conspicuous canvas hangars, either of the small single R.E. or R.A.F. tent type, or, worse still, in the large wooden-framed Bessoneaux holding six or eight aircraft or even more. Even the former were usually arranged in neat rows close together along the edge of the aerodrome with—at best—low sand-bag walls between them to reduce the splinter effect of bombs; and

from the latter there was seldom sufficient warning to get the machines out in time; and once one aeroplane was hit and the petrol-tank had caught fire, the remainder were almost inevitably destroyed. Now in this one vitally important respect conditions have changed to an extent which has altered the whole face of the problem. Even in the last War we could have done without hangars to a much greater extent than we did. In 1923 the Bristol Fighters of No. 4 Squadron stood out in the open on the Gallipoli peninsula for nine months under all conditions of weather; and more recently the Junkers Company operated an air line in Persia without any hangars for three years, the weather conditions varying from several feet of snow on the high aerodromes in winter to 130° in the shade at Bushire in the summer. In fact, metal construction and other modern developments in design have to-day rendered aircraft quite independent of hangars. At the same time, in the R.A.F. at least, improvements in engines and the removal from the squadrons of responsibility for any but small running repairs have obviated the necessity for large workshops, and greatly reduced the amount of transport required with the squadrons. Two or three light portable shelters will still be required in which running repairs and maintenance can be done in bad weather, but the bulk of the aircraft can be provided with engine and cockpit covers and picketed out in the open—just as a motor-boat is left out moored to a buoy. And instead of being picketed close together in neat lines dressed by the right (as we too often see them on manœuvres in peace), the aircraft must be scattered at irregular intervals all round the edges of the aerodrome. This is a nuisance, and will make defence, control and maintenance more difficult. But it is an inconvenience which can be minimized by training and practice, and in any case is an absolute essential; because by this means not only will squadrons become less conspicuous but also the material damage inflicted by air bombardment will be enormously reduced.

This brings us to the second point, which is that the more aeroplanes there are concentrated on any one aerodrome the higher proportion of casualties are likely to result from air bombardment; obviously the thicker the aeroplanes are on the ground the more likely are they to get hit. This factor, which

really resolves itself into the question of the space available for aerodromes, is one which is likely to be aggravated by the need for wider dispersion of aircraft on the ground—though it may be partially alleviated by the fact that such fittings as wheel-brakes, wing-flaps, and variable pitch propellors will make it possible to use smaller spaces than were necessary fifteen years ago. Behind some portions of the British line in France, in Artois and Picardy, for instance, the country was almost ideally suited for aerodromes, and facilities were more or less unlimited; elsewhere, such as in the industrial north and in the dyke country of Flanders, it was very much harder to find big enough spaces for aerodromes. It may be a pure coincidence that 7 out of the 9 attacks on aerodromes referred to on p. 54 were in Flanders, but it is worth noting that on one aerodrome attacked there were about 70 aeroplanes, and on another about 50. The heaviest casualties on record were those suffered by the French air force during their concentration behind Verdun. In that area they had assembled no less than 630 aeroplanes on 7 aerodromes, all within a radius of about 3 miles, and on one aerodrome alone there were about 150 aeroplanes.[1] In the first attack on two of these aerodromes, which was at night, 60 aircraft were destroyed. It seems likely that prior to this the French had not taken all the steps that they might have to minimize the risk of casualties, because on the next night, when the Germans attacked 4 aerodromes containing in all 390 aircraft, only 25 were destroyed and 20 slightly damaged. The obvious remedy, of course, is never to have more than one or two squadrons on each aerodrome, and although this sounds rather like a counsel of perfection, it is the only solution to this difficulty. If we are up against a bold and efficient opponent in the air, and if the country in the immediate vicinity of the area of operations does not afford sufficient possible sites for aerodromes, then our air forces must be dispersed over a wider stretch of country, even at the expense of some sacrifice in effective range. This necessity, of course, raises a problem of control, in the solution of which there are two essentials. Firstly, an efficient field meteorological service, so that the Air Officer situated centrally can tell at any moment the weather conditions in any portion

[1] This is nearly as many as are concentrated at Hendon for the Annual R.A.F Display.

of the area over which his command is dispersed, and if necessary adjust his programme accordingly. And secondly, a very comprehensive system of communications, including wireless, enciphering and deciphering machines, target codes, and the use of aircraft for intercommunication and personal visits between the A.O.C. and his subordinate commanders.

This then is a problem which, so far as it concerns the aerodromes of fighting units, can be solved—though we shall have to give it a great deal more attention than it is at present receiving in the British Service. Where aircraft parks and depots are concerned, the solution is rather more difficult. The number of reserve aircraft and the quantities of spare parts and stores maintained in the field will vary with the distance of the theatre of war from the sources of supply at home, but there will always have to be some. Even if the casualties due to enemy bombing of our forward aerodromes are reduced to a negligible minimum, it will still be serious if we cannot quickly replace normal wastage and battle casualties from our reserve parks and depots. Aircraft depots are organized and designed to serve a large number of squadrons, and there are consequently a large number of aircraft and a large volume of stores accommodated in them. It is difficult to understand why our great depots in the last War were not attacked more often, but when they were, the damage was very serious. Twenty-nine aeroplanes were destroyed in one raid on the depot at Dunkirk in October 1917; and at Marquise in the following September 13 German aircraft dropped about 12 tons of bombs which destroyed 27 aircraft and 25 engines, and seriously damaged 46 aircraft and many other stores—in each instance the bulk of the damage being done by hangars getting burnt out. The obvious solution to this problem is to establish aircraft depots out of enemy bombing range, and the disadvantages can be minimized by the use of transport aircraft for the carriage of engines and other spare parts—a service for which impressed commercial aircraft may be very suitable. But this solution will not always be practicable, and so we shall have to accept the obvious disadvantages and organize our maintenance and supply system in smaller units, and put fewer eggs into each basket.[1] Aircraft depots will in any event have to be situated on aerodromes, and if they

[1] See p. 118 below.

have to be in the forward areas, the reserve aircraft will have to be picketed out and dispersed on the ground in the same way as those of fighting units.

The third factor which we should consider in connexion with air bombardment of aerodromes is that of the facilities for replacement of casualties. In 1917 and 1918 the output of aeroplanes from industry was ample to meet all our requirements, although on the other side it was causing the Germans some anxiety at the end of the War. In the opening stages of a future war, however, it will be a very serious problem indeed; and until the normal peace production of the world's aircraft industries is very much larger than it is to-day, even those nations which are best situated in this respect will have great difficulty in finding sufficient aircraft to meet normal wastage and battle casualties in the first months of war. Therefore, when the other conditions are favourable, and especially when our Intelligence leads us to believe that the enemy is finding it peculiarly difficult to replace losses in his field air force from his aircraft industry, effective bombardment of his aerodromes may have very valuable results in reducing his air activity. And it is worth noting that the effect of such action against his aerodromes in the field may be rendered still more embarrassing by action against the centres of his aircraft industry itself, although this will not normally fall within the province of the air expeditionary force.

There is another factor, closely allied to the last, of especial concern to the British Empire, which has several isolated fortified bases of first-rate strategical importance disposed along the sea routes. Replacement of casualties may sometimes be impracticable, not because reserve or reinforcing aircraft do not exist, but because they cannot be made available where they are wanted in time. Even if the scene of operations is within flying range—and to-day at least one of our fortified bases is not—an air route is liable to be cut by the capture of even one essential refuelling aerodrome upon it. This situation, where a belligerent's air forces locally available cannot be reinforced, constitutes another condition favourable to the deliberate and systematic destruction by air bombardment of his aircraft on the ground; the more so because it is a situation in which the defending commander may endeavour, for reasons described

on p. 39, to avoid premature loss by declining battle in the air. From the British point of view, of course, the obvious moral is the first-rate importance of as near as possible absolute security for the refuelling-grounds on the Empire air routes, and of the rapid development—by emergency tankage or other means—of longer cruising range for all classes of Service aircraft.

The last condition which need be referred to as affecting the question of the bombardment of aerodromes is one of *time*, and must be combined with others previously discussed if really adequate results are to be expected. A heavy bombardment of an aerodrome, even if it does not cause many actual casualties to aeroplanes, is bound to cause some temporary disorganization, and damage to the morale of the personnel; and a mass of bomb-holes in the aerodrome must cause some inconvenience and delay in getting large numbers of aircraft off the ground to a time programme. If, therefore, such an attack is launched immediately before some important operation, it may have valuable results in restricting and disorganizing the enemy's air activity at a critical time.

Finally, this problem of the air bombardment of aerodromes and bases has necessarily been discussed mainly in the light of our own experience as the object of such action seventeen years ago, and its importance under modern conditions in the scheme of air warfare as a whole must to some extent be a matter of conjecture. Although recent developments and the results of experience in the last War have in one direction undoubtedly minimized the results likely to be obtained, it must yet be remembered on the side of the attack that the performance of aircraft, the technique of bombing, and the destructive capacity of bombs have all made immense strides in the years that have passed since it was actually experienced. To sum up, it must be sufficient to say that the air bombardment of aerodromes is a form of air action which it is very dangerous to underrate, and which may, when the conditions are favourable, still achieve very adequate results.

PART II
THE SELECTION OF OBJECTIVES

V
STRATEGIC CONCENTRATION

'All bombing, even when carried out on very distant and apparently independent objectives, must be co-ordinated with the efforts that are being made by the land or sea forces, both as to the selection of objectives and as to the time at which the attacks shall take place. . . . It is utterly wrong and wasteful to look upon them as entirely separate duties.'[1]

In the first part of this book we have considered the measures necessary to create and maintain an air situation sufficiently favourable to enable us to direct the efforts of the air striking force to the achievement of the object in a land campaign. And it seems advisable to begin the second part, which is an examination of some of the methods by which that object must be achieved, by a brief restatement of the object itself. The object of the air force in a campaign of the first magnitude in which great armies are engaged is the defeat of the enemy's forces in the field, and primarily of his army. In any future war, which even more than the last is bound to be a war more of material than of man-power, of machinery rather than of muscle, this object covers a field much wider than it is the purpose of this book to explore in any detail. And although this wider aspect of the problem is of such vital importance that it must later receive more than a passing reference, the object at least of those air forces directly co-operating with the army in a theatre of war can be reduced to more narrow limits—to operate in such a way as most effectively to contribute to the overthrow of the enemy army in the field.

This is not the place for a critical survey of the principles of war as codified and tabulated in the war manuals of the fighting services. Actually in the view of the present writer the whole matter has been overcodified, and the majority of the so-called

[1] Marshal of the Air Force Lord Trenchard, *Army Quarterly*, April 1921.

principles of war are not principles at all. But there are three great fundamental rules which are really worthy of the title of principles, and are described in the Field Service Regulations as the principles of *concentration*, of *offensive action*, and of *security*. These are the real principles, of which the observance is essential to victory, and to ignore which is to court defeat. And all the other factors described as principles are surely only elements in these three. Thus mobility, economy of force, and co-operation are elements without which concentration is impossible; surprise and again mobility are essential ingredients in a successful offensive; and it should be clear from the foregoing chapters that the correct application of the principle of security depends upon a balanced economy of force.[1] The principles of security and of offensive action have already received due recognition in the first four chapters of this book—indeed the main burden of those chapters was that air superiority, which is a measure of security necessary to ensure freedom of action, can only be secured by the offensive. And it is now necessary to consider the principle of concentration, which in air warfare, even more than on land, is the foundation and corner-stone of sound strategy. This principle is described in the Field Service Regulations in the following words:

> '*The principle of concentration*: The application of this principle consists in the concentration and employment of the maximum force, moral, physical, and material, at the decisive time and place (whether that place be a strategical theatre or a tactical objective).'

The tactical aspect of concentration is considered in a later chapter in the light of the actual employment of the air force at the battle of Amiens in August 1918; we are concerned here with concentration in the wider sense—with what may be described as the major strategy of air action in a land campaign.[2] Now

[1] See, for instance, p. 30 above.

[2] A condition which is often rather confusing, not only in air warfare, is the existence of what—for lack of a better expression—one may term *double* strategy and double tactics. Air warfare is not peculiar in this respect. This double nature of war has necessitated, long before the advent of aircraft, that complex range of definitions, from Imperial or Grand Strategy through that vague border-land where minor (or battle-field) strategy mingles with major tactics, to the genuinely minor tactics of the infantry section, for instance, or the individual warship. So in the air we have grand strategy as opposed to minor strategy—Chapter V of this book as against Chapter III; and major tactics as discussed in Chapter X as opposed

the capacity to concentrate the maximum force at the decisive time and place obviously involves as a first essential a clear understanding of *what is the decisive place at the time.* This is not always as easy as it sounds; the history of the last War is full of examples of serious disagreements on this point in high circles, from the 'Eastern' controversies of 1915 to the institution of the Independent Air Force described later in this chapter. But it must be assumed—and our improved defence organization gives us ground for hope—that it will be less difficult in the future. However that may be, some such agreement must be arrived at before it is possible to select in a general sense the objectives for air action. These objectives fall conveniently into two main classes, which may be briefly described as *fighting troops* and *supply.* Here it is necessary to elaborate a little. An army can be defeated by one of two main alternative means—not necessarily mutually exclusive: We can strike at the enemy's troops themselves, either by killing them or preventing them from being in the right place at the right time; or we can ruin their fighting efficiency by depriving them of their supplies of food and war material of all kinds on which they depend for existence as a fighting force. Thus under *fighting troops* as a general class of objective must be included not only the soldiers themselves but objectives such as the rail communications and roads on which they must depend for strategical and tactical mobility, or the head-quarters which control and direct their movements. The heading of *supply* covers a still wider field: it embraces the whole range of food-supply and munitionment, from the raw material in the mine through all the processes of production and manufacture, the depots at the base and on the lines of communication, right up to the first-line transport of the forward troops. But for the purpose of this examination it is convenient to consider supply under two sub-headings which we may describe rather arbitrarily as *Production* and *Supply in the Field.* If we consider under the heading of Production the provision and movement of food, clothing, weapons, ammunition and warlike stores of every description from their source up to their arrival in the area of operations; then the holding of reserves of such material in the theatre of war, and their

to minor tactics of air warfare in its most limited sense—aeroplane against aeroplane—which is outside the scope of this review.

distribution from the base depots throughout the lines of communication to the forward troops, fall conveniently under the heading of Supply in the Field. Actually within a theatre of war the distinction between objectives under the headings of supply and fighting troops is often nebulous; the closer those objectives are to the fighting zone the more nebulous does that distinction become, and action designed primarily to interfere with the one will inevitably affect the other. Indeed, the methods adopted will hardly differ and will ordinarily be narrowed down to attack on communications, which is dealt with in a later chapter. But between attack on production and fighting troops there will always be a very clear distinction, marked by the condition that the former will not, as a rule, be the responsibility of the air forces co-operating with the army in the field. There may be exceptions to this rule, but at least in a European war it is certain that operations against enemy production will be conducted by the Air Ministry, in accordance with a general plan approved by the War Cabinet on the advice of the three Chiefs of Staff—the more so because such operations will inevitably be connected with the problem of home defence. But the results of action of this nature may so vitally affect the operations of the field army that a brief digression to indicate its object and scope is relevant and necessary. In fact, a clear appreciation of the relation between attack on production and the more intimate form of co-operation in the theatre of land war is essential to a proper understanding of strategic air concentration—the fundamental principle on which is based the existence of a centralized autonomous air service. It is especially important that the soldier should understand this principle, and should realize how operations against enemy supply at the source may affect his own problems; because, as explained later in this chapter, there will be periods in a land campaign when it will be necessary in his own interest to withdraw at least some of the squadrons co-operating with him in the field, in order that they may be concentrated temporarily against enemy production.

This is not the place for an exhaustive treatise on air operations against industrial areas. Nor does the present writer intend to become involved in a discussion of such thorny sub-