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R.A.F. MONOGRAPH
(FIRST DRAFT)

AIR SUPPORT
IN THE
SECOND WORLD WAR

AIR HISTORICAL BRANCH (I)
AIR MINISTRY

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AIR SUPPORT IN THE SECOND WORLD WAR

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AIR MINISTRY.

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INTRODUCTION

Action by Air Forces in conjunction with the Army is known as Air Support.

Indirect air support includes air action against the approaches to a theatre of war such as sea communications, and against ports, land communications, base installations etc., within a land theatre of war. (1) It is in fact strategic air support directed against any target which has an effect, though not an immediate effect, on the battle between land forces.

Direct air support implies air action having an immediate effect on the action of the land forces in battle. It includes defensive support to impede the enemy's ground and air offensive and offensive support to destroy the enemy ground forces, with the intention of facilitating the military offensive on the battlefield. The application of air support does not greatly differ whether aircraft are used in offensive or defensive operations since, in both cases, the object is to select the best possible targets for the destruction of enemy forces and to provide the best protection against enemy air attack. It can, however, be divided into pre-arranged and impromptu support.

Supply and the carriage of troops by air may also produce an immediate effect on the land battle and, in this circumstance, may be classified as a form of direct support.

Air superiority is an essential preliminary to success in operations on land or on sea; it is also essential to many forms of air operations, particularly air support. It is rarely absolute but may be obtained by offensive air action against aircraft in the air, airfields, stocks of petrol and bombs, air bases and even aircraft factories. These operations may extend over a wide area and be carried out from airfields in widely separated localities but in order to achieve the very high degrees of air superiority required in air support, particularly during an assault landing, it may be necessary to bring the effort to a head with a concentrated attack upon local airfields and air installations. The air effort retained for purely defensive purpose should never exceed that essential for security; the offensive is the key to eventual air superiority and to security.

A close study of the use and mis-use of air forces during and after the 1914-18 war revealed the need to emphasise the importance of the principle of "concentration" and of the method of applying air power in support of armies, known as "isolation of the battlefield". If an air force were to be able to obtain air superiority and to use their air superiority in providing the maximum degree of air support, it had to be centrally controlled and free to operate essentially on the offensive. Only by this means could the air effort be concentrated upon one task at a time and the foremost of these tasks (in air support) was to exclude the enemy's supplies and reinforcements from the battle area.

Unfortunately in Europe in 1940, the Allied Armies were hopelessly outclassed by the Germans and the R.A.F. was so outnumbered and the task so great that its only victories were scored at Dunkirk and over England where the narrowness of the battle area and the backing of a healthy control organisation made possible an effective concentration of effort. Britain could do no more than save herself for the time being. The Royal Air Force had been designed to provide security and a nucleus striking force with which to go over to the offensive. The Channel and not the Army provided England's main defence on land and, contrary to continental powers which had long land frontiers to defend or cross, the British at home were able to stand on the defensive while building a strategic bomber force (Bomber Command) with which to strike at the core of the German war machine.

(1) M.E. Training Pamphlet 3A.

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In the long-run Britain's hope lay in the heavy bomber and the time when Germany would be so crippled by air bombardment that an Allied Army could fight an offensive battle to win. In the meantime, however, battles on land could not be avoided and the British soldier had to take the field against an enemy who had concentrated almost exclusively upon the provision of an overwhelming army and a strong supporting air force. The German Army and Air Force were expressly designed for a Blitz-Krieg on land (at the purposeful sacrifice of a strategic air force) and, when faced with this closely integrated combination, the British soldier not unnaturally looked to the Royal Air Force to provide the air counterpart.

Britain of the late 1930's was obsessed with the need to provide against a knock-out blow from the air and during the late summer of 1940 she was well pleased to have a strong air defence. On the other hand, the Allies took the field with only a sketchy organisation for air support and it was owing to the disruption of the British Army in the field that England was left largely dependent upon her air force and navy for defence against threatened invasion. The exclusive priority accorded to security and offensive air operations was justifiable so long as Britain was prepared to stand behind the English Channel. It was a different matter when the British Army took to the field, for to do so without an adequate organisation by air support was to court disaster.

Furthermore, views were conflicting on the method of employing the heavy bomber force. The Air Ministry wanted to get on with the strategic air war against oil targets and marshalling yards within Germany (particularly in the Ruhr), which was one means of applying indirect support. On the other hand, the Army was keen that the effect of bombing should produce more immediate results and argued in favour of air support with the accent on direct support. For this purpose a light bomber force was already available and in accordance with the current view could be directed against even "close" support targets should a critical situation, a pursuit of the enemy or an Allied land attack demand such action. In 1940, on the continent almost the whole of the light bomber effort by day was directed against targets within forty miles of the front line and to this was added about twenty-five per cent of the heavy bomber effort. But beyond this distance the heavy bombers were divided almost equally between communication and strategic targets with the result that an already inadequate force was divided in its purpose. The first principle of war (maintenance of the aim) appears to have been broken and this fact should not be obscured by the argument that in any case the available air forces were inadequate for the occasion.

With the Army committed to Battle the War Office was quite justified in demanding air support and the onus for the provision of this support fell on the Air Ministry which was required to organise the limited resources of the Royal Air Force so as to meet all justified demands. The Army wanted a specific allotment of aircraft, including a bomber specifically to provide "close" support, but the Air Ministry was adamant in its purpose of resisting any suggestion that would prejudice the concentration of the force (by breaking the Air Force down into "penny packets" or by unjustified specialisation). To achieve concentration the air force had to be under centralised control and had to be as flexible as possible and it was correctly stated that existing types of aircraft would be able to provide all the support necessary provided a suitable control organisation was evolved. Furthermore, the German dive bomber was a success only so long as it was able to operate in an atmosphere of almost complete air superiority (with few opposing A.A. guns) and such an air situation was rarely to be achieved.

Most of the operations of the Royal Air Force in support of the Army took place behind the enemy lines, well removed from the sight of the soldier on the ground. Consequently, in times of stress, the soldier was inclined to the belief that he was being asked to shoulder more than his just share of the burden. This erroneous belief was due to lack of knowledge of air methods and operations, and it was not until late 1941,

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that the demands for additional protection (and if possible a special allotment of aircraft under army control) were quashed by the Prime Minister. A directive then fixed the relationship between the two services and placed on the Army the onus for its own protection (by A.A.) against attacks by enemy aircraft.

In the United Kingdom the Services were headed by the Chiefs of Staff; in the Middle East there were three Commanders-in-Chief; in the Far East and India there was a Commander-in-Chief Army and Air Force and a Commander-in-Chief of the Naval Station; in Northwest Africa there was a Commander-in-Chief Allied Forces; in the Southwest Pacific and later in South East Asia, the Mediterranean and in Northwest Europe there was a Supreme Commander for the theatre. In each of these circumstances, an Air Commander-in-Chief was either subordinate to a commander-in-chief of the Army and Air Forces, on a level with equivalent Army and Naval commanders-in-chief, or subordinate to a Supreme Commander.

The Navy would never surrender the autonomy of its forces to less than a Supreme Commander and, if for no other reason, the most successful system of command was that in which a Supreme Commander co-ordinated the work of all three (Allied) services through three subordinate commanders. The system of integrating the staff of the headquarters of mixed (nationality) formations and the simultaneous appointment of commanders and deputy commanders of different nationality was a satisfactory solution to the requirement to keep forces under the command of officers of their own nationality.

Long and short term planning was the result of joint action between all the services concerned. A joint planning staff was established at Supreme Headquarters, long term and day to day plans were co-ordinated at inter-service conferences at all levels of joint headquarters, and requirements beyond the capacity of any service could be referred upwards to the ultimate level of the Supreme Commander.

In France, in 1940, there was no thorough integration of the national forces or of their staffs and the debacle was followed by a demand for a guaranteed allotment of aircraft for air support; but the provision of air support in the Middle East was less obscured by the long term fruits of a strategic air war and the joint Commanders were more readily able to focus their attention upon the immediate requirements of the battles on land.

The term "Air Component" became obsolete with the Prime Minister's ruling of October 1941; that the Air Commander should primarily concern himself with strategic operations until a land battle was in prospect and that he should then turn his attention to the furtherance of the Army Commanders intentions. The narrow term "Army Co-operation" gave place to the broad term "Air Support", provided by all kinds of fighter, bomber, transport, coastal and reconnaissance aircraft. Every conceivable and economic means of air power was made available to the Army and this was made possible by the retention, under the Air Commander-in-Chief, of the whole available Air Force. In addition to Area, Strategic and Functional Commands the policy was adopted of controlling tactical operations through Tactical Headquarters situated alongside the appropriate Military headquarters.

While the German and Japanese Air Forces were in comparative strength the Allied Air Forces were, generally, only able to maintain air superiority over local areas. By later comparisons the enemy were never really formidable in the air and their initial successes were due more to the weakness of their opponents rather than to their own strength. Even during 1941, the R.A.F. in the Mediterranean was able to wage a highly successful war against shipping and from the end of 1943 onwards the massive Allied Air Forces were rapidly able to secure air superiority over wide areas. These results were achieved by the early adoption of a vigorous offensive against strategic and tactical, industrial, military

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and air force objectives, by fighting in the air, and by the enemy's propensity to take on more than he could handle. The availability of airfields within range of the target area was the main factor in air operations and the Desert Campaigns were fought primarily with the object of securing air bases suitable for operations against enemy supplies and reinforcements.

Air superiority, in some measure, was a prerequisite for any form of warfare; strategic air operations had to be conducted at a steady and mounting pace; indirect support operations had to starve the enemy of supplies and reinforcements and had to be begun well before the battle was joined on land. A high degree of local air superiority had to be obtained for the opening and succeeding days of the land battle and this air superiority had to be used in providing the maximum amount of direct air support. It was air superiority (dependent upon strong offensive action from suitable bases) that made possible the successful prosecution of the battle of supplies, army operations and combined (assault) operations. The requirement for a high degree of local air superiority was greatest during assault landings and in this single circumstance the provision of air cover was essential, even when only a small enemy air force was left intact.

The bomb was the primary armament for support operations but the cannons of the fighter and the light bomber and the R.P. of the fighter were complementary weapons.

The attack of shipping in the Mediterranean and bridges in Italy and Northwest Europe was of decisive importance when coupled with attacks upon ports, base installations and dumps, railway lines and rail and road movement, and when the Army was prepared to force the issue by strong offensive action on land. Shipping, river and coastal craft were attacked mainly by light bombers and fighters; bridges, ports, bases and dumps were attacked mainly by medium, light and fighter bombers; railways forward of bridge damage were subjected to effective interdiction by fighter bombers which made series of cuts in the lines themselves; rail and road movement was attacked by fighters by day and by light bombers by night; and the railway repair organisation, rolling stock and locomotives at railway centres were attacked mainly by medium and heavy bombers. The attack of railway targets at rail centres was fundamentally a long term project designed (with the overall effect of damage to railway equipment) eventually to paralyse the rail communications system.

The attack of supplies and reinforcements en route and the interdiction of communications was designed to produce a situation more immediately favourable to the land situation but, when there existed a prospect of a rapid advance, the attack of bridges, locomotives and rolling stock had sometimes to be limited owing to their expected use to the Allies themselves.

The attack of headquarters and signals centres was an effective means of disrupting the enemy control organisation just prior to or during a land battle; and the bombing of battery sites and the attack of coastal radar stations by bombs, R.P. and cannon were effective ways of neutralising a considerable portion of the enemy defence system prior to an assault landing. But a more difficult problem was that of meeting the requirement for support against targets on the battlefield for although the Artillery was the primary bombardment weapon close to the front line there were occasions when an air effort was indispensable. This could occur in defensive or offensive operations when insufficient artillery power was available to take on the numerous targets offered, or when targets were beyond the reach of artillery owing to intervening features such as hills; or when artillery was out-distanced during a pursuit. In all these instances it was essential to provide a means whereby forward ground forces could notify their requirements to a central control and to provide a means of ground recognition whereby the attacking aircraft could engage close objectives without unnecessarily endangering the troops.

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The first requirement was met by the Air Support Control and, later the Air Support Signals Unit. Under these systems the forward army formations passed their requests for support over an army "tentacle" net to Army/Air Headquarters where the necessary executive action was taken through a detached Control Centre. This Control Centre was located centrally to the fighter, fighter bomber and reconnaissance airfields and was therefore able to maintain good communications for the control of aircraft. It also co-ordinated the plots received from Radar Stations and Wireless Units, provided information for a Gun Operations Room, and operated the advanced Radar stations as forward fighter controls or forward director posts. On the other hand, it had no intrinsic means of assisting support aircraft to their objectives until late 1944, when the Mobile Radar Control Post was first introduced into the Royal Air Force.

The second requirement, for a means to assist in the location and recognition of ground targets had therefore to be met by additional expedients. The basis of these systems comprised the notification of a bomblines which indicated to all concerned the expected position of forward troops two hours in advance, and of special bomblines for specified occasions. This was done over the Air S.C./A.S.S.U. net and in general it catered satisfactorily for attacks made as a result of air reconnaissance or armed reconnaissance. Furthermore, recognition in mobile warfare was assisted by the marking of Allied vehicles with R.A.F. roundels or the American five-pointed star. It did not, however, cater for attacks against close support targets in difficult country or by forces, such as the strategic air forces, which were either not specifically trained for the type of operation or flew too high to be able to recognise their targets.

In the case of tactical air forces operating over difficult country or well in advance during a pursuit the basis of control against targets reported from the ground consisted of the Visual Control Post or Contact Car or Tank. These operated as combined tentacles and visual control posts which could take up position on a good observation point in suitable country and could, if necessary, control a whole cabrank of fighter bomber aircraft on to a target. When vantage points were not available control could be exercised "blind" by the use of gridded mosaics and maps and under these circumstances the control post was known in Northwest Europe as a Forward Control Post. In Italy the Forward and Visual Control Posts went under the name at Rover.

Rover, however, was not developed until the autumn of 1943 and before and after that date much reliance had to be placed on visual signals displayed from the ground. These included ground strips, "V" indicators formed by tins of burning petrol, smoke and smoke shells. Fluorescent panels, radio beams and finally radio aids such as Shoran were also developed, and the majority of these devices were employed during the crossing of the Senio River in Northern Italy, when large heavy bomber forces took part. In addition the aircrews of the heavy bombers were given special training and experience over the route and target area, but, even then, a number of casualties were inflicted on friendly ground troops.

The employment of all available forces to save a critical position on land was never questioned and, at Salerno, the timely intervention of heavy bombers did much to turn the tide. On the other hand, in a land offensive, the heavy bombers could be usefully employed on the battlefield only if the land forces would remain sufficiently far forward and, after the bombing, attack in sufficient strength to overcome the objective before the defenders had time to recover from the numbing effect of the bombardment. The joint task was not easy to achieve for although the air force could normally guarantee to do all that was expected of it, the army was by no means always able to complete its share of the task. In Italy and Northwest Europe the most distressing instances of failure occurred at Cassino and Caen and in both cases the ultimate break-through was eventually achieved by flanking rather than frontal attacks. The gloomy picture was relieved by the success of operations at Senio and against the Channel Ports but, in success or failure, the massed air attack of built areas resulted in untold devastation and suffering, often to a friendly populace.

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The Army Commander could request either indirect or direct support with time qualifications as necessary and the Air Commander would advise him of the effect that was likely to be achieved. As at Cassino, the Army and Supreme Commander might be satisfied with these expectations and order the start of ground operations despite the misgivings of the Air Commander (with regard to the operation as a whole) and, once the operation was decided upon, the Air Force had to go into action. The Army was kept aware of the expected results of air support and had to be prepared, as necessary, to contend with all such difficulties as enemy troops dazed but uninjured, smashed bridges, impassable debris and craters, and homeless civilians.

A third requirement, that was first encountered on a large scale during the North African landings, was for the provision of an organisation capable of supporting a combined assault across water. The technique was developed for the invasions of Sicily, Italy and Normandy and involved the provision of good intelligence on the forces to be overrun and the practicability of obtaining or constructing airfields on captured ground, bases from which fighters could cover the assault convoy and beaches, an organisation for the forward control of fighters from the sea and then from assaulted territory, spotting for naval guns, and airborne operations. In addition to the above tasks the air force had to contend with the interruption of communications (to hold up the intervention of enemy reinforcements), the provision of a high degree of air superiority (for security) and the neutralisation of coastal defences.

Special features of the organisations were a central despatching agency for fighters, headquarters ships afloat, fighter directing ships and radar afloat, seaborne G.C.I. for the control of night fighters over the assault area and a control centre with radar and wireless units to be landed as soon as possible to take over control ashore. The most difficult problem was that of limiting the fire of friendly anti-aircraft guns in order to provide safe heights and lanes for friendly aircraft.

The versatility of the fighter and the bomber was thoroughly proven during the 1939-45 war. The organisation for control provided for precise application of effort when and where required but it was also necessary to make the force mobile and flexible. To these ends rapid airfield construction was provided by the Army, Units were organised to move on a two-party basis and were equipped with vehicles, squadrons were established on a servicing echelon basis, and technical developments increased the scope of aircraft. In particular the fighter, fitted with bombs or R.P. became a weapon of very great versatility and of foremost use for the provision of impromptu support. It was the most accurate of all weapons and was effective against the smallest of targets even to the extent of immobilising tanks (as demonstrated at Mortain in Normandy) and destroying bridges. Furthermore, the striking power and accuracy of the bomber were steadily increased and improved and, as occasion demanded, the whole bomber effort was brought to bear upon the battlefield itself.

The Air Observation Post was a new type of aircraft, introduced for use by the Artillery in observing the fall of shot, and the only other new use of aircraft was the employment of large fleets of air transports and gliders for the air supply of land forces and for use in airborne operations.

The carriage of troops and supplies by air was practised in supply and airborne operations in all theatres and involved the provision of gliders, tugs and air transports. This was a departure that was early foreseen but the use of aircraft to supply a whole army was an entirely new development. In Burma, where ground communications were either non-existent or inadequate, air transport successfully combated enemy attempts to annihilate forces isolated by climate and topography and by Japanese infiltration tactics, such as at Imphal; it transported troops and kept supplied

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Wingate's long range penetration forces; finally, it fed the Fourteenth Army during its advance from Imphal to Rangoon.

By contrast with the scope and ability of the fighters, bomber and transport aircraft of the Allies, the German and Japanese Air Forces were unable to break away from their basic design of air forces as supporting weapons for a Blitz Kreig. If the attempt to quickly subdue all Allied opposition had succeeded there could have been no criticism of this conception. And, in any event, the need for a continental power to make certain of its land defences before embarking upon the costly provision of a strong strategic air force is understandable. The enemys' fault lay in not switching their emphasis onto heavy bomber production the moment it was known that the Blitz Kreig had failed to eliminate their potentially strong adversaries.

The 1939-45 War produced no new "principles of war". A principle must have absolute relevance, wide generality, high significance and be a functional truth. (1) "The principles of war are those which experience has proved to be appropriate to warlike action" and include maintenance of the aim, offensive action, surprise, concentration, co-operation, economy of force, security and mobility. Their study and application are an acknowledged factor in the conduct of war, and although none can be ignored, it is sometimes necessary to place particular emphasis upon one or other of them.

Such was the case between the wars when the autonomy of the Royal Air Force depended upon the recognition of the need to concentrate air power. But that doctrine has now been endorsed by success and much experience has been gained in inter-service and inter-national concentration and co-operation. The rocket and the atom bomb bring forth questions concerning the aim and offensive action, surprise, security and mobility, and it is upon the answer to these questions that future strategy and tactics will depend.

If a country is to survive a war in which these weapons are used it must be prepared to take quick and decisive action with an organisation keyed to a pitch well beyond that so recently reached. The bomber is likely to excel (for a time at least) as the means of delivery of missiles, owing to its remarkable accuracy. But security is rarely likely to be absolute and there is no guarantee that the bomber will be able alone to bring a war to a rapid conclusion. If the emphasis is upon the absolute and rapid neutralisation of the enemy's air offensive, the immediate occupation of enemy territory may be involved, and this would entail a considerable air effort in support of armies.

(1) Lecture by the Commandant (A.V.M. Hill) at R.A.F. Staff College
5 June 1943.

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CHAPTER 1

PLANNING FOR WAR

By early 1939, the imminence of war was fully apparent and joint Anglo-French Staff conversations had been begun in London with the object of determining the course of Allied action in a war in which the factor of "time" was to be the key to victory. Great Britain and France possessed a vast but undeveloped potential for war with which success could be achieved provided time allowed. The resources of Germany and Italy were clearly limited, and their hope of favourable results lay in the gaining of a quick decision through the use of overwhelming strength of the land and air forces which they had taken care to accumulate. The Allies had already viewed their stock with apprehension and instituted measures intended to redress the situation "to the degree needed for security", and to provide for the implementation of the only possible course of action, which was to stand on the defensive until sufficient strength could be acquired for offensive action. Air and military strength could be increased only if industry and sea communication could be secured and, with this proposition providing the background, the war was planned to take place in three phases.

The first phase plans had the object of holding a German land attack through either Switzerland, the Low Countries, or on the Maginot Line, and to defeat either a simultaneous or separate air attack on France or the United Kingdom. (1) The second phase was to include the elimination of Italy and was to begin by the assault on the Italian African Empire. At the same time, strength was to be built up in Europe and Allied air action was to be extended to the bombing of industrial and economic objectives in Germany. The original intention, to use the whole of the bomber forces primarily for the support of the land armies in the first stage, was later appreciated by the British Air Staff to be impracticable because of the ineffectiveness of heavy bombers when operating against the comparatively small and often fleeting targets to be found in the field. Consequently, later plans provided for the attack on industry to begin in Phase I and to be directed primarily against the oil installations of the Ruhr in addition to marshalling yards, communications and enemy troop concentrations.

Although it was necessary to consider the effect on neutral opinion of bombing other than purely military targets, it was apparent that almost any air action could be justified on the grounds of military necessity, and that German action in Poland had practically removed all legal restrictions. The main point, however, was expediency and, although the policy of conserving strength remained sound, it was apparent to the British (but not to the French) that the best way to meet a German invasion of the Low Countries was to grasp the initiative in the air. As a guide however, on which to base decisions involving the factors of neutral opinion and expediency the following classification of objectives was prepared by the British Air Ministry:- (2)

- (a) Purely military - air force airfields, the fleet and naval bases, army barracks, and all Service establishments.
- (b) Borderline cases - escorted convoys.

(1) A.H.B. Narrative. The Campaign in France.

(2) C.A.S. File
Air Policy Pt. I Encl. 3A.

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- (c) Nearly borderline - munition factories (especially aircraft), industry and rail communications.
- (d) Not purely military in the narrow sense - commercial ports, single M.V's not in convoy, power stations, oil installations, and the seat of government.

The third phase was to consist of the defeat of Germany. No specific date could be given for this operation owing to the indeterminate nature of the preceding phases and the several factors which might effect the less immediate preparations for the battle.

The overwhelming strength of the German Air Force in 1939 was a direct outcome of the German need to wage "lightning" and decisive wars. British policy had limited armed forces to the strength needed to secure the United Kingdom against a knock-out blow, and French policy had directed the bulk of effort towards the construction of land defences and the building up of land forces to the detriment of air armies. The Allies, therefore, began the war with a profound inferiority in air strength and a large (but incredibly badly equipped) French Army. The maximum first line strength of air forces for the 1 April 1939 was as follows:- (1)

<u>Country</u>	<u>Total aircraft</u> <u>(all types)</u>
United Kingdom	1,290
France	1,450
<hr/>	
Allied Total	2,740
<hr/>	
Germany	3,700
Italy	1,393
<hr/>	
Axis Total	5,093

Both the British and German bomber forces were backed by about 100% reserves, the whole Italian Air Force had about 30% reserves, and the French bomber force was in such a general state of obsolescence that it could be practically discounted from calculations of air striking power. Thus the Axis Powers possessed a preponderance of bomber strength considerably in excess of the apparent numerical ratio of three to one.

To meet this the Allies had less than 1,000 fighters comprised of a practically unbacked British element and a French component of which 106 aircraft were so obsolete as to be suitable only for local defence. Although enemy long-range operations over England could be met in reasonable strength (the British fighter force would need to be harboured and nurtured for battle), operations over the Continent were bound to favour the stronger of the ill-matched forces. This situation, in some considerable measure, found its origin in the British conception of a "knock-out blow" from the air. The difficulties involved in long-range operations from Germany at a comparatively low rate of effort and the encumbent losses due to air action by day and the more natural hazards by night were apparent, but nevertheless Britain saw fit to regard such action as the most cogent threat to her security. In addition to the restricted strength of forces there was the effect of immobility which this policy inflicted upon the British Air

(1) A.F.C. (J) 6
28 May 1939.

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Forces. Except for reconnaissance and a limited number of fighter aircraft, the Royal Air Force was fundamentally tied to England and, owing to the complications involved, any limited reinforcement of air forces on the Continent was bound to be slow and fraught with difficulty.

The position was not substantially changed by the time a state of war was declared on 3 September 1939; and when the main offensive opened on 10 May 1940 the German first line strength was 4,860 aircraft, the Allies 2,940. (1) The assumption that "time was on our side" was misconstrued in that the need to make use of total national effort to redress the balance of forces may not have been fully realised. Until the German reserve stocks were exhausted she could still out-produce the Allies in war industry and for a limited time could accumulate additional strength with which to wage offensives which would open up fresh sources of supply. But whatever the cause, it is evident that Allied industry was running in an intermediate gear for too long.

A war of ill-matched forces was contrived with apparently little realisation of the gravity of the situation. The idea of stabilisation of the front into a state similar to that of the previous war, or what was known as "The Maginot Line Complex", seems to have permeated the minds of the strategists and none visualised the impending sequence of events in which one section of the R.A.F. in France would be compelled to evacuate the Continent within ten days of the opening of the German offensive, and the remainder would be chased across the breadth of France in a matter of five weeks - an operation for which they were quite unprepared.

The Principle of Concentration. The most significant lesson of the first World War was that of the importance of concentration - a principle which was seen to dominate the employment of air forces. At that time the problem of handling large air forces in a major strategic role was never fully understood, and the principle of concentration was constantly infringed. (2) This was largely because the R.A.F. in the field had grown up on the basis of decentralisation to armies, which made it difficult to practice, and therefore gain knowledge of the rewards of, centralised control and concentration. It was only by subsequent study that the full significance of this principle was revealed. Air forces, of which bombers offer the most poignant example, must be concentrated in the maximum possible force on whatever might be the decisive task at the time. The only legitimate limit to the application of this principle was that imposed by the requirement of security and diversion of enemy strength; but the use of air forces for this purpose had to be kept to a minimum whilst the bulk of air effort was to be concentrated on the primary task. Air forces possessed quite unprecedented freedom of movement and therefore equally impressive powers of concentration of primary effort. Conversely, however, the effort could be readily dispersed and strength dissipated by lack of understanding of the principle of concentration and consequent mismanagement.

Air Support Policy. As the sub-allotment of bombers to military forces would involve waste and inefficiency and could not be relied upon to provide effective support for the affiliated ground formations, the Air Staff maintained the principle, which

(1) A.H.B. Narrative. The Campaign in France.
Apps. D, E; and F.

(2) Draft C.O.S. Paper. Encl.17. II H.97

was accepted by the Army, that the long range bombers should be kept under centralised control, but the Commander-in-Chief in the field must be able to call upon the force to assist in the achievement of his aim. (1) Routine bombing tasks were not to be taken on an Army front as this would entail dispersion of effort on indecisive objectives, and if the armies were not engaged in decisive conflict the bombing effort was to be directed to more important tasks - a decision which was endorsed by the German Air Staff who categorically refused to give air support to any army formation which was not taking part in a decisive battle. On the other hand, should the Army be carrying out an operation such as a major offensive, as much of Bomber Command as necessary would be allotted for air support.

Many strategical targets attacked in enemy country would be such as to afford indirect support to land operations. But more immediate assistance could be given by direct support action against enemy land force targets such as base depots, dumps, supply columns, movements by road and rail, headquarters, rest and reserve billets, assembly points of reinforcements, forward elements of armed forces, and even forward troops deployed and in contact. This latter action was known as "close support" and entailed the active participation of aircraft in the land battle, whether it were the assault or defence of lines in static warfare, or advanced or rearguard action in mobile warfare.

Experience of numerous instances during the first world war when aircraft, generally fighters, were employed in close support showed however that, except in certain special and rare circumstances, the results were disappointing when compared with the losses sustained. (2) More favourable and important objectives could usually have been chosen. Nevertheless events in Spain, where specially developed German aircraft were used for close support, had given rise to a belief in certain quarters, that aircraft could be used efficiently as battlefield weapons. These operations took place, however, in an unusual air and ground situation. The Nationalist forces had complete air superiority and suffered from lack of artillery and armoured fighting vehicles. The enemy forces were for the most part untrained, undisciplined, and ill-equipped with light anti-aircraft weapons. Later, when the Government forces had more weapons and had become comparatively well trained in defence, the Nationalists were forced to abandon low-flying attacks of this nature. As a result, aircraft were forced higher and bombing accuracy fell off to such an extent that support to a closely engaged ground force involved almost equal danger to both sides. In Poland, the Germans had complete air superiority and were opposed by an ill-organised army which was inadequately equipped with A.A. weapons, and the success which attended genuine close support in the battlefield was due to the fact that the German aircraft were able to operate with relatively complete immunity from opposition - thanks largely to the early destruction of the Polish Air Force and to the extent to which their bombers had disorganised communications in the rear of the Polish armies. (3)

(1) Draft C.O.S. 924. Encl. 12. II H.97. 14 June 1939.

(2) Air Attack in direct support of the Field Force.
II H/97. Encl. 11.

(3) Air Staff Memo 21 November 1939.

In the conditions of the battle for which we were preparing all war experience proved that low-flying attack - which was the usual method of providing close support - on the battlefield against unbroken troops, deployed and in position, inevitably involved a very high rate of casualties. Whilst the Air Force had never been unwilling to face heavy losses, it had to be realised that highly trained pilots could not be replaced with the same ease as infantry soldiers.

The normal requirements for the provision of close support included local air superiority, a lack of light A.A. weapons with the opposing ground forces, a high standard of training and morale in the air, intelligent briefing, and an efficient organisation for the control of aircraft. All these conditions would be rarely fulfilled and it was a known fact that aircraft were not effective substitutes for artillery and, even in the absence of artillery the support operations were therefore to be limited to exceptional circumstances which justified and made essential this method of support. These circumstances were laid down by the Air Staff in a Memorandum dated 21 November 1939, as follows:-

- (a) In defence, in a critical situation when the overriding consideration was to stop a hostile breakthrough; to cover the withdrawal of our forward troops from untenable positions and to give time for the arrival of reserves. Aircraft were to be used actually on the battlefield against enemy forward elements. The use of aircraft at a terrible cost in casualties to avert a breakthrough west of Bapaume and the closing of the gap at Roye, during the retreat of Gough's Fifth Army in March 1918 served as an example.
- (b) In the pursuit against an already broken enemy to turn a retreat into a rout, such as occurred after Megiddo in Palestine on 21 September 1918, when the Turkish Seventh and Eighth Armies were annihilated.
- (c) On rare occasions in the attack on a highly organised defensive system when it might be justifiable to use aircraft "temporarily" against such objectives as artillery areas and the movements of the enemy's immediate reserves, to make sure of breaking the crust of the defence for the initial break-in. No justifiable examples existed of the use of aircraft in this manner, although there had been occasions when some benefit had been obtained; but in all instances the effect would have been greater if the effort had been applied further back.

In brief, liberties could not be taken with the rules except when one side had complete air superiority and when the opposing Army was ill-organised and inadequately equipped with A.A. weapons; only in defence could aircraft be used actually on the battlefield and, in pursuit and attack they could sometimes be directed against objectives within range of heavy artillery. Close support could only, therefore, be considered a secondary role for aircraft and it was evident that specially designed aircraft or a specially designated and reserved force could not be afforded for the task. The choice, when the occasion arose, would lie between available bomber, fighter and reconnaissance aircraft and would depend to some extent on the suitability of the aircraft for the job. Under certain conditions it was possible that more than one or even all types might be required.

It was evident that the use of aircraft in the forward battle zone was strictly limited and that attention would need to be focussed upon objectives further back. In Poland, by far the most important contribution of the German Air Force was "the devastating effect of their bombers against objectives far to the rear of the Polish forward troops. (1) Command and direction was stunned and rendered deaf and dumb by the systematic bombardment of headquarters and signal communications; counter attacks were killed at the source by bombing the movements of reserve formations to the threatened points; the Polish Air Force was neutralised, not so much by bombing their aerodromes as by destroying the means of inter-communication by which they could receive information and orders; road and rail communication, bridges, power stations and finally the armament and aircraft industry was ruthlessly and systematically bombed up to distances of 150 miles behind the lines",

There was no doubt that the true and best function of the bomber aircraft in support of an army was to isolate the battlefield from reinforcement and supply; to block or delay the movement of reserves, and generally to create disorganisation and confusion behind the enemy front while the ground forces achieved their objectives. Road and rail communications were known to be particularly susceptible to low flying attack. Even a small effort at sensitive points could effect considerable delay or disorganisation. The fact that continuous attack in the artillery sense was not possible could be remedied by the selection of targets far enough back to enable accumulated effect to be obtained by repeated attacks. The object was delay rather than material damage, and low-flying tactics were advocated in view of the accuracy required. Medium or high altitude bombing could also be effective, but would probably require supplementary low-flying attacks. All targets would need to be readily locatable and low-flying attacks would benefit from some measure of tactical surprise.

The choice of method to be used to bring about the desired effect would depend upon the extent to which the enemy had been allowed to complete his concentration before a battle. Owing to their greater vulnerability combined with their lack of flexibility as compared with road communications, rail systems offered a better dividend than other systems of communication. Three methods offered themselves:- (2)

- (a) The systematic and repeated cutting of railway lines along the open track at selected radial distances from the area to be isolated. (3) Calculations showed, however, that the number of British bombers expected to be available in August 1939 could expect to make and maintain only nine breaches during the first three days of operations, and fifteen during the following four days. Furthermore it would rarely be possible to maintain the breaches for 24 hours a day.
- (b) The attack of bridges offered an alternative method but here again calculations, based on the costly but accurate shallow dive attack, showed that the whole

(1) Bomber Support for the Army.
Air Staff Memo.

(2) A.F.C. (J) 51.

(3) A.F.C. (J) 95.

British heavy bomber force could only put eleven bridges temporarily out of action during the first seventeen days of operations. The period of unserviceability was reckoned at an average of seven days. (1)

- (c) A third method was to attack traffic centres but this offered only intermittent delay and railways would only be really vulnerable when they were either comparatively undeveloped systems or overloaded to a point near the limit of their capacity. (2)
- (d) Long term attrition of the Railway System by Destruction of Locomotives and Rolling Stock.

Alternative targets could be divided into two categories, Permanent Targets and Fleeting Targets. The former were those which could be foreseen sufficiently early for orders issued by normal means; the latter required arrangements whereby at least a portion of the bomber force could be directed at short notice on to such objectives.

Targets would often be small in size, defended, in a state of awareness, and sometimes mobile. The bomber used for low-flying attack against such objectives would require a high speed and as much manoeuvrability as possible. (3) A good forward and downward view for the pilot was of first importance and the need to operate in the presence of fighters postulated a two seater which would carry armour. As interruptive rather than destructive effect was the primary object, repeated attacks with small, rather than less frequent attacks of heavier weights were indicated, and a comparatively light bomb load of 1,000 lbs was considered acceptable. As the targets would mainly be within reconnaissance range of the forward troops a range of 500 miles would be ample. Such an aircraft would also be suitable for general purpose work overseas and be of use as a short range bomber for the Air Striking Force, and consequently a replacement aircraft for the Battle and Blenheim, on these lines, was advisable.

Bomber Plans

Sufficient agreement was reached during the 1939 Anglo-French Staff conversations to permit plans to be prepared for the support of the Allied Armies in the field in the event of war with Germany. Pending Allied agreement on the desirability of attacking the Ruhr, two separate air plans were prepared. (4) The first was for the attack of columns and purely military objectives and was not subject to further governmental sanction: the second was for the attack of the Ruhr subject to the decision of the Government at the time. Later, in April 1940 the Supreme War Council agreed that in the event of an invasion of Belgium or Holland the light bombers and a limited number of heavy bombers would operate in direct support of the Allied armies advancing into the Low Countries (5) and that simultaneously

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- (1) A.F.C. (J) 73.
 - (2) A.F.C. (J) 95 and 73.
 - (3) Air Attack in Support of the Field Force, Encl. 11. II H. 97.
 - (4) W.P. (39) 118 II.
 - (5) C.A.S. File. Air Policy Part III, Encl. 14 and WM/4OG.O.2(4).

the main heavy bomber effort would be used at night against troop concentrations, marshalling yards, communications, and oil refineries in the Ruhr. Should the situation be critical the task of stemming a German invasion by direct attack on enemy armies and their supply services was to be the primary role of the whole Allied bomber force, which even then was of such limited strength as to make it inadvisable to rely too greatly on the results of air action. (1) In the initial stages, permanent objectives were to be attacked and lists were prepared of suitable targets along Belgian and Dutch roads. These consisted in general of those cross-roads, bridges and portions of towns, the attack of which was likely to impede the passage of enemy motorised divisions. In addition lists were made of the most favourable railway objectives west of the Rhine for attack in the event that important results appeared likely from the short delays that might be achieved.

This policy for the provision of air support was not accepted without contest. False lessons learned from recent campaigns, lack of appreciation of the fundamental importance of concentration of air power, and insufficient understanding of the colossal problem of providing and maintaining a large air force in the field were the principle factors leading to dissent. However, during the discussions between the Air Ministry and War Office that continued throughout the summer of 1939 the independence of the heavy bomber force subject to the call from the Commander-in-Chief in the field to support his aim was maintained and accepted. (2) We had not in the past attempted to match the German short range bomber force because it could not attack the United Kingdom owing to range, and because previously we had no comparable army to require it. With a projected Army of thirty-two Divisions we were required to be able to provide substantially more support and this the Air Ministry proposed to do with a planned force of light bombers, which would have the dual role of strategic and direct support bombing. Suitable support training was to be provided, but the whole force was to remain under the A.O.C.-in-C, Bomber Command who would thus be able to take a wide view and apply his efforts to tasks of vital importance. The Allied bomber force would not be as numerous as might be desired for a long time and the system to be adopted provided for collaboration of the force with the whole of the Allied armies, and was designed to enable it to concentrate wherever it was most urgently required.

The comparatively short range of the light and medium bombers made it essential that, in the event of a war between Germany on the one hand and the United Kingdom and France on the other, these forces should as far as possible be based forward on airfields in the Rheims area of France. The French were to provide airfields for a force of twenty squadrons. The first echelon of the Advanced Air Striking Force was to be composed of No. 1 Bomber Group, armed with Battle aircraft; to be followed about eighteen days later by No. 2 Group armed with Blenheims; after which the two Groups would come under an established A. A. S. F. Headquarters. A Quick Despatch Scheme was prepared whereby Servicing Flight Sections would be flown to France in civil aircraft before the main body in order that the force could be ready to operate 24 hours after arrival.

(1) A. F. C. 21.

(2) Joint War Office Air Ministry Committee on Requirements.
30 June 1939. II H. 97. Encl. 38.

Bombs, ammunition, petrol and oil were to be laid down at the selected airfields prior to the outbreak of war and a French Air Company was to be installed at each to provide essential services pending the completion of the British administrative and supply organisation.

A fundamental development from the Anglo-French strategic situation was that the whole line from Scapa Flow to North Africa was one Allied front as far as the air was concerned. Fighters and anti-aircraft ground weapons were the air equivalent to the Maginot Line, while bombers were comparable to the French "mass of manoeuvre". On the cardinal principle of concentration at the decisive point at the right time, the Allied air forces had to be prepared to reinforce any particular sector of the one front at the expense of less important areas. (1) Furthermore, the fighter squadrons of the Metropolitan Air Force and the anti-aircraft units of the Air Defence of Great Britain could not be allowed to be immovably fixed in the United Kingdom, but should as far as practicable be available and so organised to make concentration possible. But any movement from the United Kingdom of units additional to those already earmarked for France was to depend upon the air situation in the United Kingdom at the time and be subject to Cabinet decision. (2)

It was evident that, in principle, a comparatively small section of the Allied Armies, such as the British Field Force would be in the early stages of a campaign, should not attempt to be self-contained in respect of fighters but on the other hand General Gamelin was pressing the British to undertake the air defence of all British Forces in France and, in any case, to provide a strong enough force of fighters and ground defence weapons to enable the French to spare units to meet a possible threat from Spain or in Libya. (3) This problem was largely resolved when the British Field Force was allocated an area to the North West which enabled the British to take over a sector for air defence which not only gave the R.A.F. direct responsibility for the air protection of the majority of British forces in France (the A.A.S.F. excepted), but was within reasonable distance of the United Kingdom. The Air Component fighters thus remained an assured part of the R.A.F. and could be used either to co-operate with the French in the event of an attack through the Low Countries, or to deal with bombers coming from the North or being directed against Southern England. Furthermore, the choice of the British Army for the sector to be defended by the R.A.F. permitted co-ordination between British aircraft, guns and searchlights. General Gamelin's requirements were not met in full for no British fighter defence was provided for the A.A.S.F. which would have to rely upon French fighters for close air protection. On the other hand the first requisite of close defence was met by the provision of light A.A. and four high angle guns per airfield and a suitable complement of ground weapons for important isolated R.A.F. establishments was also to be supplied.

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- (1) Paper Employment of Bombers and Fighters in conjunction with an Army in the Field. II H.97. Encl. 7.
 - (2) F.O.I. Paper II H.97. Encl. 52.
 - (3) A.F.C.17.

The Army viewpoint

The arrangement of dividing the British Air Forces in France into two separate Commands in order that the light bombers might remain part of the air striking force was not entirely satisfactory to the Army which considered itself to be inadequately assured of prompt air support and, furthermore, contended that the Royal Air Force did not possess aircraft suitable for close support. (1) A suggestion was made that an aircraft of simple construction should be specially designed and mass produced for the role, that the Army should be directly responsible for the command and ultimately the training and maintenance of direct support air forces, and that pilots should be drawn predominantly from Army resources in order that they might be familiar with Army methods. Additionally it was claimed that operations would be unnecessarily complicated by the practice of having independent commanders in the field whose headquarters were between one and three hundred miles apart and that the need for the G.O.C.-in-C, B.E.F. to refer in certain circumstances to the Chiefs of Staff and eventually the War Office was a further hindrance. (2) The War Office therefore pressed for an additional specially designed 250 first line aircraft suitable for close support, together with the necessary pilots and reserves, to be made available by the Spring of 1940 to act under Army orders. The claims in respect of command were similar to a proposal made earlier in the year for the Army to control all air forces in the field, including bomber, fighter, reconnaissance, communication and possibly transport aircraft. (3) Such a proposal was tantamount to placing almost a third of the Royal Air Force under the Army. (4) Such an idea was resisted by the Air Ministry for the existing basis of allotment of aircraft and the organisation for control had already been determined in consultation with the War Office and the Field Force had been substantially supplied with aircraft on the agreed scale, despite the fact that the air force was nearly 30% down on the first line requirements for Home Defence fighters, (5) that the bomber strength was seriously behind schedule, and that the forces of Coastal Command were far short of what was needed. The decision earlier that year to double the size of the Army had inevitably resounded on the air programme. It was hoped to increase the production of Lysanders up to 160 a month in order to be able to maintain the number of squadrons required on the existing allotment basis; the question of providing additional fighters and bombers was under current discussion, and all possible effort was being made to produce light aircraft for improved application of artillery fire. There could be no hope, however, of providing an Air Component (reconnaissance and fighter aircraft) on the full scale for a force of 55 Divisions by the end of two years as had been proposed latterly. To meet the Army demand for an additional new 250 first line direct support aircraft, together with the large number of reserves needed, by the Spring of 1940 would be quite impossible unless the other Commands of the R.A.F. were reduced.

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- (1) L.P.(39) 17. 17 October 1939.
 - (2) War Cabinet Meeting, 8 November 1939.
 - (3) C.O.S.924. 14 June 1939.
 - (4) C.S.1480 Encl.6A.
 - (5) L.F.(39) 18.

If large numbers of aircraft were produced which were only suitable for Army needs, an Army Air Force would in effect be established clearly resulting in a dissipation of effort. (1) What the Army really required was as many good bombers as could quickly be provided. Air requirements could not be calculated on a Divisional basis, but depended upon various other factors such as the length of front, the scale of attack, the enemy's strength and disposition, the nature of the terrain and communications behind the enemy's lines, the enemy fighter and anti-aircraft strength, and our own fighter strength for the support of bomber operations. Although the strength of ground forces affected the scale of air forces required, it was not necessarily in the sense that the more Divisions we had the more air support was required. (2) The estimate of 250 first line bombers might be too great or too small, but on the whole was considered reasonable and was already met. (3) This force could be maintained on the existing programme until 1942 and would be given special training in the direct support role. In the meantime the development of prototypes susceptible to large scale production and complying as nearly as possible with the War Office requirements was to be continued, and it was decided by the War Cabinet that the whole of the Air Striking Force was to be made available for whatever the strategical situation might require and, subject thereto, the Army was to have full assurances regarding air support.

At the beginning of the war, as had been mentioned, the Royal Air Force in France consisted of two entirely separate entities both for operations and administration except for a part of the maintenance organisation which was common to both namely the Advanced Air Striking Force and the Air Component of the Field Force. (4) Three British Air Staff Missions were also established. In view of the operations expected in 1940 it was agreed at War Cabinet Level on the 8 December 1939 to form a R.A.F. Command to co-ordinate the operations of all R.A.F. Units in France. A proportion of suitable aircraft was to be earmarked for work with the Army and was to be placed at the disposal of the G.O.C.-in-C. unless some other emergency arose which made it necessary to use them for some other purpose. (5) The new formation was to be named British Air Forces in France (B.A.F.F.) and was to be commanded by an A.O.C.-in-C whose position vis-à-vis his own Government was to be similar to that of the G.O.C.-in-C B.E.F., but he was not to come under the orders of any French General. The command included all the bomber squadrons of the A.A.S.F. in France which were thus detached from Bomber Command, and they were to receive such special training in air support as was necessary. The Air Component of the B.E.F. was absorbed by the new Command but retained an A.O.C. who would continue to advise the G.O.C.-in-C. B.E.F. and remain under the latter's operational control. The A.A.S.F. was to be allotted in accordance with the day-to-day needs of the whole Allied Western front, but the A.O.C.-in-C B.A.F.F. was to see that the G.O.C.-in-C had at all times full assurances of air support and that bomber squadrons were placed

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- (1) Prime Minister, War Cabinet, 8 November 1939.
 - (2) D.C.A.S. Note to Gen. Ismay, 19 November 1939.
 - (3) Annex I. W.P. (39) 127.
 - (4) Barratt's Report.
 - (5) War Cabinet Meeting, 8 November 1939.

at his disposal as considered necessary. Should it be required to place the A.A.S.F. or any part of it under the command of the A.O.C.-in-C Bomber Command the Chiefs of Staff were required to obtain War Cabinet sanction. This policy for a measure of decentralisation of the bomber force and the establishment of a single command in France was made effective from 15 January 1940, and Air Marshal Barratt was appointed Air Officer Commanding-in-Chief. (1)

Mobility of the R.A.F. in France

As has been stated, the French had agreed to the allotment of airfields to the R.A.F. but in fact they were insufficient and, in some cases either unsuitable or unserviceable during the winter. Maintenance and training and, above all, security and flexibility were prejudiced from the start but as luck would have it, the enemy took no particular advantage of local congestion. Unfortunately the need for mobility with its demand for an organisation capable of constructing airfields rapidly and the ability of units to move quickly had been considerably clouded by the defensive and static conception of the opening phase of the war; rapid movement was not foreseen and, when it did come in May 1940, our air forces were inadequately organised and ill-equipped for such manoeuvres. (2) Despite an Air Ministry review of the transport establishment of the R.A.F. in France and the local purchase of light vans the force was some 600 vehicles short of a plan only designed to give semi-mobility when it faced the crisis of May. The Group and Wing transport of the Air Component was re-organised but the A.A.S.F. found itself in a most difficult predicament and had to rely largely on borrowed French vehicles.

(1) S. 3054/S.6. App. 'C' to Air Marshal Barratt's Report.

(2) Barratt's Report.

CHAPTER 2

THE CAMPAIGN IN NORWAY

For several months prior to the German assault on Norway on 9 April 1940, the Allies had been engaged in concerting plans whereby it was hoped to deny Swedish iron ore to Germany; and later, when the Finns were being hard pressed by the Russians in Northern Finland, it was for a time hoped to combine assistance to the Finns with the projected operations against the iron ore supply lines. Impending operations in the Low Countries clearly limited the land and air forces which could be spared for secondary theatres such as Scandinavia and it was necessary to work on the assumption that the Allied line in the West would be held; furthermore, ports, inland communications and airfields were few and, as all were controlled by the Norwegians and Swedes, it was of paramount importance that they should co-operate, for even passive resistance by the simple process of removing the rolling stock or cutting off the electricity could have ruined the project.

In addition to these factors there existed the threat of a German invasion of Southern Norway and Sweden, possibly accompanied by the occupation of Denmark. This would mean that the strong German air forces of Northern Germany would acquire the best of the available airfields and be able to increase their already vast power of air attack on Allied communications and forces. These obvious considerations weighed heavily with the Scandinavian countries, added to which there was the not unnatural reluctance to antagonise Russia. Consequently the active co-operation of Sweden and Norway was denied and with the surrender of the Finns on 13 March 1940, the immediate plan to effect landings at Narvik and Trondheim had to be abandoned, and the forces which had been prepared for the operation were dispersed.

Plans were then prepared for the more modest project of effecting a landing at Narvik to block one of the two main arteries from the rich iron mines in Northern Sweden and to land forces at Stavanger - where the airfield was to be prepared for demolition - Bergen and Trondheim, in order to forestall the enemy at these points. No air forces were to accompany the expedition in the first instance, but if the Narvik force was to move into Sweden at a later date, consideration was then to be given to the provision of a fighter squadron and a tactical reconnaissance flight. Preliminary reconnaissance revealed unusual naval activity beginning on 4 April, when two large warships were sighted in the Wilhelmshaven Roads and on 6 April a large ship was seen steaming northwards from Heligoland: intense activity was seen at Eckernforde, and heavy road traffic was observed converging on Lubeck. (1) In the early morning of 7 April a convoy of about 50 ships was seen steaming West about a hundred miles from Borkum, and later in the day a cruiser and six destroyers were reported steaming North 28 miles West of Horns Reef, and a naval force of one battle cruiser, two cruisers, one pocket battleship or 8-inch cruiser, and about 14 destroyers was observed by two formations of Blenheims. Photographic reconnaissance of Kiel Harbour and canal also revealed two battleships, three cruisers, an aircraft carrier, three submarines and a large tanker. Consequently the British Home Fleet and the

(1) Narrative by Capt. MacMillan.

French Cruiser Emile Bertin sailed from Scapa Flow on the evening of 7 April and the sailing of the Expeditionary Force, planned for the 8 April, was postponed. The German invasion of Norway began early on 9 April 1940 and forestalled Allied action by its rapidity and success. The whole British bomber force was committed to operations in the West and no squadrons could be sent to Norway. It was possible, however, until the opening of the campaign in the Low Countries on 10 May, to employ the main bomber force from the U.K. bases against the more forward of the German held airfields in an attempt to drive the enemy air force further back and thus reduce his great advantage in range as otherwise the German bomber forces could operate in the Trondheim area from bases as close as 250 miles. The Norwegian Air Force had been based mainly on Oslo, and consequently most of the aircraft, stores and plant had been lost. Only twelve Gladiators, a Caproni bomber and a few two seater Fokkers were left, and these were based on Lake Vangsmysa with little fuel or bombs. Only one British fighter squadron was allotted for operations in the Trondheim area and, after withdrawal and refitment, the same squadron was transferred to the Narvik area where it was reinforced by one Hurricane squadron.

The major problem in the operation of aircraft in Norway was the provision, maintenance and defence of suitable landing grounds. In the case of both the Trondheim and Narvik areas the despatch of fighters had to be held up pending the initial provision of airfields. In the South all the principle airfields were in enemy hands and the most suitable remaining choice consisted of a frozen lake (Lake Lesjekogen) which bordered the main railway line running inland from Aandalsnaes about 100 miles S.S.W. of Trondheim. Preparatory work was done in clearing a runway prior to the squadron's arrival and further work was done by the squadron ground staff when they arrived on 23 April. Anti-aircraft weapons were insufficient. The aircraft arrived at Aandalsnaes on the Glorious on 24 April and were escorted by Skuas to the Lake, landing there in the evening. (1) The practically undefended landing-ground was soon spotted by the enemy and throughout the following day was subjected to incessant bombing and machine gun attacks. Thus, although some attempt was made to provide protection for the Army by means of patrols, the main task became that of self defence. The surface became totally unserviceable and thirteen Gladiators were destroyed or had to be destroyed by the time it was decided to abandon the lake. On 26 April the remaining five aircraft operated from a strip of ground in an ex-Norwegian camp nearby until only one serviceable aircraft remained and a complete evacuation was decided upon.

The air operations in support of the campaign presented a set-piece illustration of air support doctrine in a manner unencumbered by political and military side-issues such as clouded the policy for the employment of Allied air forces on the Western front. Divested of extraneous problems the doctrine was laid bare for all to examine and there can be little doubt that the vital nature of air support may be included among the lessons learnt. The principle of concentration and the peculiar facility of air forces to effect this concentration was fully illustrated by the action of the G.A.F. and had a decisive influence on the campaign. Conversely, the inability of a comparatively weak air force, such as the R.A.F. then was, to interfere effectively with a much superior enemy, while operating

(1) Narrative by Capt. MacMillan.

FIGURE 1.

NORWAY. 1940.

SCALE 1 : 6,000,000
0 50 100 200 300 Miles



1940

over considerable distances which diluted the effects of concentration, was demonstrated. In fact, even concentration and offensive action could not make up for a vast inferiority in strength under the conditions which obtained and with an exacting time factor. So far as the Allies were concerned, the Battle of Norway was only worth winning if it could be won quickly, for all possible resources had to be available for a concentrated effort in the West when the time came.

The policy of "holding the ring" was ably applied by the G.A.F. in its operations in support of the Central Norwegian campaign, and this policy was continued but in less strength, as again the problem of range took effect, in the Northern Zone. It is just possible, however, that the G.A.F. fell down slightly in the detail of application of this support, for if certain more vital railway targets had been chosen for attack in the Trondheim area, the British might have found themselves in even worse straits than actually ensued. But on this score of information and technical advice the Allies laid themselves open to much more pungent criticism, for they did not have the strength to take liberties with the rules. The lines of communication, including port facilities, roads, and railways in the Trondheim area proved on examination to be scarcely adequate for the maintenance of the forces concerned even without the interference from the air; furthermore these trenchant supply lines were peculiarly susceptible and vulnerable to air attack. No satisfactory appreciation seems to have been made of the administrative problem before or at the beginning of the campaign, and hence the expedition was allowed to set forth without adequate security against attack from the air. In short, therefore, the Norwegian campaign was lost because the enemy was able to concentrate an overwhelming bomber force which was used intelligently in support of the land operations, and because the Allies were unable to provide sufficient air or A.A. defence against this force or otherwise divert or curtail its activities. The appreciation upon which these operations were projected was obviously in error, and it must therefore be assumed that the effects of air support applied in accordance with air doctrine (as done by the G.A.F.) were not fully understood by all in authority.

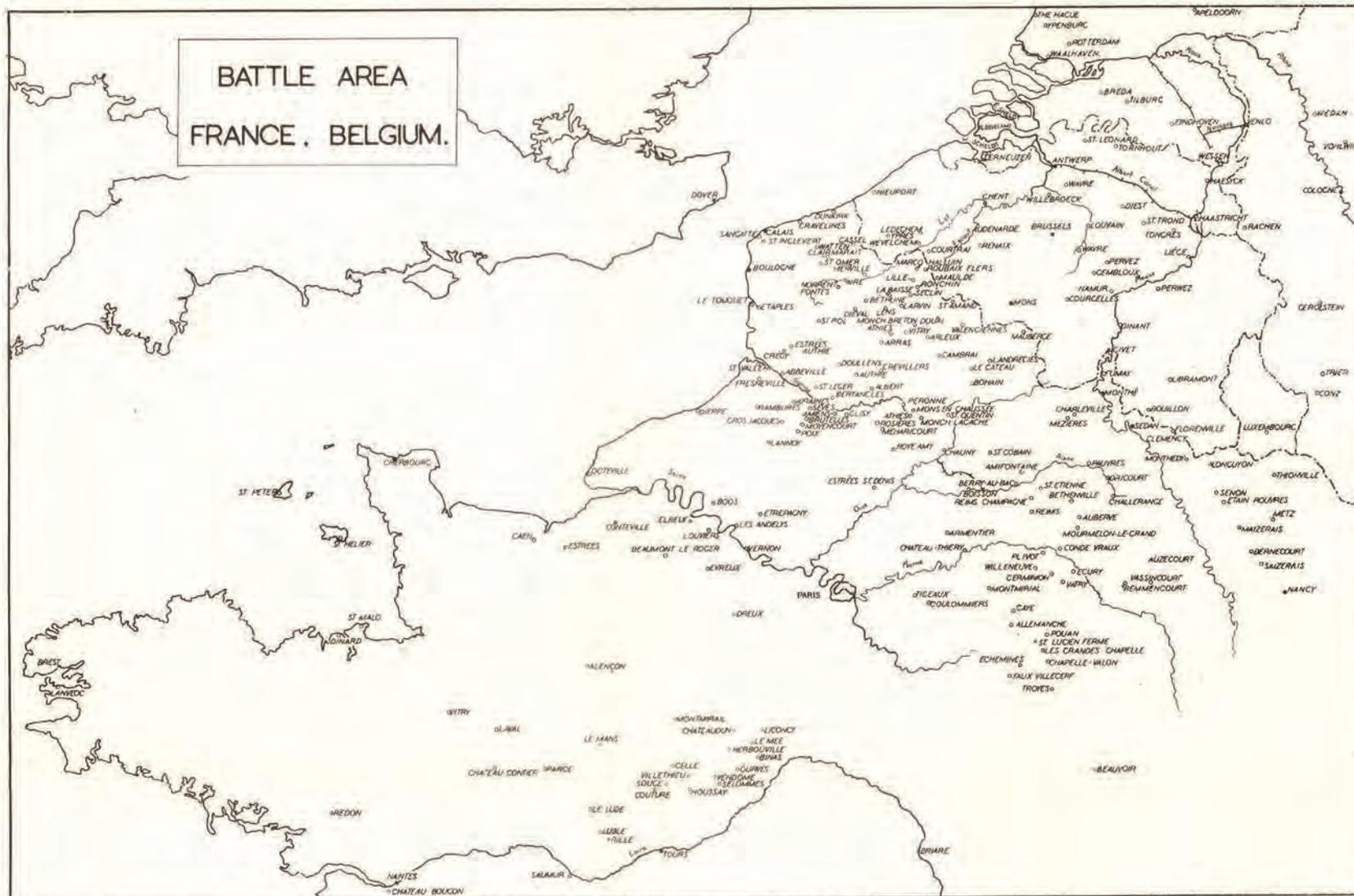
CHAPTER 3

THE INVASION OF FRANCE

At 02.15 hours on 9 May 1940 Air Marshal Barratt received a telephone message that Germany had issued an ultimatum to Holland, and consequently the British Air Forces were placed at the first degree of readiness. On 10 May, in the early hours of the morning, the German attack in the West began. Military assaults against the frontiers of Holland, Belgium and Luxembourg were combined with air attacks against airfields and communications in these countries and in France. In Holland, in addition, a full-scale air invasion of the heart of the country was mounted. The advances of the enemy on the first day were considerable. The British and French immediately began their pivotal movement on Mezieres in accordance with the preconceived plan. By 12 May the initial part of the move had been completed, enemy progress across the Albert Canal had been slowed, and the French on the right took position on the Gembloux line as planned. The enemy's practice of establishing strong anti-aircraft defences, particularly in towns at which roads converged, detracted much from the ability of the Air forces to impede his advance and, owing to the intense enemy activity in the air, tactical reconnaissance became virtually impossible without fighter escort. The fighters of the Air Component had to meet extremely heavy demands, and although in three day's operations 101 enemy aircraft were destroyed - mostly fighters - for a loss of 78 of our own, the Component fighter force was reduced to some 50 aircraft by 12 May. However, a continuous picture of events was supplied by reconnaissance and the reports of No. 3 Mission which was many hours ahead of any other comprehensive plot of the whole front. (1) From this information the bombers were directed to meet the specific requests of the B.E.F. as a whole. Although the German advance had been rapid, to what extent it might have been more rapid except for air action it is difficult to say. In general, the inception and application of the initial air plan may be termed entirely successful and the efficiency of the machinery for control surpassed expectation at this stage.

On 15 May, however, the Dutch Army laid down its arms and the French Seventh Army withdrew its advanced formations to the vicinity of Antwerp: the British front was holding the enemy attacks, the French First Army had lost ground, and enemy bombing in the rearward areas together with the movement of refugees was beginning to present a difficult problem. It was now evident that further deterioration of the position in the South would force a withdrawal of the French First Army, the B.E.F. and the Belgian Army. It was planned to withdraw to the Escaut where positions would be occupied in accordance with a pre-arranged plan. The retreat was completed by the afternoon of the 17 May. In the South a gap of twenty miles now existed and three British Divisions in the rear area were ordered to take up positions. On the 18th the bulk of the A.A.S.F. moved from the Rheims area to Central France, and the next morning the Air Component abandoned Poix and occupied airfields at Abbeville, which they evacuated the following evening. On the 19th a meeting had been called at the War Office to consider the problem of "the hazardous (but unlikely) evacuation of very large Forces" from the Continent.

(1) Barratt's Report.



1/5180

Map No 208 Compiled 1 Dec 44 J. A. B. S.

From 21 May onwards all arrangements for air co-operation with the B.E.F. were made by the War Office in conjunction with the Air Ministry at home, targets being selected in accordance with telephone or telegraphic requests from the B.E.F. so long as communications remained open.

The situation had now deteriorated so rapidly as the Allied Armies were forced back that it soon became apparent that the advancing enemy would make the evacuation of a portion of the Allied forces essential. Such a decision created grave problems as far as the Air Force was concerned, for the choice of Dunkirk as the port of evacuation was not an ideal one: firstly because Dunkirk was further from the R.A.F.'s bases than, for instance, Calais or Boulogne, (1) which was important in view of the fighters' limited endurance, and secondly, if the B.E.F. were unable to hold a front to the East of a line Calais - Abbeville, all the fighter aerodromes in North West France would have to be abandoned, involving a considerable reduction in the amount of cover which could be provided in the area of withdrawal. Nevertheless the turn of events was such that the Allies were given no freedom of choice regarding the port they had to use. Other factors also had a bearing on the air effort that could be mounted in support of the operation. Dunkirk was not the close of the campaign in France and General Wegand was already planning an offensive for which he required and had been promised the full support of the British Air Force. Furthermore, in England, the possibility of the collapse of France and all that it would entail had been foreseen and orders had been given on 18 May for the diversion of all fighter replacements to Fighter Command at the expense of the squadrons in France. (2)

Much has since been written and said about the Dunkirk operation and, at the time, there was considerable bitterness amounting to open hostility on the part of the Army and Navy concerning the amount of support, or lack of it, given by the R.A.F. The fact was that at the time the R.A.F. lacked the resources required for an operation without precedent in military history. The B.E.F., with the exception of two Divisions was now out of the battle and was concentrating on getting out of France. The R.A.F., on the other hand, although it had lost much of its equipment and its organisation had suffered in consequence, was still carrying on the battle. The choice of Dunkirk limited the length of patrols that could be flown from England and they were under the added disadvantage of being out of the range of controlled interception based on radar plots. (3) As it was impossible, therefore, to send off fighters to attack specific enemy raids the only alternative was to provide continuous standing patrols and hope that they would be successful in interception. This form of support meant that the slender resources of Fighter Command had to be spread over all the hours of summer daylight, with the result that the strength of patrols was considerably reduced, usually to some twelve aircraft. Moreover the enemy had local air superiority as well as the initiative to choose the time of attack, and he was making a determined effort to wipe out the major portion of the British Army.

(1) Note by D.C.A.S. II H/133, Encl. 39A.

(2) A.M. Signal, O, 224, 18/5.

(3) A.M. Footnote to Adml. Ramsay's Despatch. C. 32101/46.

At 18.57 hours on 26 May the executive order for the evacuation from Dunkirk (Operation Dynamo) was given by the Admiralty. A detailed account of the role of the R.A.F. in the operation is outside the scope of this monograph and it should suffice to mention the broad aspects only. The evacuation was supported in the following ways:-

- (a) By day and night bombing attacks on communications in the enemy's rear.
- (b) By reconnaissance flights which often entailed the diversion of precious fighters for escort duties.
- (c) By anti-submarine and other patrols over the Channel area.
- (d) By fighter patrols over the evacuation area itself.

From 28 May onwards the policy of sending fighter patrols over less frequently, but in greater strength was adopted; one patrol on 29 May being of forty-four aircraft. (1) From 2 June onwards the fact that German guns were now within range enforced the decision to evacuate by night only. This materially assisted Fighter Command who were thus able to step up the strength of the two main patrols at dawn and dusk and interference from the Luftwaffe was lessened. The deterioration in the weather and the ability of Fighter Command to operate in greater strength resulted in more effective interception and decreased enemy attacks until the evacuation was completed on 4 June.

During the period 26 May to 4 June inclusive No. 11 Group fighters flew some 101 patrols totalling 4,822 flying hours and claimed the destruction of 262 enemy aircraft. (2) With their help, and in the circumstances its effectiveness is difficult to judge, a total of over 337,000 Allied troops was embarked from the evacuation area.

After Dunkirk

The total British Air Forces based in France eventually available (after reinforcement) for the battles on the Somme and the Aisne may be considered as 96 bombers, 80 fighters, and about six P.R. Spitfires, though only about half this bomber and fighter force was available when the attacks opened on 5 June. In addition, however, there was the squadron based in the United Kingdom whence operations could be carried out over France. Bomber Command had a force of about 384 first line operational bomber aircraft, but owing to range, fighter operations were limited to the North of France. Furthermore, the need to rest and re-equip after the fighting in support of Dunkirk, in order to prepare for the defence of Great Britain, the shortage of certain items of equipment such as VHF R/T and incendiary ammunition, and the obvious need to conserve the force for the more profitable task of engaging the enemy within the Metropolitan air defence system, all pointed to the necessity to restrict rather than enlarge Fighter Command's commitments over France. In the event, therefore, although some seventeen squadrons represented the force that could be spared or profitably employed for the French operations, a total of 272 fighters may be added to the 80 eventually available to

- (1) A.M. Signal X 268, 28/5.
No. 11 Gp. O.R.B.
- (2) Adml. Ramsay's Despatch.

the A.A.S.F. Reconnaissance was provided by the detachment to France of a few aircraft at a time for a few days duty, and although several Blenheim squadrons existed no more than two were actually in line for the battle. The disposition of strengths in May showed a marked disparity between the Allies and the enemy.

United Kingdom	692 aircraft
R.A.F. in France	182 "
French	@@@ 675 "
<hr/>	
Total	1,549 "
<hr/>	
G.A.F. at 75% of establishment	2,969 "

@@@ Not including 100 fighters which were either night fighters or disposed for protective operations against Italy.

The Allies were outnumbered by almost one and a half to one in fighters, two to one in reconnaissance and three to one in bombers.

The German offensive, which began on 5 June, with five major thrusts to the South, reached Paris by 14 June, and the French Government moved to Bordeaux. The B.E.F. was removed from French command, but continued to co-operate with the French forces with which it had been operating and preparations were begun for evacuation of those elements which were not actually engaged with the Tenth Army. The Air Forces were relieved from the duty of co-operating with the French and told to look exclusively to protecting the B.E.F. withdrawal, save that from the as yet undisturbed South of France a bombing operation was to be carried out against Italy. Authorisation for complete evacuation was given on 17 June. In the South the Air Force contingent (Haddock Force) sailed from Marseilles on 18 June. The A.A.S.F. bomber force had already been ordered to return to England on 15 June in order to relieve the congestion on the few remaining airfields, and cover for the military evacuation was provided by the five fighter squadrons of which two were placed under South Component for the protection of Cherbourg and St. Malo, and three were to operate from Nantes under B.A.F.F. Headquarters for the protection of Nantes and St. Nazaire. The bulk of the ground personnel of the bomber wings sailed from Brest during the night of 16 June and South Component with its two fighter squadrons moved to the Channel Islands on 17 June. Thus, by the evening of 18 June the French campaign was ended as far as the R.A.F. was concerned. The French had refused an offer of Union with Britain on 16 June and on the following day Petain requested an Armistice. On 19 June South Component completed the evacuation of the British Forces by leaving the Channel Islands.

The Campaign in France - Summary of Operations

Heavy Bombers

No bombing operations took place in connection with the French campaign before 10 May 1940, and even as late as the evening of that day a request to use the two Whitley squadrons, which had been allotted to B.A.F.F. for the purpose of the attack of bottlenecks and columns in Germany was refused owing to French hesitancy to act before Germany took the initiative

in this respect. (1) Fortunately the aircraft had already left before it was possible to rescind the order.

Although the Air Staff view was in favour of the whole effort being used against strategic targets the pressure brought to bear by the French High Command for more direct collaboration was normally so intense as to swing the balance toward the latter role. Strategic targets comprised oil plants in Germany, the destruction of which was thought possible if the whole bomber force could be used for the purpose during moonlight periods; pure air support targets comprised those communications from the Rhine to the battlefield for which pre-arranged support could be provided. Joint Franco-British plans were prepared for each night's support operations in which the activities of both light and heavy Allied bombers were co-ordinated. In principle the general purpose was followed of endeavouring to produce an early or immediate effect on the land battle by disruption and disturbance of the passage of troops, munitions and other supplies through three successive sectors across the main line of the enemy advance, and thus effect the safe arrival of supplies on three successive days. The weight of attack depended upon the number of bombers available, the state of the moon and the visibility of objectives by night, and the relative importance of each task. In this latter connection it is possible, owing to the failure of the French to withstand the enemy offensive, that too much effort may have been allotted to the immediate rear of the land battle for the demands for support in that area were urgent and pressing. Although these attacks were probably valuable, better results might have been obtained by concentration of the bomber effort against targets comprising rail communications between the Rhine and the eastern frontiers of Belgium and Holland and bottlenecks on the general line Turnhout Namur and the crossings of the Meuse as far as Charleville and by allotting the road and river bottlenecks close behind the enemy to the light bombers of the A.A.S.F.

Reluctance on the part of the Cabinet to attack oil plants and marshalling yards in the Ruhr was overcome by the middle of May, 1940 for Holland was out of the war, the Allied lines had been breached at Sedan, the example of Rotterdam was still fresh in everyone's mind and it was imperative to divert the G.A.F. from its activities over France and Belgium. Authority was therefore given to Bomber Command to attack military objectives including marshalling yards and oil plants anywhere in Germany and a raid of almost a hundred heavy bombers was planned for the night of 15 May. However, of the 96 aircraft employed 78 were directed primarily against oil targets and only nine against marshalling yards. These attacks on oil and marshalling yards were continued for five successive nights but on 16 May the Prime Minister was persuaded to the view that the heavies should be used for the attack of German communications across the Meuse; and accordingly for three nights beginning 17/18 May, 1940 the heavy bomber effort was so divided. In the opinion of the A.O.C.-in-C Bomber Command and the Air Staff, this was a misuse of the heavy bomber force, and it was argued that, in undertaking defensive bombing from the United Kingdom, the force would be operating on information hours out of date, the targets would be heavily defended, difficult to hit and very little effect could be achieved.

(1) Barratt's Report.

Despite this argument the attack of communications was not only upheld but, as the crisis grew, the oil plan was almost entirely suspended in favour of direct support as near as practicable to the front, a change of plan for which the French and C.I.G.S. had been pressing. Thus it was that from 20 May 1940 until 31 May the heavy force operated almost exclusively against communications near the battle front and railways in Western Germany with the special task of derailing trains. A small effort of about half a dozen sorties a night was devoted to marshalling yards, a few aircraft were operated against airfields in use by enemy dive bombers, a factory was bombed, and on four nights oil was attacked by forces of eighteen aircraft or less.

No attack had been made against German industry, and with the close of the Dunkirk operation, the whole effort was put against oil and marshalling yards, and the intention to continue with this policy was confirmed in a directive of 4 June 1940. The heavy force was to be conserved, however, for moonlight operations and, as difficulty was to be expected in identifying oil targets, alternative objectives were to be given, the attack of which was calculated to produce a general interruption of communications in certain regions associated with German industry. This policy was to be continued until the renewal of the German offensive in France, but this occurred almost at once and, after an attack on oil on 4/5 June, the effort was divided for three nights until 8 June between oil, railways in Western Germany and communications near the battlefield including the Somme crossings. Thereafter, until the French demand for an Armistice the situation was deemed to be so critical that nothing could be spared for the attack on German oil and, except for small efforts elsewhere the heavy force was mainly directed against communications and concentrations in France.

Light Bombers

The light bombers began the campaign in May 1940 with the dual responsibility of not only engaging enemy movement in support of land operations, but also of assisting the heavy bomber force in the attack of strategical objectives. It soon proved, however, to be not only impracticable to withdraw any appreciable section of the force from operations in connection with the battle, but, in view of the casualties to be expected, impossible of tactical achievement.

The Advanced Air Striking Force, originally consisting of ten Fairey Battle Squadrons of sixteen aircraft, was based in France and ready to operate on 3 September 1939. They took part in reconnaissance from September to October and in pamphlet dropping from 16 March 1940 onwards. Daylight reconnaissance was abandoned because of interception by the Me.109, the Battle in particular proving very vulnerable from below and astern. Despite grave misgivings on the part of the Air Staff and of the A.O.C.-in-C. Bomber Command the light bombers were committed to active participation in the battle by the overriding need to assist in delaying an enemy advance. Losses as high as 50% on each mission were forecast and the opening days of the campaign in May 1940 soon gave considerable justification to this belief - especially for the Battles. The low approach was dictated by the need to evade hostile aircraft and the low attack by the desire to achieve accuracy, both manoeuvres tending to leave the Battle at the mercy of A.A. fire. Aircraft were shot out of the skies and, after five days, it was necessary to abandon day in favour of night operations, with a resulting drop in the casualty rate.

For the opening phase from 10 - 15 May 1940 the A.A.S.F. was employed by day against a heavily defended enemy as follows:-

- (a) Mechanical columns approaching Luxembourg during which 12 of the 32 aircraft employed in the first attacks failed to return.
- (b) While continuing the attacks above a large portion of the force was switched to enemy columns on the Maastricht - Tongres road and against canal bridges west of Maastricht, owing to the enlargement of the German bridgehead over the Maas in this area. The attacks were carried out with heavy losses.
- (c) To block the advance of columns on the Zundert - Breda road, and thus assist the withdrawal of the French Seventh Army. This was achieved by collapsing a factory at a cross-road.
- (d) To destroy pontoon bridges on the Meuse and to attack mechanised columns in order to assist in the critical situation developing near Sedan. In attacks on bridges etc., more than 40 aircraft were lost out of a force of some 80 Battles.

The tasks of the Blenheims of No. 2 Group were:-

- (a) To attack the Dutch airfields of Waalhaven and Ypenburg, which were in enemy hands.
- (b) To attack the main line of the enemy advance at Eindhoven, Maastricht to prevent the repair of bridges: Aachen, Maesyck, the crossings of the Meuse, the immediate approaches to the Dinant area, and enemy communications in the Tilburg - Breda area.

From 23 May to 4 June no Blenheim operations by No. 2 Group were requested by B.A.F.F. owing to lack of communications and information concerning the Northern zone of operations, but tasks were allotted from the United Kingdom. Subsequently the force of sixty Blenheims gave support to the land battle on the Somme and Seine fronts by day attacks on the river crossings, concentrations, road defiles and columns close to the front line. Air support bombing operations ended with the attack of trains and transport in the Evreux district by the A.A.S.F. Battles during their return flight to the U.K. on 15 June and with a minor operation by six home-based Blenheims against road movement near Cherbourg on 18 June.

Reconnaissance

The very nature of the "war" during the autumn of 1939 and spring of 1940 accented the work of the reconnaissance squadrons rather than that of the bombers. The reconnaissance force, except for the P.R. Spitfire squadron and a small number of Blenheims directly under the operational control of B.A.F.F. Headquarters, was operated by the R.A.F. Component.

By 10 May 1940, the Blenheims had already gained battle experience in their observation of movement towards concentration areas on the frontiers of the Low Countries. Both French and British long-range reconnaissance aircraft had been employed in this task. Starting on the night of 29/30 September and continuing thereafter mainly by daylight, Blenheims set about

the task of checking movement in the area Bremen-Hanover-Hildesheim-Hamm-Munster-Osnabruck. The field was steadily narrowed first to visual and photographic reconnaissance of specific towns in order to gain information regarding the growing concentrations on the Dutch frontier, and later to finding out whether the enemy centre of gravity was North or South of Venlo and whether or not a shift was in progress to the South. Also a continuous reconnaissance was made of the Siegfried Line North of Heinsburg, and in the new year a further, but incidental, task was that of gleaning information in respect of newly identified enemy airfields. Night reconnaissance predominated for the first time in March 1940 and to some extent was combined with pamphlet dropping, but by April day reconnaissance was resumed in observation of the Lower Rhine to detect unusual movements or bridging operations.

In the Lysander and Blenheim operations after 10 May there was much to militate against the success of the reconnaissance organisation. Enemy fighter activity, concentrations of flak, the bombing of communications, and the fluid ground situation in which friend and foe lost their identity were important factors. A.A. fire inflicted heavy damage on low-flying aircraft, and without fighter escort (and often with it) aircraft flying at 3,000 - 4,000 feet became a ready prey to enemy fighters. When the need for information became desperate and fighter escort was arranged the state of communications made the organisation difficult, and even then it was subject to last minute interference from the enemy which might completely upset the plans for rendezvous. Accurate records of the sorties flown are not available, but it is known that the losses were excessive, and during the short period from 10 May to 4 June some 33 Lysanders and 38 Blenheims out of an initial force of 90 and 68 respectively were reported as having either failed to return, been destroyed on the ground, or so badly damaged as to be abandoned in the evacuation. In the case of the P.R. Spitfires, however, only two aircraft were lost in this same period.

It had not been possible for the Lysanders to acquire any operational experience prior to 10 May as Belgium separated the comparatively short-ranged force from the enemy, but after that date operations were begun. For the first three or four days tactical reconnaissance operations consisted almost exclusively of contact patrols ahead of the advancing B.E.F. to assist movement along the roads, and of sorties in search of serviceable airfields for use as advanced landing grounds - the majority being unusable due to bombing. On 14 May, however operations to observe movement began on the B.E.F. front and soon other normal commitments such as artillery reconnaissance were undertaken. The Blenheims undertook the observation of enemy movement, the state of bridges and demolitions in the path of the German advance and the survey of the area between the Seine and the Dyle. Their work ranged into South Holland, North Belgium, Central Belgium, and the Sedan sector, and later, as the withdrawal gradually centred on Dunkirk came to include all enemy movement and communications leading to the sea at this point. Further information was obtained from P.R. Spitfires, returning bombers and French aircraft.

It was a French aircraft which brought the first news of the crossing of the Meuse by the enemy North of Dinant. The Blenheims had obtained early confirmation of the destruction of bridges over the Maas between Venlo and Thurn and of the state of demolitions on the Noorder and Wessem canals, but opposition was so fierce in the Maastricht area that No.3 Mission soon proved to be the best and probably only effective source of information for the district.

The second phase of the campaign from 16 to 22 May 1940 was marked by the breakdown of communications, increased difficulty in distinguishing friend from foe - a factor which led in some cases to Allied troops being attacked or enemy columns moving unopposed - and the evacuation of the reconnaissance force to the United Kingdom. Up to 19 May the Lysanders continued to function on the B.E.F. front in Belgium and to take counter-battery mosaics in the Audenarde-Renaix area, but difficulty with communications which made impossible the maintenance of coherent organisation gradually reduced the effectiveness of the Blenheims to almost complete inactivity on 19 May. All four Blenheim squadrons (with the exception of the two working with B.A.F.F. Headquarters) and three of the Lysander squadrons were ordered home forthwith and the remaining two Lysander squadrons were gradually reduced until only one flight remained to be evacuated on 24 May.

Back Component had been formed on the 20 May at Hawkinge and thereafter assumed control of the evacuated reconnaissance forces and, for the final period of the campaign, were largely responsible for the reconnaissance arrangements. Requirements were usually received from G.H.Q. in general terms and were covered as fully and frequently as possible and supplemented by information received from other sources. The main use of the information was as a guide to air action for the benefit of the ground forces rather than an aid to direct ground action. In fact delays due to the routing of traffic were such that very little of the information could have been of direct use to the military forces.

During the period 20/25 May the co-ordination of reconnaissance was a function of Air Ministry (F.O.7) Back Component assuming the responsibility thereafter although the staff was inadequate and also had to co-ordinate air action for the benefit of both military and naval forces. It had to rely for support on the meeting of requests submitted to Bomber and Fighter Command.

On 27 and 28 May the first priority concern of reconnaissance shifted from movement in a south-westerly direction towards the main B.E.F. front to movement in a north-easterly direction from the St. Omar area, to find suitable bombing targets. By 5 June extremely few British reconnaissance aircraft were left available for the battle South of the Aisne and Seine. Back Component had been disbanded on 4 June and B.A.F.F. was largely left to undertake its own reconnaissance with slender resources. In total, it may be said that not more than the equivalent of two reconnaissance squadrons were in line for the battle. Their work was ably supplemented by the flow of information which continued to be received from No. 3 Mission. So reliable and helpful was this source of information that at times it was the only organisation to provide the A.O.C.-in-C with dependable news of the situation. The Mission closed down on 27 May and embarked for the U.K.

With the exception of the work of the Missions the reconnaissance effort proved to be a mixture of success and failure. Almost complete failure owing to weather, heavy losses and camera failure due to cold had marked the work of the Blenheims prior to 10 May. The Lysanders had proved themselves far too vulnerable, though they had done much useful work. In the P.R. Spitfires clearly lay the development of the future and it is for regret that during this campaign their number had been so small.

Lessons Learnt

Although reconnaissance had obtained useful information, bombing had achieved good results on occasion, and fighters had inflicted considerable losses on the enemy and given a fair measure of protection to Allied air and ground operations, the most important effect of the campaign probably lay more in the clear lessons that emerged than in any material support that the Allied air forces were able to give to the land forces. The most positive material effect of the Royal Air Force undoubtedly lay in the successful withdrawal to, and evacuation from, Dunkirk, and the considerable damage done to the German Air Force. But the greatest single achievement was the survival, out of this one sided struggle, of an air force sufficiently strong to defend the British Isles successfully against the onslaught of the Luftwaffe in midsummer and early autumn 1940. And this was achieved even though "nothing within the bounds of sense" had been withheld from the Battle of France.

The lessons learnt included many of general application and of direct concern to the defence of the United Kingdom and were therefore developed apart from the more specialised progress which followed in air support methods and need not be considered here. On 24 June 1940, Air Chief Marshal Sir Robert Brooke-Popham was appointed Chairman of a committee to investigate air war experiences by the method of interviewing members of representative ranks and different units who had had recent war experiences. The report was finished by 16 July, the Chairman's recommendations were submitted to the Air Ministry on 8 August 1940, and actioned in accordance with the instructions of the Air Council. The more important lessons of the campaign of direct concern to the problem of air support (including relevant lessons revealed by the Brooke-Popham report) were as follows.

Command. The advantage of having a single authority for the command and administration of all R.A.F. formations in a theatre of war were further demonstrated and indicated a need for one supreme commander of all the air forces in one theatre, with a fully representative headquarters.

Control. A central operations room in the field, closely tied in to all sources of land and air intelligence, had the distinct advantage of being in a position to display an up-to-date picture of the battle, to co-ordinate air operations, and to select without delay the most important tasks for reconnaissance and bombing; but the need for caution in regard to over-centralisation of control and over-reliance on land line communications was apparent.

Reconnaissance. The value of a reconnaissance organisation for the transmission of information from ground sources was demonstrated by the work of No. 3 British Air Mission (the origin of the Army Support Signal Unit (A.S.S.U.) and of the G.H.Q. Reconnaissance Regiment) and the way for future development in the air was indicated by the outstanding successes of the Photographic Reconnaissance Spitfires. The De Havilland Mosquito had been designed primarily as a fast unarmed bomber, but was also specifically laid out for photographic reconnaissance and, for tactical reconnaissance, it was proposed to use the new types of light bomber which were being designed to meet the army's requirements for direct support. On the other hand, as the single engine fighter had been shown to possess a considerable advantage in speed and armament, arrangements were made to transfer a number of trained army co-operation pilots to fighter squadrons should fighter reconnaissance prove a necessity.

Bombing. The need for a replacement aircraft for the Battle was fully evident and new types were being prepared. The possibility of reducing the time between the receipt of a task at bomber airfields and the aircraft being airborne was also investigated, but owing to the essential nature of careful briefing and preparation for operations against ground targets it was agreed that, in active military operations, no more could be done than to reduce the delay to the minimum and that bombers could not be maintained continuously in the same state of readiness as fighters. The relative safety of night operations to day operations had been strikingly demonstrated but the value of night operations was open to considerable doubt.

Fighters. The doctrine of fighter cover had had to be abandoned in favour of escort which indicated that a comparatively weak air force could not in every circumstance operate in rigid accordance with the accepted theory of offensive air fighting. The first duty of the fighter was to assist, in the most practicable way, in offensive operations of other arms (air, land and sea) by ensuring an adequate degree of immunity from air operations.

Communications. The essential nature of good communications was again illustrated and, except for short periods, BAFF H.Q. was in communication throughout the campaign with the Air Ministry, H.Q. AASF, South Component on the Seine and Haddock Force at Marseilles, even during the last phase from Angers and Nantes. This was achieved by siting the principle headquarters on the run of existing main trunk cables (the work in connection with land line communications was done by the Air Formation Signals Units attached by the Army to Air Force formations), by the use of normal point to point W/T, by transmissions to the Air Ministry and Bomber Command via the Eiffel Tower, and by means of two Heavy Mobile W/T Stations (Blue Trains) fitted for high power and high speed transmissions. The principal example of failure was in respect of direct land line communication between BAFF H.Q. and the R.A.F. Component (whose communications were an integral part of the B.E.F. system) which broke down early in the battle.

Standing instructions had always provided for plain language to be used where speed outweighed the importance of secrecy, but in addition the provision of simple codes and the better use of machine cypher was investigated as the result of these lessons. The importance of communications exercises was fully recognised and there is no doubt (from subsequent operations) that full cognisance was taken of the value of siting headquarters on the main trunk cables.

Ground Defence. The local defence of airfields had been provided by anti-aircraft formations of the B.E.F. and by light automatic weapons on R.A.F. establishments, but nevertheless it was demonstrated that either high or low flying attack could prove a menace to air forces on the ground. This threat could, however, be met by adequate fighter and heavy and light A.A. defence combined with a reasonable measure of camouflage and dispersion and by the development of alternative landing grounds and a well practiced mobile servicing organisation. With regard to defence against land or airborne raids it was further indicated that light A.A. weapons should be deployed to cover both the airfield surface and the approaches, and that some form of mobile A.F.V. defences should be provided. Furthermore, it was advisable that, as far as possible, the various air force establishments including airfields, headquarters, workshops, and supply dumps should be located in defendable localities and that all personnel should be suitably armed and trained. This

requirement for general training in ground defence, and the need for additional defences which would comprise an integral part of the airfield organisation, although beyond the function of the Royal Air Force at the time, was later met by the formation of the R.A.F. Regiment and the adequate provision of arms and training for personnel generally.

Airfield Construction. Although, on many occasions there were two and sometimes three squadrons on an airfield the R.A.F. squadrons did not suffer unduly from air attack, but it was obvious that this was primarily owing to the fact that the German Air Force preferred to concentrate upon the task of giving direct support to the land offensive. Airfields were also a clear requirement in the rearward areas for reserves, refitment and repair, and in certain circumstances for front line squadrons which could operate through advanced refuelling grounds.

Mobility. The requirements for mobility in the field were shown to hinge on the provision of airfields and motor transport and, of these, motor transport had formed a bottleneck to the development of a suitably mobile organisation. A need for forward based units and headquarters to be made fully mobile had been made apparent and the requirement for a centralised M.T. organisation for the supply of the force and for special tasks had to be considered. In addition, it was obvious that more training was needed in order that moves could take place at short notice with a reasonable degree of convoy discipline.

Flexibility. Airfields and M.T. were factors in the organisation for flexibility, but an additional requirement was found to lie in the provision of self-contained units which could operate fighter or bomber aircraft for short periods in the general scheme of reinforcement or redistribution of forces.

Administration. Owing to the fact that BAFH H.Q. had been formed as a policy headquarters for the control of two fully staffed air forces (Air Component and AASF) it was established almost entirely with administrative services. This arrangement did not prove fully satisfactory, however, when the subordinate commands became intensively engaged and the need for frequent movement arose, and consequently Air Marshal Barratt recommended in his despatch that a Commander in Chief should have all main administrative services and specialist branches represented at his headquarters and that the staff of subordinate formations should be confined to that needed to enable them to look after themselves within their own administrative area.

Maintenance. No proper repair and salvage organisation was established in France until eight months after the arrival of the force, nor did the equipment holding unit of the Aircraft Depot become effective until April 1940. This delay might well have been serious in other circumstances. The appointment of a Maintenance Officer in Chief working at BAFH H.Q. had been tried with good, but not perfect, results, and it was thought possible that the solution might be found if such an officer were given executive control of the principal maintenance units in the field. Thus we have the precursor to the "Base Group" and the "Officer in Charge of Technical Services".

Finally the experiences of the campaign gave a powerful impetus to the question of air support and resulted in the formation of Army Co-Operation Command before the end of the year.

CHAPTER 4

THE UNITED KINGDOM - RE-CAST OF PLANS

The development of air support methods and weapons was naturally linked to the commitments of the Army in the revision of plans which followed the disasters in Norway, the Low Countries, and France. These commitments fell into three stages of operations:-

- (a) Primary Stage. The main strength of the Army was to be taken up in facing invasion threatened against the United Kingdom. (1) The other commitments were the campaign in the Middle East, minor amphibious operations, and garrison duties in other overseas theatres.
- (b) Intermediate Stage. This stage would be reached when the development of the home strength on land and in the air reached the point when the Army could afford to release forces for amphibious operations of a more ambitious nature.
- (c) Final Stage. This stage would be reached when complete air superiority had been won over North West Europe and the German military machine was showing signs of strain. At this stage it was hoped to put an armoured force on the Continent adequately supported by air forces.

The outstanding lesson which the war had demonstrated in every operation was that the choice of battlefield and success in the battle depended upon ascendancy in the air. No carefully balanced force of reconnaissance, bomber and fighter squadrons forming an integral part of each Corps and Army could ensure the success of the land campaign. (2) The essential was a high measure of air superiority and the size of this force (of fighters and bombers) necessary to obtain that air superiority would vary, not in relation to the size of the land forces engaged, but with the strength of the air forces which it opposed. The need was therefore to build up an Air Force of bombers and fighters large enough, after allowing for the security of bases and communications, to enable an air situation to be created in which the land forces could operate freely, and reconnaissance aircraft could go about their task unmolested. A specialised Army Support Force could not be provided except at great expense to the growing power of the Royal Air Force for strategic action, and there was little prospect of defeating the enemy except by the development of a superior bomber force. The most economical means to this end was considered to be the heavy bomber, which implied that as many as possible of the bomber squadrons would only give the Army a fraction of its specialised requirements, while at the same time the expansion of bomber and fighter forces would be seriously curtailed. (3)

The Army, for a time remained less conscious than the Air Force of the broad conception of the effect of air superiority and tended to lay emphasis upon the need to employ air forces

(1) A.M. Meeting 16 May 1941. S.6512 Encl. 41A.

(2) Draft Memo by C.A.S. 12 June 1941. S.7736.

(3) Agenda for C.A.S. and C.I.G.S. Meeting 19 February 1941. S.6162, Encl. 66A.

against targets closely related to the battlefield. (1) This widespread misconception of the root cause of German successes gave rise to a demand for dive bombers, but, as it seemed probable that in any future land battle more effective support would be provided by bomber action against other than close support targets, the Chief of Staff ruled on 19 February 1941, with the concurrence of the War Office, that "no more dive bombers need be ordered." (2) It was therefore accepted that the Royal Air Force should expand and re-equip to the extent required for security in the first instance, the bomber offensive in the second, and finally for air support.

Army Co-operation Command

After the return from Dunkirk, the Army was more or less disorganised, lacked clothing and equipment and, above all, guns. Invasion became an immediate threat and the Army asked for close support dive bombing on the German model. This request as already stated, was resisted but certain light bomber squadrons were earmarked for decentralisation to Army Commands and lower levels and a Central Combined Operations Room (C.C.O.R.) was installed at G.H.Q. Home Forces. (3) Agreement was then obtained to centralise once more the control of bombers under Bomber Command. The C.C.O.R. was thus the instrument by which the C-in-C Home Forces was enabled to convey to the A.O.C.-in-C. Bomber Command his requirements for air bombardment in support of land forces in the event of invasion. (4) At each Army Command Headquarters there existed a Combined Operations Room (C.O.R.) organised on reduced but similar lines to the C.C.O.R. These C.O.R.'s were responsible for keeping the C.C.O.R. fully informed of the land situation with particular reference to Air Support, and the C.C.O.R. was to keep Bomber Command informed. Then, at G.H.Q. Home Forces a small Air Staff was established under a Senior Air Staff Officer who acted as air adviser to the C-in-C. A Deputy Directorate of the Director of Plans at the Air Ministry kept in close touch with the War Office and dealt with matters of policy in connection with the air requirements of the army; and finally the execution of policy in respect of all air forces under the operational control of the C-in-C Home Forces (army co-operation squadrons) and the organisation and administration of all army co-operation squadrons, schools and establishments was vested in the A.O.C. No.22 Group. On the other hand these squadrons were allotted under the operational command of Army and Corps Commanders.

This organisation was in some respects an improvisation for the control of air forces placed at the disposal of the C-in-C for defence against invasion, (5) and as such it was not suitable to deal with matters of policy in regard to future development and training to meet the requirements of the Army both for Home Defence and operations overseas. Progress in

(1) Note by D.D.M.C. S.6461 Encl. 18A.

(2) Agenda for C.A.S. C.I.G.S. Meeting 19 February 1941
S.6162. Encl.66A.

(3) ACC/S/55.Air

(4) 71 Gp. A.S.I. No. 2.

(5) S.6461, Encl.6B. Memo by Home Forces.

this important matter was a secondary responsibility of a number of officials at the Ministries and, as a more concentrated effort was needed, the War Office advocated that the responsibility should become the primary charge of highly placed officers in the Army and R.A.F. working in close co-operation. The setting up of an establishment combining the appropriate Directorates of the Air Ministry and War Office presented the practical difficulty of still being susceptible to arresting influences. Consequently the War Office recommended the formation of a separate Army Co-operation Command. This was agreed. The new Command formed on 1 December 1940 with Air Marshal Sir Arthur S. Barratt K.C.B., C.M.G., M.C. as the Air Officer Commanding-in-Chief. At the same time a Directorate of Military Co-Operation was formed at the Air Ministry and No. 22 Group was disbanded.

The Command was organised in two Groups as hereunder:-

- (a) No. 70 (Training) Group, whose functions were to control the policy, training, administration and other undertakings of the Units under its control.
- (b) No. 71 (Operations) Group, comprising all operational squadrons allotted to Home Forces. It had an Advanced Headquarters located with G.H.Q. Home Forces which consisted of the Air and Intelligence Staffs of the Group and from where the A.O.C. normally exercised command. The Group Commander was charged, in the capacity of A.O.C. of an Air Component, with advising the C-in-C on all matters relating to the Air Force, and with the responsibility for the administration and technical efficiency of the air forces in the Group. (1) He was to receive his orders regarding operations through the General Staff of G.H.Q. Home Forces, but he was to be responsible for the means employed to carry out the tasks allotted to him.

The A.O.C.-in-C was charged with the supervision of all air training in co-operation with the Army and with the development of the tactics and technique of Army Co-operation, including close support. A portion of the posts in the Command and Group Headquarters were filled by Army officers and the A.O.C.-in-C was given a Brigadier as his Senior Air Staff Officer.

The anomalous position remained, however, that the A.O.C.-in-C had no operational responsibility and was excluded from discussions of policy in respect of such problems as the employment of bomber squadrons in close support of Home Forces. His task was to implement the training policy, and his subordinate was interposed as adviser to the C-in-C Home Forces. The reason for this arrangement was well enough founded for, in the event of an invasion, Home Forces - charged with the defence of the United Kingdom - would have to make certain demands upon the other R.A.F. Commanders-in-Chief, and the establishment of the A.O.C.-in-C Army Co-operation Command as adviser to the G.O.C.-in-C Home Forces might well have provoked unnecessary difficulties. A four day home defence exercise known as "Victor I" revealed, however, that the A.O.C. No. 71 Group could not be expected to act as adviser to the C-in-C in

(1) A.P. 1300 Chap. XI. Para. 7.

addition to exercising command of his squadrons and, consequently, a Senior Air Staff Officer was re-established as adviser and principal liaison officer to the C-in-C Home Forces on all air matters and the No. 71 Group Staff was withdrawn from G.H.Q. Liaison officers still had to be retained at G.H.Q., however, to represent the A.O.C. -in-C, and the A.O.C. No. 71 Group and so the G.O.C. -in-C had links to both the Air Ministry and to Army Co-operation Command. This again was not entirely satisfactory, and the principle gradually emerged that the Military Commander should have no more than one Air Staff represented at his Headquarters, and in the circumstances the obvious choice was that this one should be provided by Army Co-Operation Command. The S.A.S.O., as provided by the Air Ministry, was therefore withdrawn in July 1941 and a strengthened Air Staff, known as R.A.F. G.H.Q., was provided from Army Co-Operation Command. (1)

In August 1941 No. 71 Group and the small Air Staffs at the Headquarters of Army Commands were abolished and were replaced by six Wing Headquarters which were allotted one to each Army Command and were given the following responsibilities:- (2)

- (a) To command the A.C. squadrons with the Army.
- (b) To command re-inforcing A.C. squadrons joining the Army in operations, including those A.C. squadrons provided for giving air support.
- (c) To organise the movements of squadrons during operations.
- (d) To man the air operations room at Army Headquarters, which was the link through which the Army Commander made requests on the air cell at G.H.Q., for assistance from Bomber and Fighter Commands etc.
- (e) To act as a liaison line between the Army Commander and adjacent Royal Air Force Groups in the event of any general breakdown in communications.
- (f) To advise the Army Commander at all times on air matters.

Each Army Co-operation Wing was commanded by a R.A.F. officer who had executive control under the Army Commander of all the A.C. squadrons within the Command, but the operational control by Corps etc., of A.C. squadrons sub-allotted to them was not to be effected. The four Army Air Support Controls (A.S.S.C.) in existence were to be the medium for controlling Army Air Support, with the respective Wing Headquarters as the controlling R.A.F. authority. (3)

The Control of Air Support

Following the campaigns in the Low Countries, France and Norway, attention was focussed upon the need to determine a means of co-ordinating and providing close support to meet the

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- (1) C. 88277/D.M.C. 25 July 1941.
 - (2) A.C.C./S50/3/Air. A.C.C./S.50/1/Air.
 - (3) Not necessarily applicable at the time to No. 2 Group.

requirements of the Army, particularly armoured formations. (1) The existing methods for the provision and control of direct support (excluding close support) were satisfactory, but, with the advent of mechanisation in land forces, the outdistancing of the artillery was likely to become a regular feature of army operations abroad.

A study was therefore made of German methods and the experiences of recent campaigns, and extensive trials were carried out in Northern Ireland during September and October 1940 under the direction of Group Captain A.H. Wann and Lieutenant Colonel J.D. Woodhall with the active co-operation of No.75 Wing and Army forces. Despite German success in the application of close support it was clear that this form of assistance was still subject to tactical considerations and to certain basic limitations. (2) The enemy had made extensive use of both direct and close support, but under conditions of almost complete air superiority and with negligible opposition from ground anti-aircraft weapons. (3) This state of affairs had given him a freedom of choice in his methods of applying air support which was unlikely to be repeated for either side, and which enabled him to use the highly vulnerable Ju.87 dive bomber in a manner which with more evenly balanced forces would have proved disastrous. (4) The object of the trials was to look to the future and to hammer out some organisation that would provide the required measure of support in the circumstances likely to be met at the time. They resulted in the issue in early December 1940 of an agreed policy for the organisation and methods of demanding and applying close support. The various factors that bore on the problem were considered and a system was evolved which was both flexible and yet maintained the necessary co-ordinated control. (5) The methods and organisation for the operation of air forces in support of the Army as subsequently jointly developed and agreed between the Army and the Air Force were eventually crystallised and recorded in Army Training Instruction No.6 issued on 31 October 1941. (6) This Instruction categorised the forms which air support would take, stated the responsibilities of the Royal Air Force for the provision of an Army Co-operation Force operating under Army control and for the provision of air support by air forces under separate R.A.F. command, and broadly defined the means by which the Army was to assist the air forces in the field. The types of air reconnaissance and the level of control were recorded, the nature and methods of controlling were explained, and, in a note on the selection of targets, examples were given of targets which might be usefully attacked on the battlefield and comments were made upon the vulnerable points in communications. In fact, the Instruction was a compendium of knowledge on the subject of Army Air Support.

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- (1) Memo on Close Support. C.S.5943, Encl. 10D.
 - (2) Wann-Woodhall Report Encl.36A. Notes on Close Support, Enc.46B.
 - (3) Army Co-op Cmd. Directive on Close Support. Encl. 48A.
 - (4) Decisions of Meeting. 4 December 1940. Encl.49A.
 - (5) See App.1.
 - (6) See App.2.

Tactical and Artillery Reconnaissance

Although in modern conditions of warfare tactical reconnaissance was a matter for special missions rather than for continuous patrols the Lysander had been shown as quite unsuitable for such limited tasks. A faster and less vulnerable aircraft was required and in addition it was desirable that it should be capable of carrying bombs in order to meet the secondary role of ground attack under the direct orders of the Army formation to which the units were attached. On the other hand, it was also desirable from the point of view of economy to combine the role of the support bomber with that of reconnaissance, and this again postulated a dual purpose machine. Continued efforts were therefore made to find a suitable replacement. (1)

Considerable changes had also occurred in the conception of the requirements for artillery reconnaissance and spotting. The system hitherto employed was based on the experience of the 1914-1918 war in a situation of static warfare with masses of artillery on either side of a more or less stable line. Trench warfare was, however, no longer normal and it was necessary to be able to follow the battle from a high observation post which would need to control the artillery from the air. Artillery no longer consisted of isolated units of four or six guns. The Field Regiment, itself of twenty-four guns, was often able to shoot as one battery and simple methods of linking batteries graphically had reached a stage at which a single observation post, given good command, could switch and concentrate the fire of a mass of artillery with almost the ease which formerly could only be attained for a single battery. In addition to these advances, research had eliminated the need for many of the old and slow methods of ranging. It seemed necessary, therefore, that a means should be devised whereby an aircraft could act as a high observation post from which the battlefield could be seen and appreciated and the fire of a mass of artillery could be controlled. Several types of aircraft had been tried before the war and a flight of Taylorcraft had flown to France in April 1940, but was withdrawn at the opening of the German offensive. However, the foundations for the Air Observation Post had been laid. (2)

The Composite Group

By early 1942 the War Office was becoming perturbed with regard to the ability of the Royal Air Force to provide full assistance to a land campaign in Europe. Air superiority, reconnaissance, army air support, and air transportation were needed but, of these, the stated requirement for air transportation was completely beyond the realms of practicability and the provision being made for reconnaissance and army air support was unsatisfactory, largely owing to the fact that army co-operation took third place in the provision of aircraft. (3) Furthermore, American resources were being diverted to other fields, and Britain was committed to send two hundred aircraft to Russia each month.

(1) See App. 3.

(2) See App. 3.

(3) D.O. (42) 8 and 34.

By February 1942 the Air Ministry plans to meet the Home Forces requirements in Army Co-operation aircraft by the provision of ten fighter reconnaissance and ten bomber reconnaissance squadrons was being met by only fourteen squadrons, and of the eight Tomahawk squadrons only thirty-five aircraft could be termed reliable. (1) Under the impact of fresh reverses in the Far East, the War Office demand now took the form of a renewed claim upon an enlarged Army Co-operation Force totalling over four thousand aircraft of all types. This was a demand to which the Air Staff could not conceivably acquiesce, and it was again stressed that the primary need of the Army was for general air superiority, and that an army co-operation force would be backed by the full weight of the Metropolitan Air Force in Continental operations. It was proposed to train and equip a number of fighter squadrons for Army air support in order to offset the tactical inadequacy of the light bomber, and a settlement was agreed upon on 19 May 1942. No decision was reached as to whether or not light bombers (or fighters) were eventually to become part of a composite Army Co-operation Force, and the question of airborne lift was left in abeyance. (2) Under the agreed settlement the Royal Air Force was to take action as follows:-

- (a) The strength of Army Co-Operation Command was to be built up to twenty squadrons by 1 September 1942.
- (b) The light bomber Group (No.2) was to be built up to twenty squadrons, organised and trained with the Army for Army Air Support, subject to overseas commitments and the fulfilment of American deliveries.
- (c) Fifteen cannon-fighter squadrons were to be made available from Fighter Command to exercise and operate with the Army.

This agreement left open the question of the organisation to be adopted for training and operations in Army Air Support at a time when the feasibility of opening a second front in Europe was being closely studied. In June 1942, however, the C.I.G.S. presented a proposal, prepared by the S.A.S.O. at G.H.Q. Home Forces, for the formation of a new mobile R.A.F. Army Air Support Group, on a Field Force basis within Army Co-operation Command, consisting of bomber and fighter types of aircraft especially designed for the attack of ground targets. This proposition possessed the special attraction of involving a comparatively small immediate commitment of aircraft, of probably closing the argument in favour of placing No.2 Group under Army control, and of being able to satisfy the Army in respect of a stated requirement for an R.A.F. organisation whose attention would be entirely focussed upon the particular problem of Army Air Support. The organisation would be built up against the day of active operations, as opposed to being hurriedly devised and assembled at the last moment: training would be standardised, operations would be practised from advanced landing grounds, and a more effective army air support weapon would be created, of which the potential would be a known quantity on the day of battle. Furthermore, The War Office agreed that such a force should be employed in the main air offensive pending the beginning of land operations.

(1) C.A.S. File Army Air Requirements 1745.

(2) C.O.S. (42) 155 and 208.

Owing to the unsuitability of the Blenheim or the Boston, due to high casualties from light flak at low altitudes and inaccuracy in bombing at height, Army interest was partially withdrawn from No. 2 Group. It followed, from the limitations of the light bomber, that the fighter would become the primary support weapon, in which task it had already been proved extremely effective against thin skinned targets. The fighter was still largely ineffective against armoured vehicles and it, too, was susceptible to light flak. The joint Army/R.A.F. opinion from the Middle East, that fighters should be modified to give the pilots and vital aircraft parts greater protection and be more suitably armed for the attack of ground targets, indicated the means whereby the specialised fighter could be converted to an effective support weapon without incurring the risk of introducing a further specialised type with limited application. (1) In the Army view it was most desirable that this development and the necessary training should be effected under a Group organisation.

The proposed initial establishment for the Group consisting of twelve squadrons (2) was readily accepted. The total of thirty-five bomber and fighter backer-up squadrons was to be correspondingly reduced, and the Group was to gain its operational experience by taking part in the main air offensive. Likewise the conception of the Group as a mobile formation for field operations was not contested, but the Air Staff conviction that the initial phase of an invasion of the Continent, up to and including the securing of a lodgement, could best be assisted by means of an extension of the fighter organisation of the United Kingdom was in direct conflict with any proposal that might tend to perpetuate Army Co-Operation Command or superimpose additional formations upon the otherwise uncomplicated fighter organisation.

The Air Staff plan of 21 July 1942, was based upon the assumption that there would be a Supreme Commander over all land, sea and air forces engaged in an invasion of Europe and a single A.O.C.-in-C. over the British and United States Air Forces. The whole of the Metropolitan Air Force, apart from units of Coastal and Fighter Commands engaged in a security role, were to be employed on Army Support in the widest sense, and the appointment of a single A.O.C.-in-C. was intended to ensure that the air forces were applied in the most effective manner toward the attainment of the common aim - an arrangement which also provided for the condition that the Army Commander should have to deal with one Air Commander only as had been shown to be necessary in the Middle East and during exercises in England (Exercise Victor II February 1942).

The paramount consideration was to ensure air superiority over the area of land and sea operations but this depended upon the metropolitan fighter force being able to operate freely over the selected area without fear of having to be withdrawn for the defence of Great Britain. The overriding status of Fighter Command in operations to effect a lodgement on the Continent was therefore established and moreover, it had been demonstrated, in active combined operations, and was subsequently proven in the Dieppe raid of 19 August 1942, that such expeditions could be successfully supported and protected by the normal

(1) C.A.S. File 1745, Pt. II, HF/S.12231/Air.

(2) Four of 40mm. anti-tank fighters, four of 20mm. fighters for the attack of thin skinned vehicles, and four of Bermuda bombers.

Home Defence Fighter organisation, assisted by forward direction through R/T in ships. (1) The No. 11 Fighter Group Headquarters at Uxbridge and the sector organisation stretching from London to the coast provided a very highly developed, well tried, and efficient organisation, specially designed and adapted for the control of air operations over the channel. No better system than this organisation, suitably expanded, and extended, could be provided for the control of the very large numbers of squadrons which would be involved in the initial assault. Twelve Army Air Support squadrons, of which eight were specifically fighter types, were to be formed and, as Fighter Command had taken a keen interest in Army Air Support throughout the year, (in the spirit that success depended upon "Willingness to co-operate and good signals"), all seventy-five of the Commands squadrons had received some training in Army Air Support by September 1942, including control by an A.A.S.C.

The existing operational organisation in England which consisted of functional Bomber, Fighter, Coastal and Army Co-operation Commands was irreconcilable with the requirement for flexibility and rapidity of action which were necessary in order to ensure that air effort could be switched and applied with speed to the support of any deserving part of the Army front. Furthermore, it was necessary for the Army commander to be able to select objectives and apportion effort for almost any number of supporting squadrons which had to come under the control of one Air Force Commander in any one area, who could see the air situation as a whole and co-ordinate support, reconnaissance and fighter operation. This postulated a non-functional or composite organisation and it was apparent that the organisation of Fighter Command offered the best basis upon which to build. (2) The role which was known as "army co-operation" had therefore shifted from the restricted domain of a specialised service into the much wider field of the main fighter offensive, where it was now a function of the Air Force as a whole. "Air Support" was no longer to depend upon limited resources but was to have the whole strength of Fighter Command squarely behind it and the elimination of Army Co-operation Command therefore became a logical step in invasion for, owing to its specialised nature, it never could or would be able to command sufficient resources.

The Air Staff was reluctant therefore to establish a new Army Air Support Group within Army Co-operation Command or to commit themselves to any permanent allocation of the twelve new squadrons to it. The more satisfactory solution appeared to be to re-organise No. 11 Group into a composite force within which Groups would be formed on the basis of one for each Army to be supported.

The proposals of July 1942, to meet the requirements of invasion operations the following year were based upon the Luftwaffe organisation and the lessons learnt in North Africa where the entire air forces of the Middle East were devoted to army support. (3) It was proposed to form two Air Forces (corresponding to Luftflotte) under the A.O.C. in C., who, in addition to commanding all the air forces in support of land

(1) C.B.O. 4244. Report by Air Force Cdr. on the Dieppe Raid.

(2) Note on A.C.Cd. by the Inspector General. 17 April 1943.
C.A.S. File 1745B.

(3) C.O.S. (42). 351.

operations was to be responsible for the Air Defence of Great Britain. The Eastern Air Force comprising of fighters, light bombers, army support, and reconnaissance squadrons organised into three composite groups (corresponding to Flieger Korps), was to occupy No. 11 Group H.Q. and the three eastern sectors of the Group area in order to cover the British Armies. The Western Air Force (U.S.A.A.F.) was to be organised on similar lines to cover the front of the U.S. Armies. In addition, all or part of the U.S. Heavy Bomber Groups were to be employed under the direction of the A.O.C. in C. in conjunction with Bomber Command on such tasks as were required on either front.

In the initial stages, captured airfields were to be used as advanced landing grounds by squadrons based in England which were to be serviced on the Continent by Servicing Commandos, each Commando being capable of servicing any of the aircraft types in the Groups. Operational control was to be exercised through advanced Headquarters of the Groups but later, when sufficient ground was occupied, stations were to be established in France to maintain three squadrons each. The necessary mobile signals and R.D.F. required to extend the Group communications and warning system into France together with the appropriate sector control and A.A./searchlight organisation required for the air defence of the Group area was also to be provided.

The Army Co-operation wing was to be renamed the Army Support Wing and became the basic control organisation (using an extended A.A.S.C. for the purpose) through which the army commander was to control any class of squadron allotted to air support, including Army Support, light bombers, fighters, and reconnaissance aircraft. The A.S. Wing Headquarters was then to become the advanced headquarters of the groups concerned but, for more than a very limited effort, operations were to continue to be controlled by the Group Commander in the U.K. (experience in Libya had shown the necessity of the Group Commander retaining control) pending the time when a mobile operation headquarters could move forward in immediate contact with the appropriate army headquarters.

There was to be no separate Air Command similar to B.A.F.F. of 1940 and no Air Component or Army Support Group Headquarters was to be superimposed upon this organisation. It was intended, however, to establish an officer of air rank at G.H.Q., in place of an Army Co-operation Force Commander as Air Adviser to the G.O.C. and to supervise training and development from No. 11 Group Headquarters during the preparatory phase. The twelve new squadrons were to form in No. 11 Group as soon as aircraft and personnel became available; the light bomber squadrons of No. 2 Group were to be affiliated for training to the appropriate fighter sectors forthwith, and, at the end of September, No. 11 Group was to be re-constituted with three mixed groups as the Eastern Air Force.

This organisation as conceived by the Air Staff did not, however, satisfy the C.I.G.S. who argued that it was tied down to one operation in particular (whereas it should cater for operations in general) that it was immobile in its conception, and that it did not insure continuous and intensive co-operation with the Army in training. (1) The fact that the command of Army Air Support during operations was not vested in an R.A.F. headquarters having direct control with G.H.Q. throughout all stages of the operations (being necessitated by the proposal

(1) C.O.S. (42) 364. 1 August 1942.

to use No. 11 Group Headquarters as the headquarters of the Eastern Air Force until it was possible to move on to the continent), was stated to be a direct contradiction of the fundamental lesson that the military commander on all levels should be able to deal face to face with an executive R.A.F. Commander. Furthermore, there was great reluctance to jettison the existing Army Co-operation Command organisation for one which would have dual responsibilities (ADGB and Army Co-operation in the Field) during the important training period prior to operations.

By the end of August 1942, however, operation Round Up (1) had receded into the remote future and arrangements had been made to send seventeen of the seventy-five fighter squadrons, required during an invasion, to participate in operation Torch which entailed landings in North-West Africa. (2) The re-organisation, as proposed, was therefore not immediately appropriate or necessary as the three armies which were to have been supported by three composite groups were now to remain dispersed over the United Kingdom. The rate of formation of the twelve A.A.S. squadrons was reduced (owing to the need to replace the lost fighter squadrons) to two immediately and one a month from November 1942 onwards but it was still necessary to decide whether they were to form in Army Co-operation or Fighter Command. Of these alternatives the Air Staff preferred the latter and was prepared to provide a special staff under an Air Officer in Fighter Command for the purpose of organising and supervising training, tactics, and technique, not only of those twelve squadrons but of all other squadrons in Fighter Command and No. 2 Group. This arrangement was in accordance with the organisation being considered for Round Up and provided for the quick development of technique and equipment (e.g. the mobile control, communications, and warning equipment) required to enable the operation to pass from the initial assault phase, when the existing Fighter Command system had to be relied upon, to the phase when a lodgement had been effected and a fully mobile independent system was needed.

The C.I.G.S. could not however agree that these arguments justified the transfer of responsibility to Fighter Command which at any time might find its interests focussed upon Air Defence rather than upon the development of the organisation for Air Support training and operations. (3) He furthermore expressed misgivings with regard to the C.A.S.'s condition that with either alternative, the Army Air Support squadrons would be required to train and operate in a normal fighter defence role should the United Kingdom become subject to a renewed air threat while Fighter Command was below strength. At the same time a suggestion that the C.A.S. should not have ordered the formation of two Typhoon bomber squadrons without first determining the wishes of the C.I.G.S. evoked the firm stand that whereas it was unquestionably the duty of the C.I.G.S., to indicate his requirements in terms of effect on the enemy, it was unquestionably the duty of the C.A.S., to resolve the purely air problem of how the effect could be produced most effectively and economically.

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- (1) Invasion of Europe.
 - (2) Letter from C.A.S. to C.I.G.S. Dept. OA, 31 August 1942. File C.A.S.1745B.
 - (3) Letter C.I.G.S. to C.A.S. 3 September 1942. File C.A.S.1745B.

Given the choice, the C.I.G.S., elected to have the twelve new squadrons formed in Army Co-operation Command under an Army Support Group as a training organisation and this was agreed by the C.A.S., without prejudice to the Air Staff proposals for the Round Up organisation, in order that their formation should not be delayed. The difference of opinion with regard to the proposed Air Staff organisation for Round Up were however, too great and too far reaching to be allowed to rest for long and consequently the whole problem together with that of the type of equipment and the organisation for training was brought before the Prime Minister on 5 October 1942. The Air Staff plan for meeting the "fifty five" squadron commitment was tabled as comprising an eventual force of twenty army co-operations squadrons, twelve army support squadrons, ten light bomber squadrons from No. 2 Group, and thirteen fighter squadrons from Fighter Command. The decision to form the army support squadrons within Army Co-operation Command was confirmed without prejudice to the final decision and it was agreed that the Air forces should be organised on the Libyan model in such a manner as to provide for the following phases:- (1)

- (a) The training in co-operation before operations began.
- (b) The move across the channel.
- (c) The establishment of a front in France.

In this connection the Prime Minister ruled that the whole of the air force was to be under the command of one A.O.C. in C. whose relationship to the Army C. in C., was to be that laid down in his directive of 7 October 1941, (2) in connection with the Middle East Campaign. This ruled that when a battle was in prospect or in progress the A.O.C. in C. was to give the G.O.C. in C. all possible aid irrespective of other targets, however attractive. Whenever the army established on land conducting operations against the enemy the organisation and employment of the R.A.F. was to conform to that which had proved so successful in the Western Desert and the solution to the problem of organisation was therefore to be sought by first deciding what had to be achieved in France and then to work backwards in order to determine the method of execution for "the spring across the channel". Finally, the solution to this phase was expected to indicate the arrangements required for training in the initial phase.

By 14 November 1942, the War Office and the Air Ministry had studied the application of the Western Desert system to conditions when the Army would be established in France and agreed upon the following main points:- (3)

- (a) The Supreme Commander and the A.O.C. in C., of the combined air forces were to be established in immediate contact, either in the U.K. or France. (4)
The bulk of the British and U.S. Bomber Commands and the fighter squadrons employed upon the protection

(1) C.O.S. (42) 138, 5 October 1942 and P.M.'s minute. M.430/2. 7 October 1942 in C.A.S. File 1745B.

(2) D.O. (I) 17.

(3) See App. 5.

(4) App. to S. of S. for War's Statement to P.M. enclosed in C.A.S. File 1745B.

of the U.K. and the line of communications across the Channel were to continue to operate from bases in the U.K. until the later stages of the third phase. It was unlikely that the main headquarters of the Supreme Commander and the A.O.C. in C., would transfer to France until an advanced stage of the invasion of the continent. Adequate communications would be provided between the A.O.C. in C., and the H.Q. of the two air forces in the field.

- (b) The G.O.C. in C., British Army and the A.O.C. Eastern Air Force were to be established in immediate contact at a H.Q. in the field.
- (c) Mobile composite groups, each containing fighter, light bomber, army support, and reconnaissance wings were to have their respective headquarters in immediate contact with the headquarters of the armies in the field. Under the A.O.C. in the Field they were to be subject to the general operational control of the A.O.C. in C. They were to be flexible units of no fixed strength, and one or more could be reinforced at the expense of others by the A.O.C. in the Field, in consultation with the G.O.C. in C., according to the situation on any army front. Their basic organisation was to be such as to be capable of controlling the formations permanently under command, also those which would be allotted. Air support operations and reconnaissance by all aircraft were to be controlled by a specially trained Army support Commander through an A.A.S.C. organisation at Group H.Q.

The only major point of disagreement was on the issue of whether or not the A.O.C. in C., was to have additional responsibilities such as the Air Defence of Great Britain. The Air Staff held that neither the A.O.C. in C., or the A.O.C. Eastern Air Force could disinterest themselves in the Air Defence of Great Britain or in the communications between the United Kingdom and the forces in France and pointed out that during the preparation and initial stages of invasion when South-East England would be one vast air base and army concentration area, the fighter squadrons taking part in the preliminary offensive operations would also be responsible for defeating attacks made by the enemy on S.E. England. While admitting that, once the forces were well established on the Continent and were attacking Germany, new conditions would arise, it was considered that a division of the command of the air forces would reduce the flexibility with which they could be operated. The General Staff, however, did not accept this view and argued that the responsibility for determining the division of air forces between support for the Expeditionary Force and the defence of Great Britain should rest with the Chiefs of Staff. They were not content that the A.O.C. in C., should have to "look over his shoulder" instead of concentrating his whole attention on the battlefield and claimed that under these circumstances he would be unable to do his job properly.

On 3 December 1942, the Prime Minister stated in a personal minute that having agreed upon the third phase, except for the above point, he would like to see a similar statement covering the second phase. (1) He considered that the difference of

(1) C.A.S. File 1745B.

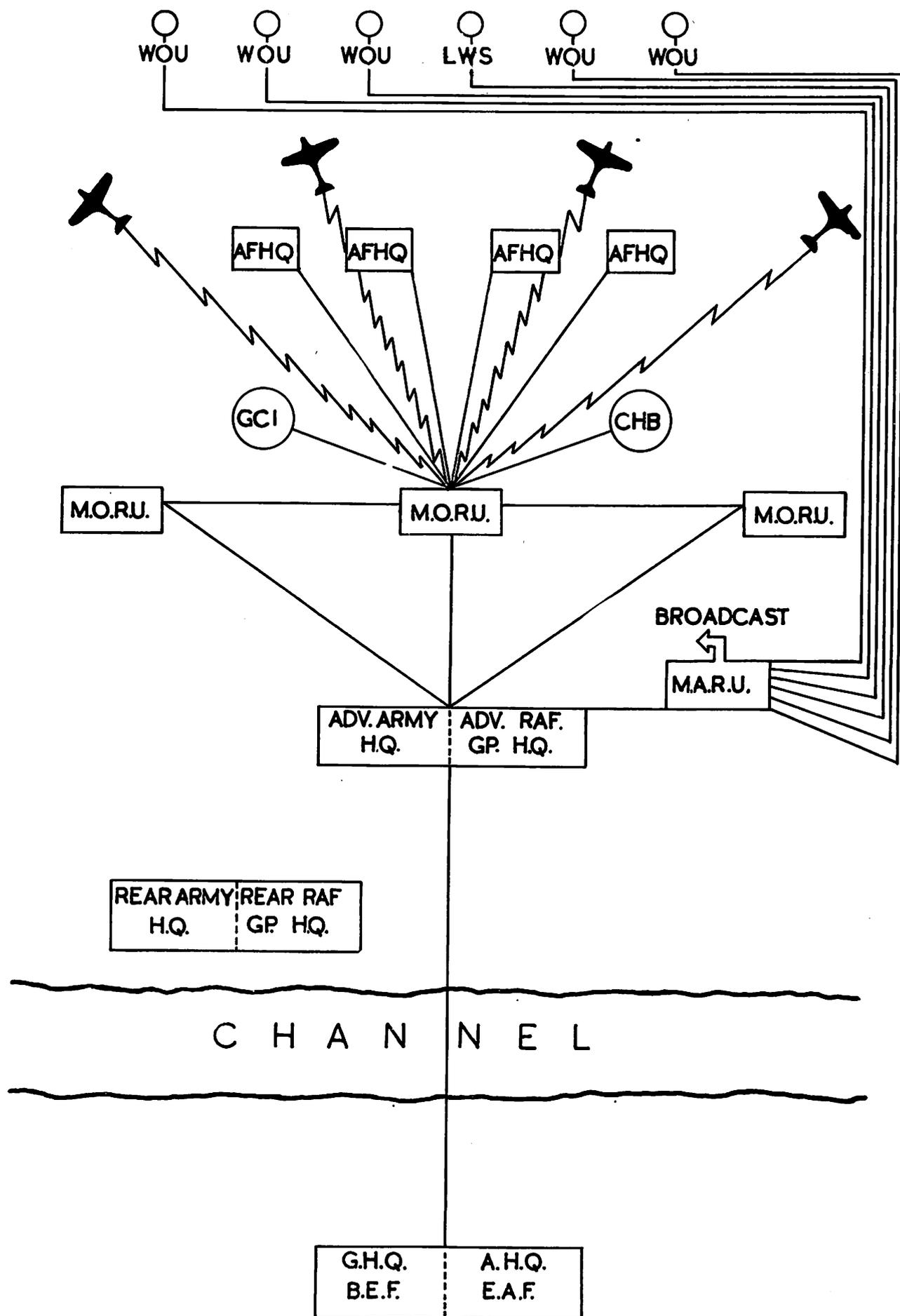
opinion on the responsibilities of the A.O.C. in C., would solve itself when phases two and three were considered together. In his opinion, the A.O.C. in C., could not disinterest himself in the protection of his base, which would be the U.K., but that when the invasion had made considerable progress on the Continent, he thought it quite possible that the A.O.C. in C., would not need to concern himself with anything further to the rear than French Channel ports.

The general form of the Composite Groups for mobile operations in the field was thus agreed and included the introduction of a new unit known as the Mobile Operations Room Unit (M.O.R.U.). Fighters, bombers, tactical support and reconnaissance aircraft were to be kept under central control and were to be interchangeable between airfields to allow for flexibility and reinforcement. Local control for a variety of types could not be achieved by specialised Wing Headquarters and so the M.O.R.U. was to be designed, staffed, and allocated on the basis of one for each four airfields. In considering the crossing of the channel, however, it was also necessary to determine the most suitable method of change over from control by a projected permanent organisation, as applicable to the initial assault, to control on a basis of full field mobility as required for the third phase. (1) This transition stage was to occur during the establishment of a firm lodgement on the Continent and it was necessary to ensure that the Corps/Army and Composite Groups Headquarters retained close contact throughout. Contact was to be effected by means of mobile advanced headquarters pending the move across of the main headquarters, and it remained to be decided whether the existing static organisation could be effectively projected on a mobile basis in close contact with the Army or whether it would not be better to evolve a distinctly mobile field organisation which would take advantage of the static organisation for as long as practicable. (2) It was not, however, advisable to attempt to formulate a final organisation to provide for the conditions of phase two before some additional experience had been gained of the mobile Composite Group in action and it was therefore decided to postpone the submission of a plan to the Prime Minister until the organisation had been tried out on a full scale.

This conception of the Composite Group and the location of the Group and Army Commanders in joint or adjacent Headquarters as a means of ensuring that Army and Air Force resources were directed to the accomplishment of a common task was tried out and proved basically sound in exercise Spartan in England in March 1943. (3) The exercise dealt with the problems arising in an advance from an overseas bridgehead, practised the handling of mixed military forces, and exercised the control organisation of Air Forces operating with the Army, in fact it was a rehearsal for the invasion of North West Europe.

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- (1) Draft Page C.A.S. File 1745B.
 - (2) C.I.G.S. letter to C.A.S. 9 January 1943.
C.A.S. File 1745B.
 - (3) Spartan Narrative and Reports by A.O.C.-in-C., A.C.Cd.,
and C-in-C. Home Forces. CS.18704.

OPERATIONAL CONTROL AS FOR THE COMPOSITE GROUP.



- W.O.U = Wireless Observer Unit
- L.W.S = Light Warning Set
- A.F.H.Q = Airfield H.Q.
- M.O.R.U = Mobile Operation Room Unit
- M.A.R.U = Mobile Air Reporting Unit

Air action was co-ordinated with the land battle through the medium of two Composite Groups (1), one of which was allotted to the support of each of the two opposing Armies, each Group being composed of fighters, light bombers, tactical support fighters, and fighter reconnaissance aircraft. The internal R.A.F. organisation was deliberately experimental and was handicapped by limitations of the personnel available and inadequate knowledge and experience in the conduct of the combined land/air battle. Constructive criticism had therefore to be confined to the broader aspects of the problem.

In order that the Group Commander and his Headquarters could always be with the Army Commander and his Headquarters, the Group Headquarters was divided into two parts to conform to the Army H.Q. organisation. These were the Advanced (or operational) Group Headquarters and the Rear (or administrative) Group Headquarters. The principle units of the Group were as follows:-

- (a) The Advanced Group H.Q. designed for mobility with no large administrative Staff. Operational control was exercised through the Mobile Operations Room Units.
- (b) A self-administering M.O.R.U. It had ground to air communications for the control of aircraft and W/T or land-line communication to each of four airfields. Additional control facilities were to be provided by means of a Ground Control Interceptor (G.C.I.) directly associated with the M.O.R.U. (2)
- (c) The Rear Group Headquarters which was transportable by means of the Group pool of vehicles. It maintained and administered all R.A.F. Units in the area. This organisation was not fully carried into effect for the exercise, some units being maintained by their static stations. Twelve "British" squadrons, however, were organised on a field force basis involving the provision of the following:-
- (d) Airfield Headquarters. Each A.F.H.Q. was responsible for the operation, maintenance and administration of three Squadrons of various types. Due to the assumption of a large measure of responsibility the Field Force Squadron was reduced to a very small mobile unit.

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- (1) "Z" Mobile Composite Group - British Forces.
 - (i) One Mobile Operations Room Unit.
 - (ii) Four airfield Headquarters.
 - (iii) Six Fighter Reconnaissance Squadrons.
 - (iv) Seven Fighter Squadrons.
 - (v) Four Tactical Support Fighter Squadrons.
 - (vi) Two light bomber Squadrons.
 - (vii) One Air Observation Post Squadron.

Total: Twenty Squadrons.

- "X" Mobile Composite Group - "German" Forces.
 - (i) Five fighter Reconnaissance Squadrons.
 - (ii) Seven Fighter Squadrons.
 - (iii) Two Tactical Support Fighter Squadrons.
 - (iv) Four Light Bomber Squadrons.
 - (v) Three Air Observation Post Squadrons.

Total: Twenty-one Squadrons.

- (2) Warning of enemy air raids was to be obtained through the medium of a Mobile Air Reporting Unit (M.A.R.U.) which broadcast information received from a chain of Wireless Observer Units (W.O.U.) and through a Radar Reporting Unit (C.H.B.) which was to be directly linked to the M.O.R.U.

- (e) Two mobile Air Stores Parks were provided, each being responsible for supply to two airfields.
- (f) A Mobile Repair and Salvage Unit was responsible for the repair of aircraft and M.T., to a limited extent, on site. In addition it carried a pool of maintenance personnel (Servicing Commando) which was at the call of airfields to assist in the first line maintenance of Squadrons if required. The Commando was to move forward as soon as an airfield was ready and function as the maintenance element of the A.F.H.Q. until that moved up. When thus relieved it moved either to another Advanced Landing Ground or back to the R. and S.U.
- (g) A Motor Transport Company, under Group Headquarters, was provided to assist the move of units not themselves fully mobile.
- (h) A Supply and Transport Column under the Group Headquarters, was provided for the transport of supplies within a radius of forty miles. Beyond this radius transport was provided by the Army.

The active operations during the exercise lasted nine days before which it was assumed that an Allied bridgehead had been established and preparations made for the advance therefrom. In this early period the Allies had gained a marked air superiority and a number of airfields had been captured and put into use by "Z" Group. The heavy bombers attacked centres of communications and bottlenecks, the British concentrating more on the rearward areas while the "Germans" were forced to lay emphasis on the more forward zone. A number of air attacks were made on targets reported by reconnaissance, but delays in getting the details to aircraft resulted in many of the attacks arriving too late.

The Air O.P. was especially useful after the ground forces had made close contact and, as was becoming usual, the Auster was used also for local and contact reconnaissance, liaison and communications duties. The need for ample warning of projected moves was demonstrated when some aircraft had to be left behind temporarily during a night withdrawal, but the danger from being spotted by enemy aircraft was shown to be not as great as originally feared and properly camouflaged A.L.G.'s also proved difficult to locate from the air.

The capture and retention of airfields and the need for speed in movement were shown to be primary factors affecting the operations of supporting air forces. Forward moves of thirty to forty miles were practised by R.A.F. Units and two airfields were constructed by the Airfield Construction Groups of the R.E.

Exercise Spartan confirmed the view that the organisation of the R.A.F. should be based primarily upon the predominant requirements of the third phase operations on the Continent when support would be required for a full land campaign, and indicated some of the expedients which, though possibly necessary during the preceding phases, should be given temporary status only within the basic organisation. (1) The following lessons reported by the A.O.C.-in-C Army Co-Operation Command were the outcome, not only of Spartan, but of the experiences in both the Western Desert and the United Kingdom.

(1) Report on Spartan by A.M. Barratt.

The aim was to provide for combined planning and operations, but this was not necessarily achieved merely by placing the Army and Air Headquarters in contact. The higher Army and Air Force Commanders had to plan well ahead but the former could only influence a battle that had been joined by the use of his reserves. The latter, however, commanded an inherently flexible force which required his constant attention. This fundamental difference in the pace of the air and land battles had to be clearly understood by Staffs and the combining of the points of control and their communications had to be considered with caution in order that the flexibility of air forces might not be cramped.

It was expected that the majority of targets attacked by fighter-bombers and light bombers would be found as the result of reconnaissance, and would be of a fleeting nature. Many of them would appear to be attractive from the narrow view point of a local commander whereas the results to be achieved might not justify the effort. It was of the gravest importance that air action should be concentrated on objectives vital to the land operations and this could be achieved by careful selection based upon a clear air plan of campaign. The greatest technical limitation was likely to be the delay between a target being found and the attack, but this could be reduced by means of improvements in method.

As the heavy bomber resources available could make a powerful contribution it was essential that commanders should look well ahead in studying the means whereby this effort could be used to provide a full measure of assistance. The co-ordination of these forces was to be effected at the highest joint level and it was essential that a request for assistance should state why it was needed and the results it was hoped to achieve in accordance with a single concerted plan.

The proposed organisation provided for the control of air forces to be centralised at the highest possible level, nevertheless the needs for a measure of decentralisation were also evident. (1) The immediate recommendation did not go so far

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- (1) (i) The defensive action of fighters could best be controlled at Wing or Group Headquarters within the terms of a general directive. For the defence of the base area the possible need for a static fighter organisation was foreseen.
- (ii) The offensive action of fighters and light bombers could be best provided by confining orders issued to the outline of the task and leaving the details to subordinate commanders. This method had been tried and proved in the Western Desert.
- (iii) Air reconnaissance was a normal requirement over the whole front and centralisation was desirable owing to the need to co-ordinate reconnaissance activities with other operations which would provide for the safety of our aircraft and in order to permit the economical use of resources. On the other hand the system had to provide for the reception of information by tactical military commanders with the minimum of delay and consequently the means had to exist for a measure of decentralisation as necessary for particular operations.

as to suggest a separate Group organisation for fighter types and light bomber types, but advocated a functional Wing organisation for reconnaissance and light bomber aircraft and a Wing or Group organisation for fighters and fighter bombers depending upon the size of the force. This concept was undoubtedly sound and provided for the organisation of these functional forces under either a Composite Group or Command, again depending upon the size of the force.

The agreed lay-out for a Composite Group working with the Army at the time of Spartan envisaged the establishment of similar joint Army/Air Headquarters at Army and Corps level. (1) The proposals for the organisation of the joint headquarters provided for it to function as follows:-

- (a) Planning and Policy. The Army and Air Commanders and their principle Staff Officers should concentrate primarily on planning for future action and should delegate the responsibility for current operations to their Staffs.
- (b) Current Operations. These should be dealt with by the Combined Operations Room Staff within the limits laid down by the Commanders.
- (c) Implementing decisions. Separate executive operations rooms should be provided for the Army and Air Force. Their action should be taken on the decisions made by the Combined Operations Room Staff.

The organisation of the Army Air Support Control as an independent mixed unit was shown to be illogical as the result of Spartan. The Mobile Operations Unit (later known as the Group Control Unit) had become the instrument by means of which the Commander of the Composite Group exercised control of his aircraft and this therefore left the A.A.S.C. with a signals function only, and it afterwards became known as the Air Support Signals Unit (A.S.S.U.). A separate Army network was provided, as in the past, of tentacles for the rapid transmission of information affecting air action and requests for air support and reconnaissance. The communications from Air Force control points to airfields and aircraft became an integral part of the R.A.F. Group signals organisation. The system of broadcasting the results of centralised reconnaissance from Army/Group level was shown to be a requirement which required further study.

A further lesson learned from the exercise was that a high proportion of units which would eventually comprise the "Air Expeditionary Force" required experience in living and operating in the open air in conditions such as they would encounter on the Continent.

The Tactical Air Force

The experience in the Middle East and the contemporary developments in the United Kingdom up to Exercise Spartan in March 1943 were of supreme importance in the build-up of the organisation methods and equipment, for the support of armies. The superseding of the term "close support" by that of "immediate support" was followed by a new and broader conception of air support, in which the pure fighter, the ground attack fighter, the fighter reconnaissance aircraft, the light bomber, and the heavy bomber were all to be harnessed for the support of armies.

(1) That at Corps level was later dropped.

This made obsolete the old notion of army co-operation as a specialised and limited form of air assistance.

The conception of the Air Component was now dead and had been replaced by the composite "Air Contingent" in which all aircraft were subject to centralised control under an Air Officer who enjoyed equal status to a parallel Army Commander with whom he had a common aim and in the attainment of which he was required to assist the Army with all means at his disposal from the moment a land battle was in prospect. To this end the Army and Air Commanders had to be able to deal "face to face" at all levels and air forces had to be organised in such a manner as to provide the necessary mobility and flexibility to make effective support possible during all phases of an operation. The organisation for land operations against the Continent had therefore to be adjustable to meet the requirements of three operational phases now defined as follows:- (1)

- (a) The sea crossing and landing during which the main support was to be carried out from England.
- (b) The establishment of the bridgehead during which certain squadrons would operate from the Continent. The number of airfields available would be a limiting factor.
- (c) The expansion of the bridgehead for which the most suitable organisation had to be evolved for the support of the full land campaign.

Exercise Spartan confirmed the view that the R.A.F. organisation should be moulded to suit the predominant final phase and, consequently the "Z" Group Headquarters and certain Field Force units were kept in being after the exercise and used to form No. 83 Group within Fighter Command. (2)

The need for units of different Wings to use the same airfields was seen to be a temporary requirement when airfields would be limited within the bridgehead, and it was therefore decided to organise operational units into functional wings in order to achieve concentration and economy of effort under the more effective control that could be achieved. (3) Furthermore, Spartan again demonstrated the extent to which bomber effort could be dissipated by sub-division and, as the fighter-bomber was the obvious weapon for day to day use on the comparatively narrow front of the Composite Group, it became clear that the light bomber force should be retained as a functional Group under the Headquarters of the Eastern Air Force.

Land operations were in prospect for 1944 and it was accepted that the basic conception for the organisation of the air forces should primarily be one of mobility and close contact at corresponding Army and Air Force levels for study, planning, training, and conduct of operations. These conditions required the early formation of a supporting British Air Force as a separate entity which would make full use of all Fighter Command facilities for as long as possible. The new force - Tactical Air Force - was therefore to form and remain within Fighter Command pending the appointment of a C-in-C Allied Expeditionary Force. Responsibility for Home Defence was later resolved

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- (1) A.M. Barratt's Report on Spartan.
 - (2) C.A.S. File 1745B. LM.1029/A001. 19 March 1943. C.O.S.(43) 149(O).
 - (3) Minute by Inspector General. 17 April 1943.

by the replacement of Fighter Command by a reconstituted Air Defence of Great Britain.

The Chiefs of Staff were therefore informed on 10 March 1943, that a Tactical Air Force (1) was to be formed within Fighter Command with effect from 1 June 1943, and that, in consequence, Army Co-Operation Command would cease to exist from that date.

The functions of H.Q. T.A.F. were to be as follows:- (2)

- (a) To command the appropriate formations.
- (b) To study the air aspects of Continental operations.
- (c) To exercise with Army Group Headquarters.
- (d) To train Composite Groups, including tactical reconnaissance squadrons, and to exercise them in actual operations.
- (e) To train light bomber squadrons with fighters and fighter bombers and to exercise them in actual operations.
- (f) To make detailed plans in conjunction with the G.O.C-in-C Expeditionary Force for Continental operations when the outline and cover plans had been issued.
- (g) To meet requirements for strategical reconnaissance for continental operations.
- (h) To study the air aspect of the employment of airborne forces.

The arrangements made regarding the organisation of the R.A.F. for the support of cross channel operations and the appointment of Air Vice Marshal D'Albiac as Commander of the Tactical Air Force were notified to the Prime Minister by the Secretaries of State for War and Air on 10 June 1943. (3)

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- (1) To be composed of the following formations and units:-
 - (a) No. 2 Group - to be transferred from Bomber Command.
 - (b) No. 83 Composite Group - then in Fighter Command.
 - (c) No. 84 Group - not yet formed.
 - (d) No. 38 Airborne Wing - then in Army Co-operation Command.
 - (e) No. 140 Photographic Reconnaissance Squadron - then in No. 35 Wing, which would continue to administer it.
 - (2) C.O.S. (43). C.A.S. File 1745C.
C.S. 19336/43. 18 May 1943.
 - (3) C.I.G.S./P.M./317. 10 June 1943.
C.A.S. File 1745C.

CHAPTER 5

THE MEDITERRANEAN THEATRE

The Task

The strategic importance of Egypt lay in its commanding position on the sea route through the Mediterranean to India and the Far East and its use as a base for the defence of Allied interests in the Middle East, including oil. To the Italians, the acquisition of this strategic centre offered the twofold attraction of possibly contriving the collapse of British resistance in war and of making a particularly valuable addition to the rising Italian Empire. The possibility of an Italian attack upon Egypt was discussed along with counter-measures during the 1939 Anglo-French Staff talks. (1)

The primary tasks of the Air Force in the Mediterranean Theatre - after Italy entered the war in June 1940 - were three-fold: to wage war, in conjunction with the Navy, against the enemy supply and reinforcement routes in order to keep or make weak the enemy while strength was being mustered for decisive blows on land; to attain and maintain air superiority to the extent required to make possible air and naval operations and to the greater extent required for the security of land operations: to use this air superiority to the best advantage in giving maximum air support to the land operations when joined. (2)

With few exceptions, the notion of subordinating elements of the Air Force to the Army was not an acute problem in the Middle East and the system of employing air and army forces of equal status got away to a good start against relatively weak Italian opposition. This happy state did not go unchallenged however, for when the German Air Force and Army entered the field the "going" became unexpectedly rough and the soldier on the ground began to think that it would be much more to the point if the R.A.F. were to concentrate more upon shooting down aircraft overhead than upon tasks that apparently left the Army "wide-open" to attack. These tasks, about which the soldier was obviously ill-informed, were the very ones that were most needed in the field: offensive effort against the Luftwaffe on and over its own bases, against communications and supplies

(1) A.H.B. Narrative. Italian Campaign, Vol. I.

(2) In June 1940 the R.A.F. Middle East Command, with headquarters at Cairo, had subordinate headquarters at Malta, Khartoum, Nairobi, Aden, Habbaniya and Jerusalem. No. 201 General Reconnaissance (later Naval Co-operation) Group was at Alexandria, No. 202 Group was at Maaten Baqush and on 23 October 1941 No. 205 (Wellington) Group was formed at Shallufa. H.Q., No. 202 Group was subsequently and successively replaced in the Western Desert by Air Headquarters Cyrenaica, H.Q. No. 204 Group and, finally, Air H.Q. Western Desert - which operated in support of the Army's Western Desert Force and its successor the Eighth Army. The successive commanders of the Eighth Army and the (Western) Desert Air Force (which operated throughout Libya, Tunisia, Sicily and Italy) were Generals Cunningham, Ritchie, Montgomery, Leese and McCreery and Air Vice-Marshal Coningham, Broadhurst, Dickson and Foster. (See also Appendix 4).

and against enemy troop concentrations, But the soldier, faced with an enemy air force that threatened him directly and personally, raised a demand for protection at all costs and in June 1941, during the abortive Battleaxe operation to relieve Tobruk, the R.A.F. gave in to the extent of providing an "Air Umbrella" over the advancing columns. (1)

Needless to say, no effective results were achieved and the Air Ministry made its case with the Prime Minister who condemned the policy of "frittering" away the Air Force in providing "small umbrellas" and confirmed his views on 7 October 1941 when informing General Auchinlek (Army C-in-C, vice General Wavell w.e.f. July 1941) that Bofors guns would be provided for the protection of columns and assembly points. "Never more must the ground forces expect, as a matter of course, to be protected from the air by aircraft. If this can be done it must only be a happy makeweight and a piece of good luck. Above all, the idea of keeping standing patrols of aircraft over moving columns should be abandoned. It is unsound to distribute aircraft in this way and no air superiority will stand any large application of such a mischievous practice".

While army doubts were still fomenting the new C-in-C revived the demand for "air components" but this too had been quashed by the Prime Minister - "I feel that for all major operational purposes your plan must govern the employment of the whole air force through the Middle East, bearing in mind that the Air Force has its own dominant strategic role to play....." Faults in co-operation could undoubtedly be found on either side and, in particular, the R.A.F. suffered considerably from the inability of the army to hold airfields. But these difficulties could be resolved by common understanding and the adoption of a single objective and consequently the Prime Minister continued in his edict of 7 October 1941 to define the principles of this co-operation. "Upon the military Commander-in-Chief of the Middle East announcing that a battle is in prospect, the Air Officer Commanding-in-Chief will give him all possible aid and irrespective of other targets, however attractive..... The Army Commander-in-Chief will specify to the Air Officer Commanding-in-Chief the targets and tasks he requires to be performed, both in the preparatory attack on the rearward installations of the enemy and for air action during the progress of the Battle. It will be for the A.O.C. in C to use his maximum force against these objects in the manner most effective. This applies not only to any squadrons assigned to Army Co-operation permanently, but also to the whole air force available in this theatre..... As the interests of the two C's-in-C. are identical it is not thought that any difficulty should arise, The A.O.C.-in-C. would naturally lay aside any routine programme and concentrate on bombing the rearward services of the enemy in the preparatory period. This he would do not only by night, but by day attacks with fighter protection. In this process he will bring about a trial of strength with enemy fighters, and has the best chance of obtaining local command of the air,.... What is true of the preparatory period applies with even greater force during the battle."

This implied the fullest interlocking of R.A.F. and Army plans and operations at all levels and endorsed the practice of the A.O.C. and Air Staff and the G.O.C. and G. Staff sharing a common camp. (2) Further, in order that the A.O.C. could

(1) A.H.B. Narrative - M.E. Campaigns Vol. 2.

(2) Memo on Org. of W.D. Air Force by A.V.M. Elmhirst. August 1942.

exercise immediate and direct control over the operations of bomber and fighter groups it was desirable to select a camp site within five or ten miles of the forward airfields and adjacent to one for its own use. Such a position, some forty to sixty miles behind the front line suited the Army and by compromise it was possible to meet the requirements of signals, and Air and G staffs. Such a site could not accommodate the total staffs of both Army and Air HQ's and consequently the splitting of Army and Air HQs into Advanced and Rear HQs became a necessity.

Italian East Africa - 11 June 1940 to 27 November 1941

The British land forces in the East Africa theatre were outnumbered by ten to one and in the Sudan, Kenya and Aden a total of little more than 175 comparatively slow aircraft were faced with an Italian force of about 240 aircraft on 11 June 1940. This discrepancy in numbers was, however, effectively countered by a victorious offensive on the part of the British and although the initial eleven squadrons were reinforced during the year by a further eight by November 1940 it was found possible to reduce the force to sixteen squadrons and to transfer the remainder to Egypt. Furthermore, despite the flying of enemy reinforcements across the Sudan by night, the Italian Air Force was so completely broken in strength, (1) organisation, and morale by the following April, that it became possible to reduce the force to eleven squadrons again, and after the close of operations in November 1941, a single Blenheim squadron was left, based at Aden.

Air operations in support and defence of ground forces included air fighting, the attack of ground targets, tactical, photographic, and artillery reconnaissance, supply dropping, pamphlet dropping, and communication flying. During the opening phase the Italians exercised control of the air and a most striking illustration of the value of air power was afforded by the loss in August 1940 of British Somaliland. Airfields were quickly made untenable by the enemy, fighter aircraft had to be withdrawn to Aden, the Italians thus gaining local air superiority in which little effective British bomber support could be given to the totally inadequate British ground forces whose evacuation became necessary. The last successful effort of the Italian's to achieve air superiority took place over the local area of Metemma in early November 1940 (following the re-capture of Gallabat by the British) when, owing to incessant attacks by enemy bombers with full fighter escort, a plan for the assault of the post had to be abandoned despite the construction of two new British airfields. After this final Italian air victory, however, the British Air Forces never again lost air superiority in the East African theatre.

A two pronged military offensive was launched which in an incredibly short space of time brought about the Italian defeat. The northern arm entered Kassala on 19 January 1941, Agordat fell on 1 February and, after prolonged operations culminating with intensive bombing and ground strafing, the stronghold of Keren was taken on 26 March. Thereafter the enemy was bombed and ground strafed (including Hurricane operations) whilst in retreat and by 8 April the Red Sea was virtually freed from Italian influence. In these operations bombing, ground attack, supply dropping and reconnaissance all played an essential part,

(1) A.H.B. Narrative. The Middle East Campaigns. Vol.V.

but probably the most outstanding feature of the operations was the practically complete local air superiority which was achieved mainly by the operations of No. 1 S.A.A.F. fighter squadron working from abandoned enemy airfields against enemy aircraft in the air and on the ground.

A further and more striking operation in the East African campaign was that carried out by the Kenya force under Major-General A. Cunningham D.S.O., M.C., who, with full air support on 16 December 1940, began a dual thrust from the south which quickly gained momentum as Italian morale declined. These forces struck northwards and then westwards to Addis Ababa which fell on 6 April. Thereafter followed almost eight months of further fighting during which the remaining large but isolated bodies of the enemy were all defeated and on 27 November 1941 operations were brought to a close.

Throughout the campaign the British Air Forces were occupied in assisting the land operations as follows:-

- (a) The destruction of Italian aircraft in the air and aircraft, workshops, hangars and accommodation on the ground in order to stop the enemy from successfully interfering with British air and land operations. Bombing and machine gunning (including ground attack by fighters) were the methods adopted and by May 1941 all that remained to be done, was to complete the destruction of a few remaining aircraft.
- (b) The disruption of Italian communications, signals equipment, control centres, and technical installations by bomb and machine gun attacks on ports, rail and road transport of all kinds, bridges, railways, wireless stations, headquarters, pumping stations and repair organisations.
- (c) The destruction of enemy supplies by attacks on dumps of ammunition, fuel and other stores.
- (d) The destruction and demoralisation of enemy forces by virtue of the above attacks and by the bombing and machine gunning of enemy concentrations on the roads, troops and buildings in encampments, towns and villages, and troops and emplacements in defended localities including forts.

Pre-arranged operations took the form of attacks against specific targets or, when information was lacking, of armed reconnaissance during which targets of a specified nature were attacked. Immediate or impromptu support was, however, generally against definite objectives, which had been disclosed either by air or land observation, on the request of military formations. For this task the multi-purpose army co-operation aircraft was of particular value and it became a feature of the close support formations formed during 1941 for specific operations.

These operations required the constant provision of forward airfields near the battle front. For this purpose many captured Italian airfields were repaired as necessary and put into use but, when these did not exist, it was often necessary to construct new landing grounds on virgin sites. The capture of airfields or suitable sites was therefore a special commitment of the Army and, in addition, the work of preparation was accepted as a military responsibility.

This campaign illustrated the supreme value of air superiority and showed that even vulnerable aircraft such as the Battle, Lysander and Hartebeest could operate effectively against an inadequately defended enemy. By this time the essential nature of air superiority and the problems involved in acquiring this degree of supremacy were becoming well enough known to discountenance any further proposals to fit airforces with specialised and vulnerable weapons such as the dive-bomber. The remarkable endorsement which events gave to the policy of the offensive as being the best means of achieving air superiority had of course to be considered in relation to the strength, equipment, and fighting quality of the enemy air forces; but there could be no doubt that the offensive was the best policy to be followed and that only the minimum forces needed for security should be devoted to any other purpose. The cumulative dividend derived from the offensive policy became more evident as air superiority was gained and less forces were required for defensive purposes. This in turn, not only released much needed fighter forces for operations in the Western Desert, but, as the rate of transfer from East Africa could not exactly conform to the diminishing need for fighters, the remaining squadrons became more free to participate in offensive action against military ground targets such as convoys and concentrations of motor transport and troops.

Cyrenaica 9 December 1940 to 11 April 1941

This was the scene of a great and victorious advance and a humiliating retreat. The Western Desert Force fought the decisive battle of Sidi Barrani on 9 and 10 December and, in a two months advance, cleared the Italians out of Cyrenaica and destroyed a four Corps Italian Army. But German Air Force intervention resulted in the abandonment of plans to establish Benghazi as a port upon which to base further operations; (1) and the decision to send additional Air Forces and large Army Contingent to Greece left only a skeleton force to hold Cyrenaica. This, at the time, was thought to be reasonably safe as the Italians alone could not be expected to launch a counter-attack for several months but the Axis managed to effect a comparatively unrestricted flow of reinforcements to Africa and, in the event, a strong and effective German/Amy/Air contingent arrived on the western frontier. The British forces were dependent upon Tobruk with an attenuated line of motor transport communications, and the Axis attack of 24 March 1941 met with little real resistance. By 11 April the enemy were once again on the Egyptian frontier; by 27 May they were not only in full possession of Sollum and Capuzzo but also of the pass at Halfaya, and the only remaining British stronghold in Cyrenaica was the besieged port of Tobruk.

Crusader - 18 November 1941 to 20 January 1942

The German invasion of Russia absorbed most of the enemy's reserve forces and removed the immediate threat from the North but the respite could not, at the time, be considered as more than temporary and it was necessary to prepare for a renewal of that threat in the Spring of 1942. This placed a high premium upon the early expulsion of the Axis from North Africa and the summer of 1941 was devoted to preparations of all kinds and to the successful prosecution of the naval/air war against shipping en route to Libya. By the Autumn of the year the Royal Air Force and the Royal Navy had won the battle for seaborne supplies. In

(1) Wavell Despatches.

Egypt, time had been used to great advantage in re-organising training and reinforcing the Air Force for the offensive so that, by the eve of Crusader (1), the British had some 65 operational squadrons based in Egypt, Sudan, Palestine and Malta with a strength of about 823 aircraft. Exclusive of forces dispersed to outlying parts of the Mediterranean, the Axis had 540 operational aircraft (of which 65% were Italian,) and more than 250 transport aircraft. In the battle zone, the British serviceability excelled by about 554 aircraft to 313, a reserve stock of 50% was entirely in the Allies favour as the enemy had none, and the superior performance of the Me 109F was offset by the superior numbers and fighting ability of the Hurricane and Tomahawk pilots. (2) The one black spot was the possibility of the enemy being able to concentrate the forces dispersed throughout the Mediterranean or to bring additional forces from Europe before the battle was won and a safe line secured. The air effort against supplies and against the enemy air forces was therefore stepped-up during the thirty-five days immediately preceding the planned land offensive, and equal accent at high intensity was placed upon the destruction of supplies forward of the ports and upon the attainment of local air superiority during the last five days of this period.

The phasing of air operations before and during Crusader finally shaped the method of applying air power in support of a land campaign. It comprised a battle for and against supplies whilst the air forces designated for direct air support were being prepared for participation in the struggle on land; it prescribed a battle for air superiority both before and during the initial clash of armies; thereafter, the aim of the Air Force was simply to secure local air superiority (for which a maximum effort, from the evening before to the evening after the move forward of troops, was planned) and to use this superiority in providing the maximum support for the Army.

All possible effort was directed towards making the Air Forces mobile for the battle and in the provision of M.T. But time did not permit the adoption of the mobile wing/squadron scheme in which affiliated servicing echelons were to be established separately from squadrons and in which wing headquarters were to be transformed into fully mobile control, administrative and maintenance units. The agreed principle was that, in order to provide uninterrupted air operations during a move of the ground organisation, every unit was to be divisible into two mobile sections either of which should be able to function separately while the other was on the move.

Mobility of fighters had been achieved for Crusader by the division of squadron ground staffs into a rear echelon, two small self-contained echelons with a high degree of mobility, and two wing headquarters which, like the mobile echelons of the squadrons, could leapfrog forward at a considerable pace. (3) The Headquarters Wings were, however, considerably hampered in their operational functions by their responsibilities for administration and, in consequence, they were replaced by a new Operational Group headquarters and three Administrative Wing headquarters. (4)

(1) A.H.B. Narrative. The Middle East Campaigns Vol. II, Pt.V.

(2) Draft Tedder Despatch.

(3) O.R.B. Air H.Q.W D.

(4) O.R.B. No. 211 Group.

The Group headquarters operated in two parties, each with identical mobile operations room equipment, and a third party of signals and radar equipment. (1) The leapfrogging operations rooms were located in convenient positions central or near to the group of forward airfields in order to simplify communications, maintained a plot of radar and observer screen information, controlled defensive and offensive operations, and housed a gun operations room for the Army. The third party was comprised of radar equipment, including an operations room, V.H.F. and H.F. for the control of aircraft by R/T., W/T communications back to the A or B parties, and functioned as a Forward Fighter Control Unit (F.F.C.U.) as well as a source of radar plots. (2)

In order to afford support to and cover the advance of our ground forces it was necessary to prepare and safeguard a series of landing grounds which would allow the Air Force to keep the battle area within range. Fighters with their limited range had to progress by short strides to quickly prepared landing grounds on selected sites and bombers followed with longer strides to take over suitable landing grounds vacated by the fighters. The C.R.E. (aerodromes) was responsible under the Army for construction and an R.A.F. officer was appointed to co-ordinate the work and supervise minor tasks that were an R.A.F. responsibility. Strips came into use as the alternative to large surfaces (that could not always be obtained) during 1941, and, to facilitate communications, control, and the economical concentration of ground defences, the forward fighter airfields were grouped about the controlling Wing Headquarters (No. 211 Group and No. 1 M.O.R.U.).

The essence of the Army plan was to precipitate a battle of armour by means of the XXXth Armoured Corps thrust towards Tobruk and thus effect a junction with the garrison and destroy the enemy close to the British railhead. In the circumstances it appeared not unreasonable that a spirited attack might well result in an overwhelming victory before the enemy could disengage sufficient forces from the Russian front to come to the rescue.

A successful concentration of the Eighth Army (which had been formed in September 1941), an advance to the frontier, (3) and the move of Battle Headquarters and Advanced Air Headquarters to the Maddalena area were followed at dawn on 18 November by the move forward of the armoured brigades of XXX Corps.

Few enemy fighter patrols were reported, and none on D-Day; and it was clear that a combination of counter-air force operations and weather had provided the British with complete air superiority. The prevention of enemy reconnaissance so achieved, in conjunction with effective camouflage, deception and dispersion, gave complete concealment to the concentration of the Army and rewarded the effort of the fighters and bombers with the supreme gift of surprise on the ground. In addition to the above mentioned fruits of battle, the Royal Air Force succeeded in obtaining a good picture of enemy dispositions and at the same time was able to effect a considerable improvement in the offensive ability of the fighter and bomber forces. All this

(1) Elmhurst Report, August 1942. Leigh-Mallory Report II J/15/15.

(2) See page 95 et. seq.

(3) Auchinleck's Despatch.

was achieved at a comparatively low cost, and air operations met with only one major failure. An attempt to sabotage airfields at Gazala and Imimi went awry owing to weather and faulty navigation; but this same weather, in almost putting a stop to the maximum effort covering the initial advance, revealed the wisdom of not husbanding too closely the bomber force for a pre-offensive knock-out blow.

X
Air reconnaissance on 19 November reported some 1,800 vehicles and 80 tanks in the Bir El Gubi area and, as was expected, an armoured battle ensued to the South and South-west of El Adem. All went well until the 21 December and in the haze of battle it was thought, erroneously, that the greater part of the German armour had been put out of action. A move of enemy transport westwards seemed to signify an attempt to break off the battle, but Rommel took the occasion to muster an armoured blow against XXX Corps, and by mid-day the situation was so critical that the hope of a successful break-out from Tobruk was abandoned. On the 22nd the fog of war literally descended on the battlefield, for clouds of dust and smoke raised by the tanks and bursting shells made accurate shooting impossible, and at times it was difficult to tell friend from foe; Sidi Rezegh was captured, only to be abandoned later and, during the ensuing night, the H.Q.'s of the Armoured Brigade, then commanding the last substantial force of British tanks, lost most of its wireless links. A hundred tanks were therefore left without control for twenty-four hours and, during this period, a whole infantry brigade was virtually annihilated.

Despite being blinded from the air and R.A.F. attempts to jam his wireless, Rommel had so far been able to retain control of his mobile forces and outmanoeuvre the British. He re-captured Sidi Rezegh, re-isolated Tobruk (together with H.Q. XIII Corps), took up a position behind an anti-tank screen, and proceeded, unsuccessfully, to try to get relief columns through to Bardia and to drive back the Tobruk salient.

The next British move was to ignore the disputed Sidi Rezegh position and to drive strongly towards the rearwards communications centre of El Adam on 7 December. Rommel was unable to stand up against the combined weight of XIII Corps and the armour of XXX Corps and consequently withdrew to Gazala. A further advance was begun on 11 December, and about half the Axis positions at Gazala were captured by the 16 December, thus precipitating a further enemy retreat. Two thirds of the Axis Army had been destroyed but, unfortunately, the remnants escaped; by 17 December a pursuit in full earnest was in progress. The armour swept through to Mechili and Antelat, but waterlogged country, lack of strength at the spear heads, and resistance at Beda Fomm allowed the bulk of the enemy to get away. Benghazi was entered on 24 December and the surviving Axis forces were back at Agedabia by 26 December, from whence they withdrew to El Agheila in January.

The initial requirement for airfields during the advance had invariably been to provide bases for fighters, which, owing to their comparatively short range, had of necessity to be based well forward for, by keeping air forces close behind the forward troops, much could be done to compensate for the impracticability of sending large land forces in pursuit of the enemy. Convoys with petrol and equipment kept close upon the enemy's heels and during the fighting before Gazala the airfield working parties were, in fact, well in advance of the front line for a period of two days. Throughout the moves of fighters, control was maintained by Nos. 258 and 262 Wings working as a single unit

in which either could retain control of the whole, while the other moved. By 26 December eleven fighter squadrons and one army co-operation squadron were based on MSUS and by 14 January nine fighter squadrons had moved forward to Antelat.

The move forward of bombers, on the other hand, was naturally dependent upon the availability of landing grounds not, or no longer, required by fighters. The Wellington force with its heavy demand on petrol and bombs (and being primarily a strategic force) could, for the most part, be more profitably operated from the bases in the Canal Zone - although for the especially long-range operations it was necessary to provide refuelling facilities at advanced landing grounds. Nevertheless, when the forward line had advanced as far as El Agheila a plan was prepared for moving the force to Benina: but it was forestalled by the German counter-offensive from El Agheila. The situation for light bombers was different, however, for they were required for direct support operations which could brook no unnecessary delay, and consequently (after an initial move to Sidi Barrani - about 70 miles east of the frontier) the Blenheims moved to Gambut and used Gazala and Msus as advancing landing grounds; the Marylands moved to Sidi Rezegh and thence to Bu Amud.

Wellington bombers flew 101 effective sorties by night, against concentrations of vehicles and other pin-point targets, in support of round-the-clock operations during the six day period preceeding the relief of Tobruk. Over the battlefield itself, a force of specially equipped Wellingtons attempted to jam the R/T communications of the enemy armoured formations. The operation was dangerous and the turn-round slow, (1) but the results of subsequent tests with captured equipment indicated that a fair measure of success had probably been achieved. Aircraft operating at 12, 25, and 50 miles distance could jam tank communications between points a half, one, and two miles apart.

Further afield the Wellingtons continued the battle against supplies by the attack of ports, bases, dumps and airfields engaged in air supply. More close at hand the Bombays began, on 20 November, the task of ferrying British supplies, and during the ensuing months the "menagerie" of transport and communications aircraft saved both the Army and the Air Force from many an awkward situation.

The light bomber and the fighter bomber, with the assistance of front-gun fighters, were the primary means of providing support against ground targets engaged through the Air Support Control machinery, as the result of reconnaissance, or by means of offensive sweeps. The light bombers' first active operations under the new organisation took place on the 18 November 1941, the opening day of the battle, when Blenheims and Marylands attacked A.F.V.'s and transport which had been reported by reconnaissance as mu-bound in the Bir El Gubi area. This operation immediately indicated an appreciable improvement in the Blenheim force as the result of recent training, the take-off being effected within half an hour of the orders being issued. But on 20 November at Gabr Saleb and later at Gazala the operations of the light bombers were most gravely restricted by the

(1) Signals Appendix to Draft Tedder Despatch.

difficulty of identification of troops on the ground. (1) In fact the problem of fixing a bomb-line or otherwise providing for the protection of friendly troops was a restrictive influence throughout the campaign. Furthermore, as the requirements of impromptu support took precedence in respect of the light bomber force, much waiting for targets and loss of effort could not be avoided. Low cloud, rain, dust, unserviceability, diversions to contend with the enemy air transport force, the need to have fighters suitably based for the provision of escort, and the shortage of fuel and supplies in the area West of Tobruk, further reduced the effort against enemy land forces. During the three days 25 to 27 November, when the enemy penetrated to the Egyptian frontier, the light bomber effort averaged over 70 effective sorties per day on direct support. But at Gazala the light bomber effort was disappointing and negligible, and for nine days in January the effort was stopped altogether. During the first month while fighting was most intense the light bombers flew almost 900 effective sorties of which about 90% was against direct support targets, an average effort of about 30 effective sorties a day.

The effect of bombing decreased after the first week of operations as the enemy learned the lesson of dispersal and, thereafter, the attack of direct support targets in the forward area was not on a sufficient scale to be a dominant factor in the land battle. Enemy movement was restricted and considerable casualties were inflicted upon thin-skinned vehicles and on certain early occasions, such as occurred from 24 to 27 November 1941, much good was done in checking Rommel's marauding columns and in assisting in the Sidi Rezegh and El Duda areas. Again on 3 and 4 December air attack played a valuable part in turning back enemy columns, but Gazala was a disappointment and it was painfully obvious that until communications and the control of army forces were improved the air force would be forced more than ever to strike the vulnerable enemy tail rather than to give more immediate assistance on the battlefield. The Army could not give the definite positions of its own forward troops and a bomber effort, held for the attack of battlefield targets, was bound to be wasteful.

On the other hand, light bombers by means of a four day effort of 338 effective sorties against fortified positions and gun emplacements within the perimeter of the enemy's defences at Bardia and in an extended effort comprising 281 effective sorties spread over thirteen days at Halfaya assisted in the capture of these fortresses on 2 and 17 January respectively. In the case of Bardia a pre-offensive bombardment by artillery and naval guns was supplemented by 259 sorties and followed up on the first day of assault with a further 79 sorties. At Halfaya the process was more gradual and, although fighters failed to stop JU.52's from supplying the garrison by air, surrender finally came about when the defenders were exhausted from lack of food and drink. These operations, especially at Bardia, (the capture of Sollum was effected on 12 January without help from bombers), were subject to much criticism on account of the lavish expenditure of bomber effort at a time when the need for conservation of forces was greatest; and despite the fact that the object of keeping ground casualties to a minimum was achieved, it was for consideration whether the results of bombing so far behind the forward scene of battle justified the effort and whether artillery might not have sufficed alone.

(1) See Wovser pp. 90 et. seq.

Both fighters and bombers proved effective against concentrations of thin skinned vehicles, especially when these were caught in defiles from which dispersion was difficult. (1) The fighter-bomber by means of high speed shallow dive tactics from about 800 ft. after a previous descent from high altitude, was adept at stopping convoys as a preliminary to ground strafing, but as soon as halted targets were engaged the task became more difficult owing to the increased A.A. opposition that was immediately encountered. (2) The inclusion of a proportion of tracer in front gun ammunition was of considerable assistance to ground strafing, but neither bomb nor machine gun could contend with tanks and consequently, after "Crusader", No. 6 Squadron was re-armed with 20 Hurricanes equipped with 40 mm. cannon for tank-busting. But although bombs failed against tanks because only a direct, and therefore unlikely, hit could be counted as lethal, the Hurricane bomber proved to be a formidable weapon against less well armoured targets. The 20 and 40 lb. bomb was obviously too light, but, given a heavier weapon, it was apparent that a much larger fighter force could be usefully employed.

Despite the usefulness of the fighter in ground attack, the requirements of air superiority had first to be met before any appreciable portion of the fighter force could be directed against military targets. This, and the generally deterring effect of A.A. imposed a limitation upon the extent of material damage that could be expected from direct support operations against ground targets but, fortunately, it was confirmed by events that a considerable benefit accrued from air action above or against troops on the ground, in the form of a strengthening of friendly morale and a weakening of that of the enemy. It was apparent that even though fighters might be largely engaged upon counter-air force operations, the observation of their work from the ground could be of direct benefit to the Army in helping to raise morale; and, more precisely, such counter-air force operations gave specific assistance in the form of defensive support.

Although we had gained a timely victory, it was incomplete. Appreciable enemy forces had escaped and the lack of lighters for unloading at Benghazi and the impracticability of hurriedly installing a defence of the port against air attack, made it impossible to obtain sufficient supplies either to maintain the advance or to hold the ground that had been won. The enemy on the other hand made a rapid recovery and counter-attacked at El Agheila on 21 January 1942. Bad weather successfully prevented full air co-operation in the form of reconnaissance and on 22 January the enemy had pressed forward to seize Antelat. An effort was made to hold the advance but February saw our forces pushed back as far as Gazala.

The three months following the withdrawal to the Gazala line was a period of accumulating supplies for the next battle in which the enemy gained the advantage. The efforts of the R.A.F. to build up its striking power and interfere with the reinforcement of the enemy were being nullified by demands from the Far East theatre. This diversion of aircraft (3) reduced the strength in the forward area to barely equal that of the enemy in serviceable Me,109f's which, with its great tactical superiority was a trump

(1) A.H.B. Narrative, Middle East Campaigns, Vol. II,

(2) Middle East Training, Pamphlets Nos. 3 and 3A.

(3) A.C.C. M.E./34. Pt.I, 16 March 1942.

card in performance, range and hitting power. (1) In April yet another demand for aircraft to meet a threatened invasion of Ceylon diminished the chances of interrupting Rommel's supply lines to Libya. (2) Malta, as an effective base for attack against his sea communications had been largely neutralised; long range Liberators, which would have made possible the sustained bombing of Benghazi, never materialised, enabling the enemy to build up his forces for the coming attack. Consequently, by mid-May the enemy forces were better supplied than they had ever been before and the R.A.F. no longer held air superiority.

Efforts were made, however, to use what air forces there were to the best advantage. More effective use could be made of the fighters by re-organising them under the new No.211 Group, which formed at El Adem on 28 March to control four fighter Wings of four squadrons each. The policy was also embraced of fitting all fighter aircraft to carry bombs, though supply reasons prevented this being done completely. Nevertheless it enabled calls for support to be answered more quickly by the fighter-bombers than if medium bombers had been the only aircraft available. The lesson of Crusader was acted upon and the Air Support Control was moved from Corps to Combined Headquarters where it could achieve more rapid executive action within the framework of the combined Plan. Every effort was made to interrupt the enemy's supplies, but the long range bomber force was too small, (3) although during the period 21 April to the opening of the enemy's offensive 308 effective sorties were made against Benghazi and 54 against shipping.

About mid-May it was clear that the enemy offensive was imminent. Every effort was made to prevent our air reconnaissance from observing troop movements, and air attacks were increased on our landing grounds. (4) Rommel's supply position was at its peak whilst that of the R.A.F. was seriously depleted. He had superiority both in numbers and in the Me.109f. (5) Although the frontline fighter strength of the R.A.F. had been increased, it was short of reserves to maintain it. The bomber force had neither the numbers nor the range to interfere seriously with the enemy's supplies. On the other hand our fighter-bomber force was formidable, morale was high and the force as a whole was well trained and well organised.

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- (1) During February and March, 139 Blenheims were sent to the Far East reducing the light bomber force to two squadrons. In March this was only raised to three. The sending of 300 fighters East reduced the fighter force to four squadrons in the forward area excluding one which was entirely occupied covering Tobruk.
 - (2) The demand was for thirty Hurricane II's, twenty Blenheim IV's and a Beaufort squadron.
 - (3) Tedder Despatch.
 - (4) R.A.F. M.E. Review No. 1.
 - (5) Tedder Despatch.

The attack began on the evening of 26 May and developed on the 27th. Fighter-bombers went into action and fully justified themselves by destroying 200 vehicles. Air Vice Marshal Cunningham was faced, however, on the 28th, with a difficult decision and decided to ignore the fight for air superiority, limit fighters to below 6,000 ft., and concentrate on low attacks. In this particular, success was achieved, and by 30 May the enemy was in trouble from the fighter-bombers. Soon, however, the high wastage caused in Kittyhawks and the gap in deliveries had swallowed up the reserve of these aircraft and we were unable to pursue the advantage. (1) On 2 June, re-organised and under cover of a two day sand storm, he attacked Bir Hacheim and fighters and fighter-bombers were diverted to the protection of the fort, inflicting much punishment. Nevertheless, German armour, by 6 June, was threatening the Knightsbridge area and the air effort was primarily engaged in assisting the Army there. The efficiency of close support reached a high standard, one call for support on 7 June being answered within 35 minutes.

On the night 8/9 June the situation at Hacheim became critical and attacks were intensified to such an extent that the garrison was forced to withdraw on the night 10/11 June, the R.A.F. providing cover for the move during daylight. The loss of the fort permitted the enemy to drive forward towards El Adem and our troops were forced to retire through Tobruk. For a while the enemy was held but, by-passing El Adem he soon threatened our landing grounds at Gambut. A plan was therefore drawn up for a steady withdrawal of the squadrons, keeping them about twenty miles behind the front line. By 18 June the risk in remaining at Gambut was too great and the squadrons withdrew, first to Sidi Azzeia, then to Sidi Barrani. This denied the Tobruk garrison an adequate measure of air support even when long-range tanks were fitted to the fighters.

After the tragic fall of Tobruk on 20 June the enemy advance continued swiftly and without respite, and the whole air effort was directed towards delaying him and protecting our own retreating columns: in the latter role they were eminently successful. The effort was prodigious and there were instances of aircraft doing as many as seven and pilots as many as five sorties in one day. On this occasion the R.A.F. found itself in the novel position of fighting a rearguard action with its bases often separated from the advancing enemy by only a dozen miles or so. To achieve the mobility required in these circumstances the personnel worked behind a screen of R.A.F. armoured cars who were able to give warning of the approach of the German columns and everything on the landing grounds was dispensed with save the barest essentials. Only six aircraft were left behind and everything else that might have been of value to the enemy was taken away.

Mersah Matruh was circled on 27 June and by the 30th Rommel was prepared to attack the Alamein line. The Royal Air Force and the Army threw all they had into the defence, the attacks were held and the line was finally stabilised, but only after repeated enemy offensives in which the R.A.F. played a great part. Although the Afrika Corps were now only sixty miles from Alexandria the enemy relied on long lines of communication and it was essential for him to draw breath before he could attempt another move forward. In this he was forestalled by the Eighth Army and a reorganised and strengthened R.A.F.

(1) D.A.O.C./5, Pt. II.

Much had taken place in the desert during this eventful period. American medium bomber and fighter squadrons had arrived necessitating a change in the organisation of the air forces. Accordingly, as one measure, No.212 Group was formed on the same lines as No.211 Group, thus making two mobile Fighter Groups in the Command. (1) The day bomber force was expanded to two Wings, thus making it more manageable, and the heavy bombers were strengthened by two groups of U.S. Liberators. By the 22 October the R.A.F. in the Middle East (excluding Malta) had 926 operational aircraft ready to play their part in the coming battle. These are tabulated as under:-

<u>Type</u>	<u>Strength</u>	<u>Serviceability</u>
Single-engined fighters	452	89.8%
Twin-engined fighters	27	77.8%
Night fighters	25	92%
Light bombers	115	86.1%
Medium bombers	75	70.7%
Torpedo bombers	61	67.0%
Heavy bombers	24	37.5%
Army co-operation and recce:	101	81.0%
Coastal and miscellaneous (Inc: F.A.A.)	46	63.0%

Note: The above table does not include United States aircraft.

As well as the training of the air forces advantage had been taken of the lull to build up the signals organisation to an unprecedented degree. Communications both on land and between the air and ground were improved, notably by the extended use of V.H.F. R/T, with the result that the efficiency of air support was considerably enhanced. Much of the signals equipment was adapted for rapid movement, one C.O.L. station, for example, moving 740 miles across rough desert in seven days of the advance.

Meanwhile the policy of hitting hard and constantly at the Axis' supply ports was continued. From 6 September to 22 October the R.A.F. carried out 183 heavy and 903 medium bomber effective sorties against these objectives, with Tobruk as the predominant target. U.S. Liberators during the same period flew 120 effective sorties in attacks on enemy ports, including 80 sorties against Benghazi, upon which the enemy had had to place more reliance due to the successful attacks on Tobruk. As a result of these offensive measures against his communications, Rommel was reduced to flying petrol into North Africa due to the heavy losses he had sustained in tankers bringing in this vital commodity.

Enemy attempts to reconnoitre at high altitudes with Ju.86's, the preparations being made were stopped by a specially stripped Spitfire that carried only two .303 guns with which to knock out one of the Ju.86's engines and thus bring the intruder within range of an accompanying standard Spitfire. Furthermore, after a heavy rain beginning on the 6 October, the enemy landing grounds

(1) Draft Tedder Despatch.

had become waterlogged a few days later and the Allied plan for a four day counter air offensive immediately before the battle was anticipated by a day and night attack on enemy airfields by fighters, light bombers and Wellingtons. Attacks were renewed on 19 October, and, by the time the full air offensive opened for the battle the Air Force had scored an important tactical success.

El Alamein. 23 October to 4 November 1942

The enemy positions now stretched in a strong defensive line from the coast west of Alamein to the impassable Quattara Depression, and armour was disposed in groups behind this front. Since frontal attacks alone were possible, and the density of gun and minefield defences precluded an initial assault by tanks, the Eighth Army planned to clear a gap in the northern sector with infantry and to follow through with armour to engage and destroy the enemy's tanks in open country. The plan also involved limited thrusts in the centre, in order to draw the enemy's fire, and an assault in the south to occupy the enemy armour in that sector. Extensive changes of disposition in the battle area and a quick move forward of armoured forces was required and could only be achieved successfully if the enemy air forces were prevented from observing and interfering with their movements. In the event, the counter air force operations had been amply sufficient to achieve these ends and to ensure adequate air superiority during the battle.

By 22 October the preliminary Army moves were complete and tactical surprise was virtually certain. At 21.40 hours local time on 23 October the heaviest artillery barrage ever heard in Africa preceded the Eighth Army's attacks along the entire front twenty minutes later. In support of the attacking troops, and to supplement the artillery barrage, continuous attacks were carried out during the first night by 66 Wellingtons and 24 Albacores in the northern and southern sectors. Particular attention was paid to gun positions, leaguers of armour and encampments and, to the immediate rear, much confusion and damage was caused by 30 night flying Hurricanes which strafed ammunition trucks, field guns, dumps, vehicles and transport repair shops. By dawn, 24 October, two gaps had been made through the minefields in the northern "six-mile" sector as planned and, during the day, these positions were consolidated with the assistance of light bombers that ceaselessly attacked vehicles near the gaps. The Hurricane IID's had a successful day of "tank busting", bombers and fighter bombers raided forward landing grounds, Spitfires and Hurricanes patrolled over the forward areas, and Hurricanes provided cover for the assembled armour that was waiting to pass through the gaps (but was as yet deterred by the commanding position of the enemy anti-tank guns).

A dispersal of the enemy's forces was achieved during the 25 October by concentrated artillery fire in combination with air attacks by light bombers and fighter bombers (that continued their assaults against vehicles, gun emplacements and landing grounds) but the enemy armour had still to be defeated. A further attempt by the enemy to concentrate and develop a counter attack was again prevented, largely by light bombers, on 26 October, and concerted enemy attacks by armour and infantry were repulsed by our land forces, with the assistance of ten separate bomber attacks, on 27 October - while the fighter bombers engaged similar concentrations of transport in the central and southern sectors where the flak was less formidable, and fighters continued to rule the air.

On 28 October 1942 the enemy made a final effort to develop a full scale armoured counter attack. At once the light bomber force went into action against the enemy's tanks and vehicles, which were concentrated in an area three miles by two. Seven attacks were made, and bombing was so devastating that the planned attack was abandoned. Little assistance was given to the enemy by his air forces, which seemed unable to deviate from the set plan of sending over heavily escorted Stuka formations, in spite of the heavy losses sustained "and the many occasions when bombs were jettisoned over Axis troops (when the German aircraft were threatened by Allied fighters). From 29 October to the evening of 1 November the fighter bombers wrought havoc on vehicles, gun emplacements and encampments, and seriously reduced the capacity of fresh enemy formations to resist the subsequent onslaught of the British land forces. The dispersal of enemy vehicles during this four day period left few targets in the battle area for the bombers but this merely reflected the extent to which the enemy failed to concentrate for and stage an effective counter attack.

On the night of 1/2 November the British land forces struck westwards with the support of Wellingtons and Albacores. By dawn a way had been forced between the enemy armoured divisions and the British armour went on ahead of the infantry. The light bomber "shuttle" service went into action again to break up an attempted enemy counter-attack from the north and, on 3 November, reconnaissance reported signs of withdrawal. Soon the coastal road from Ghazal to Fuka was packed with traffic moving west, and our light bombers and fighter bombers had an opportunity for merciless destruction which they did not neglect to accept. By night, Wellingtons and Albacores kept up the good work. In these conditions the enemy was unable to mass for more than a momentary stand at Fuka on 5 November and the pursuit rolled on".

The Battle of El Alamein may be assumed to have ended on 4 November 1942 just twelve days after it began on land, and four days before the Allied Expeditionary Force landed on the shores of North Africa. Less than a third of the enemy escaped and by 25 November the British were again at El Agheila. At this stage the full benefit was felt of the battle in progress in Tunisia and the enemy withdrew from El Agheila on the night of 11/12 December. By the end of the year, Buerat had been reached and the enemy had decided to evacuate Libya completely. Tripoli was entered on 23 January, 1943, and the remainder of Tripolitania was cleared by 6 February.

Tunis and Bizerta (1) 17 April 1943 to 13 May 1943

The Battle of El Alamein was over and victory had been achieved in the East before the Anglo-American Expeditionary Force made its landings at Algiers, Oran, and Casablanca (Operation Torch). As a result, Allied prestige prospered, no Spanish intervention was encountered, and French resistance was over in two days. By 28 November the British First Army was only twelve miles from Tunis, but at this stage bad weather, enemy tanks, and enemy dive bombers intervened and forced a withdrawal to Medjez. The immediate advantage in rate of build-up rested with the enemy and for some time the Allies were primarily concerned with consolidation and build-up while the Eighth Army advanced rapidly to the Southern frontier.

(1) Alexander Despatch.

The first phase of the campaign, from 18 February to 15 March 1943, as far as the North West Tactical Air Force was concerned was primarily one of preparation for offensive action and the repulse of enemy counter-attacks. Operations were governed by the need to conserve resources and to train units and consequently the force only worked under pressure when a critical ground situation required it. The Western Desert Air Force was not at first faced with any critical ground situation, but, the German thrust through the Kasserine Pass was threatening very large Army supply dumps. The German advance was halted on 21 February, XII Air Support Command supported by the Strategic Air Force continued to operate at high intensity, and the Western Desert Air Force attempted diversion by large scale action against landing grounds and positions in the Mareth Line. From 26 February into March the maximum Spitfire, Hurribomber and Mitchell effort of No. 242 Group was unleashed against an enemy attempt to capture the Medjez El Bab Salient - the fighters were given permission to strafe any moving target - and after severe fighting the attack was held. On 6 March the Africa Corps attacked the Eighth Army. But enemy air attacks were successfully dealt with, while the Strategic Air Force bombed enemy airfields, and by 7 March, the Africa Corps having been trapped in an exceptionally heavy concentration of gunpower, was defeated on the ground and in the air, and the Western Desert Air Force turned to the offensive on his retreating columns.

The second phase, from 15 March to 6 April 1943 was centred upon the Eighth Army's frontal attack and the successful out-flanking movement at Mareth. For three days, beginning 19 March, the tactical bombers raided enemy airfields in force and for the second and third day were supplemented by a maximum effort by the Strategic Air Force. One of the outstanding features of these attacks was the use of fragmentation bombs and, although material damage was not in a high proportion to the bombs dropped, only five enemy aircraft appeared over the Eighth Army front. Again, on 22 March, while the Western Desert Air Force was carrying out its maximum effort in support of the Army, the enemy forward landing grounds were attacked every fifteen minutes by heavies or mediums and he was unable to interfere in the operation. Continuous bombing, fighter interceptions, and the land threat kept the enemy air force in check and forced it back from the battle area until finally, by the end of the period, the G.A.F. had ceased seriously to contest air superiority. In the meantime, beginning on the night 19/20 March, the Western Desert Air Force laid a maximum bomber effort on the Northern Sector of the Mareth Line in support of a frontal attack by infantry, while fighter bombers supported the New Zealand Division on moving targets on the south flank. On 22 March the accent of the battle was shifted to an outflanking thrust by the New Zealand Division through El Hamma and the 15th Panzer Division to force the Northern Sector to retire or be cut off. Between 1515 hours and 1700 hours, 500 fighter, fighter bomber, bomber and tank-buster sorties were carried out within an area of two or three miles and within 1,000 yards of our own troops. This was a complete success and only thirteen pilots were lost (46 of our fighters were destroyed or seriously damaged) but it was realised that the conditions for such an operation were (a) tactical surprise (b) poor visibility with regard to the sighting of aircraft from the ground - one half mile visibility on this occasion and (c) no reasonable possibility of interference by enemy aircraft. The Mareth position was now out-flanked and the enemy withdrew (under the fortunate cover of bad weather with dust) to the Wadi Akarit position, which was broken on the night of 6 April.

The third phase, from 7 April to 16 April, featured the headlong retreat of the enemy to Enfidaville, under the convincing threat of air forces which, subject to weather, could make the roads leading north untenable. All available aircraft from Western Desert Air Force and XII Air Support Command attacked enemy columns with devastating effect on 7 April; the Western Desert Air Force continued alone on 8 April owing to the Tunisian forces being grounded by weather; and No. 242 Group, XII Air Support Command and Tactical Bomber Force continued with fighters, fighter-bombers, light and medium bombers from then until 16 April - during which time the Western Desert Air Force was unable to keep within range. Throughout the whole of this period the enemy air force was disorganised and did not operate in any strength in the battle area.

The fourth and final phase, from 17 April to 13 May, was concerned with the attack on Tunis and Bizerta and the collapse of the Axis forces. Following the withdrawal of the enemy to the Enfidaville position the Air Forces moved forward to a position where they could operate over the Cape Bon Peninsula and Tunis - thus bringing fighters and day bombers into the closest association - but the two night Bisley squadrons remained back with the French night bomber unit at Biskra. No. 242 Group with its Headquarters alongside First Army was the main control on this front with XII Air Support Command and Tactical Bomber Force working in close co-operation, and Desert Air Force would continue to operate on Eighth Army Front. No's 242 and 211 Group Controls (main and forward as applicable) were responsible for the control of all aircraft in the battle area. A division of territory was agreed between No. 242 Group and Western Desert Air Force using the Majerda River, running southwest from Tunis, as the common boundary, and the tasks set for the Tactical Air Force were as follows:-

- (a) To destroy the enemy air forces in Tunisia.
- (b) To disrupt the enemy's vital supply lines by air transport and by sea.
- (c) To give maximum support to the Army on their final drive through.
- (d) To employ every available aircraft to attack shipping or air transport if the enemy attempted a "Dunkirk".

The air offensive against occupied landing grounds were continued from 17 to 21 April, by the whole Tactical Air Force, less that part of Western Desert Air Force employed against air transport, and supplemented by the Strategic Air Force whose Fortresses attacked the heavy flak defended airfields at Tunis and Bizerta. From 22 April onwards the German Air Force withdrew from North Africa with the Ju.87's in the van of the retreat. Except for isolated operations from Sicily and a light scale of attack by fighter bombers from forward landing grounds in Africa, the G.A.F. ceased to play any serious part in the battle, and 6 May, when the enemy lost twenty fighters in three hours, was the last occasion on which any enemy aircraft appeared at all. On 8 May, 120 light and medium bombers and 96 P.38's attacked the landing ground and air installations on Pantelleria and seem to have been decisive in denying the base to the Luftwaffe.

From 28 April until the final surrender, fighter bombers were available for anti-shipping strikes. A striking force was held at readiness for this attack on shipping sighted by air reconnaissance, which was flown continuously and left little

opportunity for shipping to get through unseen. Armed reconnaissance, looking for air transport, had shipping as a secondary object and attempts to move shipping by night were frustrated by the Navy. During the period some 43 craft ranging from destroyers and 3,000 ton M.V.'s to small boats were destroyed or damaged by the Tactical Air Force.

At all stages of the Tunisian Campaign, air transport was a necessary line of supply for the enemy, especially when shipping losses increased and the supply position of the Axis armies became strained by continuous battle expenditure. A full scale mass attack by the Strategic and Tactical Air Force, on 23 March, had been made against transport landing grounds in Sicily, Italy and North Africa while P.38's and Spitfires had flown sweeps to intercept transports and enemy fighters in the air. Thereafter, the accumulative effect of attacks had substantially reduced the air transport effort and forced the enemy to provide heavy fighter escort for each convoy, and the Strategic Air Force had not been required to repeat its full scale effort. From 12 April, however, the enemy air transport in use had begun to increase again and the Me.323, with a capacity four times that of the Ju.52, had come into extensive use in large convoys of not more than two a day, with short range fighter escort provided from both ends of the route. But from 16 April Western Desert Air Force was located on forward landing grounds north of Sousse and was able to operate the whole Spitfire and P.40 force over the Bay of Tunis and consequently, the intensified enemy air transport effort was short-lived. Sweeps were flown with never less than three squadrons of P.40s and one squadron of Spitfires as top cover and on 18 April fifty-two Ju.52s were destroyed out of a force of about eighty and practically the whole of the remainder crash-landed on the beaches of the Cape Bon Peninsula. On 20 April a further twelve transports were destroyed and on 22 April twenty-one Me.323s were intercepted and all destroyed. The enemy was now convinced that an effective air blockade was in being and no further attempt was made to use air transport in day-light hours.

From 17 April, attempts were made to break through the German defensive line with the assistance of full air support but, by 29 April, it was clear that only an attack in great strength directly on Tunis, could succeed. This was to be supported by the maximum air power available.

Air attack began on the evening of 5 May with a preliminary bombing in the Zaghuan Area to soften positions on the ground that were to be attacked that night. The following day, starting at first light, a moving barrage of air support on the Axis Medjez to Tunis successfully blasted through enemy positions for the first time in any war by laying a four miles by one thousand yards "carpet" of bombs. This was done at small loss with over 2,000 aircraft sorties and, later, in Italy the technique was developed, (under the code name of Timothy), as a carefully timed and co-ordinated ground and air attack. The supporting air force was given the axis of advance, the width of front, the startline and zero hour and, when the time came the artillery put down a clearly defined bomblines with a combination of coloured smoke - such as blue in the centre with white either side and red on the flanks - about 200 - 400 yards in front of the forward troops. The bomblines was usually about 1,000 yards in extent and, if a second phase was required, would be moved forward about 1,000 yards. Fighter bombers would be despatched in waves of twelve aircraft at intervals of ten minutes and would attack all buildings and military activity with bombs, R.P. and cannon from the smokeline to a depth of 1,000 yards. Late in the Italian

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campaign, hostile batteries had also to be attacked simultaneously with the primary support, for as the enemy learned the significance of such tactics, strong defensive fire was likely to be begun as soon as the smoke bombline ceased.

By the afternoon, 6 May, the advance was ahead of schedule and consequently Army calls had to be waited for and this lessened somewhat the scale of air attack. By the evening the battle for Tunis had been won, with the help of 2,154 direct support sorties during the day, and on 7 May, Tunis and Bizerta were entered.

The ground situation was now changing too rapidly for support calls to be awaited or acted upon and the air forces were directed to disrupt the movement of the enemy's already disorganised forces. The last of the enemy between Tunis and Bizerta surrendered on 10 May and the enemy attempting to reach the Cape Bon Peninsula were surrounded the same day. The air force maintained pressure until the final surrender on 13 May but as no "Dunkirk" was attempted no final attack against shipping or air transport was needed.

During the campaign from 18 February until 11 May 1943 Tactical Air Force Units completed 59,000 sorties and claimed the destruction of 573 enemy aircraft, more than 500 motor transport vehicles, 23 miscellaneous ships and finally, provided the largest weight of air attack ever undertaken in support of a ground battle to that date.

The main lessons of this Tunisian campaign affecting operations included the following:-

- (a) U.S. and British Air Forces could work closely together in operational tasks and units were interchangeable. With mixed U.S. and British Air Forces it was desirable to have an integrated staff at main headquarters.
- (b) Despite widespread dispersal the G.A.F. could be demoralised by sustained bombardment of his airfields. The use of superior equipment (such as the Spitfire IX) as a surprise had a most detrimental effect on enemy morale.
- (c) The fighter bomber with experienced pilots was a most versatile weapon and could be rapidly switched to a variety of targets with confidence.
- (d) Ground signs put out by the land forces were of great help to close support bombing and the use of pathfinders materially increased the efficiency of night bombing.
- (e) Except in emergency low flying strafing attacks should only be carried out against an enemy suffering from disorganisation (or otherwise unable to adequately defend himself).
- (f) The standard of G.A.F. airfields was much lower than that required by the Allies. Somerfield tracking and Pierced Steel Plank required a base such as sandy soil, that would not be unduly softened by rain and, in any case, considerable maintenance was required on a tracked field in constant use. A measure of control at Tactical Headquarters in the field was required over the Airfield Construction Units.

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- (g) Specialist aircraft such as the "tank-buster" was uneconomical. The one squadron with Western Desert Air Force travelled 2,000 miles in four months but only operated for about a week during which damage to aircraft was very heavy.
- (h) The U.S. fragmentation cluster bomb was a most effective weapon.

An admitted mistake (1) was made in the organisation of air forces to support the Allied Expeditionary Force in North Africa for it provided for two separate air commands (R.A.F. Eastern Air Command in the East under Air Marshal Welsh with headquarters at Algiers and Twelfth U.S.A.A.F. in the West under Brigadier General Doolittle with headquarters at Oran) and when the battle flared up in Tunisia it was necessary for the British Air Commander to take control of the whole force under conditions that had not been foreseen in planning. Needless to say, the arrangement did not work. General Spaatz U.S.A.A.F. was therefore appointed Allied Air Commander in Chief in North West Africa and, a month later on 19 February 1943 one Air Commander-in-Chief, for the whole Mediterranean theatre was appointed (A.C.M. Tedder).

The Mediterranean Air Command contained three subordinate commands: Malta, Middle East and North West Africa Air Force under General Spaatz.

Pantelleria and Lampedusa - 29 May to 12 June 1943

At the end of May 1943, it was decided that the capture of Island of Pantelleria was an essential preliminary to the assault on Sicily in order that the airfield should be available as another base, in addition to Malta, from which to operate fighter aircraft in protecting shipping and beaches in the assault stage. (2) Lampedusa, Linosa and Lampiøre, which also lay across the Allies' path, were to follow. It was appreciated that an assault on Pantelleria would be impracticable against determined resistances owing to the strong fortifications and the restricted beach landing areas and, consequently, the main structure of the plan was to weaken the garrison by continuous bombing on an increasing scale prior to the assault and to neutralise the assault areas by air and naval bombardment. The final assault by land forces was then to be made by one British Division.

The air forces available were the Strategic Air Force and the Tactical Air Force (less the majority of Western Desert Air Force which was returning to Tripoli to prepare for Husky). An advance element of HQ North African Air Force was established at Sousse where it formed a combined headquarters with the Naval and Army Staffs controlling the operation, and these embarked in the HQ Ship from which communications were maintained to the air forces on land and in the air.

A small raiding party on the night of 28/29 May reported the island in a state of alert and, beginning 29 May, the island was attacked every day and on all but one night, until its capitulation. Messages were dropped on 6 June demanding

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- (1) Eisenhower Despatch.
 - (2) Report by N.A.T.A.F. and War Room Summary.

surrender, and the display of a white cross on the airfield, but this was not accepted and, on 7 June, the aerial bombardment was greatly intensified. A feature of this effort was the introduction of the Mustang fighter bomber for the first time in North Africa. A further demand for surrender, giving a two-hour time limit, was made on 10 June but was again unanswered and the effort was brought to a climax when 1,375 tons bombs were dropped in 1,145 sorties. In the period from dusk 4 June to the surrender on 11 June, 2,792 bomber and 972 fighter bomber sorties dropped 4,538 tons of bombs. An interesting comparison is afforded with the evening attacks on Malta during 1942 when in the most severe week, between 19 and 25 April, 1,267 sorties dropped 2,478 tons.

The assault force left Sousse during the night 10/11 June and at 1137 hours 11 June, after an almost unopposed landing, the white flag was hoisted and a cross appeared on the airfield. Subsequent examination showed that 53 out of 112 gun sites on the island had been neutralised (although only two had suffered from direct hits) and that practically every position in the areas attacked had been wrecked and communications severed. The latter must have been the cause of the offer to surrender radioed to Malta by the Italian Admiral commanding the island: "Beg to surrender through lack of water", as examination revealed stocks of water in both public and private reservoirs and adequate stocks of food remained. The town of Pantelleria was almost totally destroyed, yet by contrast, the eastern end of the island was practically untouched.

At mid-day 11 June, following the capitulation of Pantelleria, the bomber effort was switched to Lampedusa and the 15th Cruiser squadron was ordered to bombard the island and call for surrender. By 19.45 hours 12 June, when the garrison surrendered, 445 tons bombs had been dropped. The morale of the troops was higher than at Pantelleria, probably due to the less concentrated bombing, but 11 out of 33 guns had been neutralised by splinters. Linosa surrendered to a destroyer at 0456 hours 13 June and Lampiøre was found deserted on 14 June.

None of these operations was seriously contested by the Axis air forces.

The following lessons were recorded in the Tactical Air Force report on the operation:

- (a) Even with a vast quantity of bombs, very few direct hits were obtained on coast defence gun positions. The majority of neutralisation was effected by near misses within 5 to 10 yards of the target. This limitation of the effective range of the burst was, however, largely due to the fact that bombs were fused with a 0.025 seconds tail delay fuse and, consequently, it was considered that instantaneous action bombs should be used for blast effect against unscreened equipment.
- (b) There was little to support the view that low flying fighter attacks against gun positions produced more than a temporary intimidating effect and, consequently, rocket projectiles or other heavy armament, such as the 75mm gun mounted in the B25, should be tried.

Sicily - 10 July to 17 August 1943 (1)

The Sicilian invasion, known as Operation Husky, was carried out by the American Seventh and British Eighth Armies. Direct support for the land operation was supplied by Desert Air Force, XII (U.S.) Air Support Command and Malta, assisted by the Strategic and Coastal Air Forces under the overall direction of the Air C-in-C Mediterranean Air Command. Convenient to his Headquarters the subordinate Commands (Tactical, Strategic, Coastal and Troop Carrier) set up Command Posts, thus virtually establishing one large Headquarters at La Marsa, near Tunis. The Air Support Control was at Malta, in the R.A.F. War Room, together with the representatives of H.Q. Eighth Army and with Advanced H.Q. Desert Air Force, which at that time was in Malta prior to moving to Sicily. (2)

Major planning had been completed while the battle was in progress in North Africa. Executive action with the subordinate formations was initiated from a joint planning centre at Algiers in accordance with the following outline plan:-

- (a) A preparatory phase, beginning at the close of hostilities in Tunisia and lasting throughout the operation, to neutralise the enemy air forces in Sicily.
- (b) A pre-assault stage during which convoys were to be escorted to their assault areas.
- (c) An assault stage during which eight pre-dawn landings were to be made on five beaches on the southwest corner of Sicily; two landings on "Acid" beaches to capture the port of Syracuse, three landings on "Bark" beaches to capture the airfield at Pachino and to support the "Acid" assaults, and one landing on each of "Cent", "Dime" and "Joss" beaches with the object of capturing the airfields at Comiso, Ponte De Olivo, Biscara, Gele and Licata and the port of Licata. This stage therefore offered the prize of two ports and six airfields and the main air task during its execution was the protection of shipping and the beaches by night and day, with a subsidiary task of attacking enemy movements towards the assault area.
- (d) A final phase during which the Air Forces were to operate in direct support of the advance from the beachhead to the capture of the whole of the island.

The Strategic Air Force maintained spasmodic attacks on ports and airfields in Sicily from the close of the Tunis campaign but the scale of attack was increased to a sustained medium and heavy bomber effort from 20 June 1943. The Ninth (U.S.) Air Force in Cyrenaica assisted with occasional attacks and Malta provided escort for bombers of both formations as the occasion demanded. The results were devastating. From 3 July Tactical Bomber Force added its weight to the attack by day and also, with the aid of Wellingtons harassed all airfields on an increasing scale by night. In addition, two new United States B.36 (Invader) Groups gained valuable experience and a knowledge of Sicily (that was later to prove extremely valuable) by the attack of selected objectives such as road and rail movement, radar stations and camps.

- (1) IJ5/8. Signals Report on Amphibious Operation in the Mediterranean. July - September 1943.
- (2) IJ5/92. Report on Ops. of N.A.T.A.F. in Capture of Sicily.

Enemy air opposition decreased rapidly before the onslaught and on 9 July only two airfields were in use on the western end of the island, intermittent use was being made of Comiso, and only slight activity was visible on two of the Gerbini satellites and at Catania Main. New strip airfields with a few fighters were found at Enna but in the main, the enemy air force was broken and little further effort was required to effect complete neutralisation. Flak was on the increase at the airfields that remained active but the effort continued.

From 8 July onwards, a heavy pre-occupation was the protection of assault convoys but the anticipated high scale of enemy air effort did not materialise and the convoys were entirely unmolested by air attack. The weather and the state of the sea suddenly deteriorated on the morning of 8 July but died down in the evening and the landings were begun as planned, at 0245 hours on the 10 July. Tactical surprise was achieved and very slight opposition was encountered from coastal batteries. The ports of Syracuse and Licata and the airfields at Pachino and Licata were captured; on 11 July the port of Augusta and the airfields at Comiso and Ponte de Olivo were taken; by 13 July an advance was in progress in all sectors.

In anticipation of a full enemy air offensive upon shipping and beaches on "D" day continuous patrols were flown over two beaches throughout the hours of daylight and over all landing grounds for the first two hours, from 1030 to 1230 hours, 1600 to 1730 hours, and for the last one and a half hours of daylight. Additionally, one Wing was retained at readiness to re-inforce any area as occasion demanded. The anticipated high scale of enemy air effort did not materialise in full but attacks by day on 11 and 12 July involved a large number of enemy aircraft and much air fighting. By last light, 10 July, only 12 out of about 2,000 ships had been damaged by air attack and, from 11 July, the enemy concentrated mainly upon a day fighter-bomber effort and a night effort. To counter this night effort, three G.C.I.s had been mounted in L.S.T.'s for employment off "Joss", "Bark" and "Acid" beaches, where they were to act as forward controls for Malta G.C.I., and Beaufighters, Hurricanes and Mosquitoes were provided from Malta, with the result that 45 enemy aircraft were claimed as destroyed during the six nights beginning 10/11 July.

Airborne landings employing about 350 aircraft under the control of Troop Carrier Command were synchronised with the seaborne assaults. Mainly glider-borne landings were made in the Syracuse area and paratroops were dropped in the Ponte de Olivo area but the former were adversely affected by a strong wind from the northwest and poor navigation which resulted in a proportion landing in the sea or just on shore. Diversionsary attacks in the Catania area and in the vicinity of the dropping zones were carried out by Tactical Bomber Force and searchlights along the routes and in the dropping zones were attacked by Hurricanes from Malta. The Tactical Bomber force also provided navigation markers by dropping incendiary bombs in the paratroops' sector. This was the largest airborne operation so far attempted by the Allies and bearing in mind the limited experience of the crews of the transport aircraft the result was satisfactory although "not emphatically successful".

In addition, the two (U.S.) A.36 Groups, re-inforced by the two P.38 Fighter Bomber Groups flew formations of twelve aircraft throughout the day, beginning 10 July, against traffic on the routes leading to the beachhead. At the outset targets were scarce but traffic tended to increase as the day wore on and a considerable number of M.T. was destroyed. Under this scale of attack traffic was not allowed to develop and road and

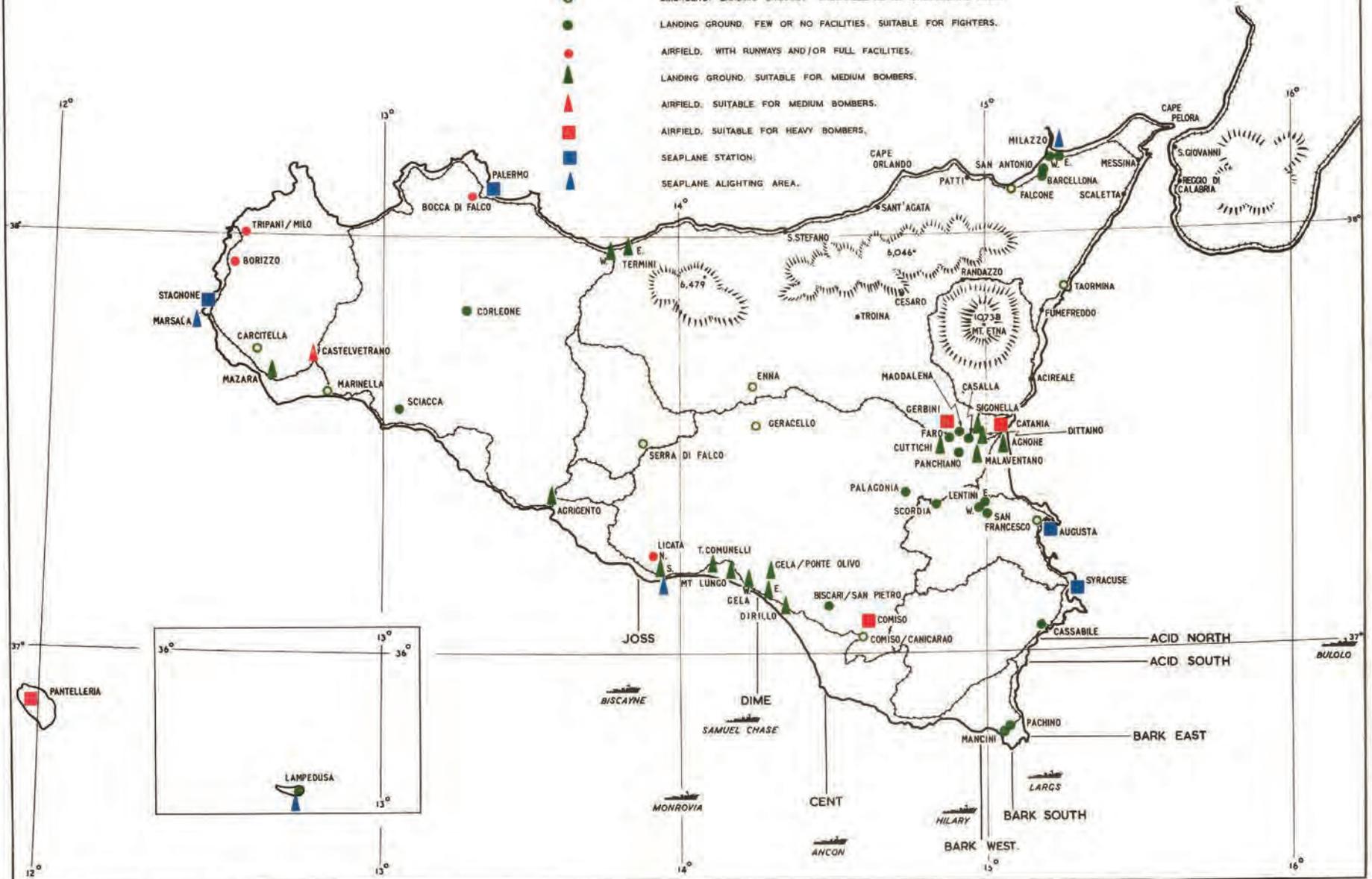
SECRET.

THE SICILIAN CAMPAIGN.

10TH JULY — 17TH AUGUST 1943.

LEGEND.

-  EMERGENCY LANDING GROUND. UNSUITABLE AS AN OPERATIONAL BASE.
-  LANDING GROUND. FEW OR NO FACILITIES. SUITABLE FOR FIGHTERS.
-  AIRFIELD, WITH RUNWAYS AND/OR FULL FACILITIES.
-  LANDING GROUND. SUITABLE FOR MEDIUM BOMBERS.
-  AIRFIELD. SUITABLE FOR MEDIUM BOMBERS.
-  AIRFIELD. SUITABLE FOR HEAVY BOMBERS.
-  SEAPLANE STATION.
-  SEAPLANE ALIGHTING AREA.



rail movement was quickly reduced to small proportions. During the subsequent days the attack spread over the whole island and resulted in complete dislocation of enemy movement.

The control of the air forces during amphibious operations catered for day and night fighter cover over the assault convoys and beaches, tactical reconnaissance, intruder, fighter-bomber and air/sea rescue operations, light, medium and heavy bombers and photo reconnaissance and air transport, (1) All aircraft had to operate from the launching territories until airfields could be secured ashore in the assaulted territory for the priority use of fighters (2) and headquarters and control centres had to be located in the launching territory, afloat and finally ashore on assaulted territory. The basis of this control was as follows:-(3)

(a) On launching territory

- (i) An Air Command Post for the overall direction of air operations and subordinate headquarters for the control of tactical operations, and to arrange and provide assistance by bomber, photo reconnaissance and transport aircraft.
- (ii) A radar organisation and a broadcast system.
- (iii) A central fighter operations room or despatching agency for the control of day and night fighters, tactical reconnaissance, intruder, fighter-bomber and air/sea rescue operations.

(b) Afloat

- (i) Short range on cruisers, monitors and A.A. ships, long-range radar on naval fighter directing ships and on certain American H.Q. ships and G.C.I.'s mounted in L.S.T.'s.
- (ii) H.Q. ships for each assault area (and one stand-by H.Q. ship) fitted to accommodate H.Q. staffs and to operate as forward fighter controls using information received from broadcasts and, when fitted, from their own radar.
- (iii) A naval fighter directing ship with each main H.Q. ship to provide information from its long range radar, but not to control (except in the case of the control of the F.A.A. carrier-borne aircraft at Salerno). It was considered necessary to limit the function of control to H.Q. ships as the naval controllers on the fighter directing ships were not sufficiently briefed or in the air picture to be certain of keeping the few available fighters within the most important patrol areas.

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- (1) Signals Report M. Amphib. Ops. in Med, IIJ5/8.
 - (2) For the assault on Salerno some Fleet Air Arm fighters operated from carriers.
 - (3) The control system described applied to both Sicily and Salerno with a few exceptions which are noted.

In retrospect, however, it was evident that there was no basic reason why controllers and H.Q. staffs should continue to be crowded together on the one ship, with an over-complicated communications system, and, consequently the provision of separate Air Force Fighter Directing Ships was recommended. (1)

(iv) Three seaborne G.C.I.'s were used at Sicily for the control of night fighters. (2)

(e) Ashore on assaulted territory

(i) On D-Day the R.A.F. Forward Fighter Controls with a G.C.I., two light warning sets and a skeleton W.U. of 5 posts in jeeps went ashore on each of three assault beaches; a similar U.S.A.A.F. organisation consisting of an advanced section of main fighter control went ashore on a fourth beach; a fifth beach had no control landed ashore on D-Day. The purpose of these controls was to relieve the H.Q. ships. (3)

(1) See Invasion of North West Europe pp. 122 et seq.

(2) This was reduced to two at Salerno,

(3) The Forward Fighter Control consisted of the following:-

- (i) A.C.O.L. Station.
- (ii) A light warning set,
- (iii) A V.H.F. R/T Station,
- (iv) W/T channel to the main fighter control centre,
- (v) W/T channel for reception of plots from the G.C.I. or M.R.U. Station,
- (vi) Trailer operations room.

Squadrons were sent out under the Fighter Control Centre and then called F.F.C. by R/T. The function of informing close support aircraft and bombers of changes in the position of the target was the duty of the Forward Control Post and Visual Control Post or "Rover" (q.v.)

The Control Centre at Group embraced the Intelligence Staff, Mobile Gun Operations Room, Controller, "Y" Officer, Forward Bomber Control, Operations staff, and H/F receiving cabins all housed in four vehicles. Information received was plotted direct on to the table and tracks were selected by the Controller. Bomber missions were co-ordinated with fighters and controlled through the Forward Bomber Control which was in touch with the bomber formation. This was, in effect, the working equivalent of the Mobile Operations Room Unit (M.O.R.U.) formed in the U.K. in October 1942. The unit eventually became the Group Control Centre used in the invasion of N.W. Europe. The original No. 1 M.O.R.U. arrived in Sicily between 19 and 24 July 1943 and a Gun Operations Room and Bomber Operations Room were added to it. The Mobile Air Reporting Unit was not incorporated in the new control organisation in Italy as it was a handicap in a mobile operational area and sporadic attacks were acceptable to the Army and could be countered adequately by M.O.R.U. control and A.A. and small arms fire.

(IIJ1/22/53, 17A and 18A. T.A.F./51/1/Air, 30 October 1943. IIJ5/83/127).

- (ii) On D+3 H.Q. No. 211 Group went ashore for the purpose of centralising the control of fighters ashore, and, on the same day additional G.C.I./C.O.L's, L.W.S's and W.U's were landed. It transpired, however, that the Forward Fighter Control had been unable efficiently to relieve the H.Q. ships and, consequently, it was recommended that a main fighter control complete with operations room, radar, W.U's and a "Y" services (R.A.F. Group H.Q. U.S. Wing H.Q. or a M.O.R.U.) should land on D-Day in subsequent operations. It was intended that Forward Fighter Controls should be landed at the same time on the other beaches in order to guard against the loss of the main control. (1)

By 13 July the enemy operational air bases were in the toe and heel of Italy and only small numbers of aircraft were using the remaining airfields in Sicily as advanced landing grounds. From this date until the close of the campaign tactical air operations were as follows:-

- (a) Protective cover for shipping, beaches and ports,
- (b) Direct support.
- (c) Prevention of enemy withdrawal to Southern Italy.

As a background to Tactical Air Force operations the Strategic Air Force continued to attack airfields and communications targets in Southern Italy, ports either side of the Straits of Messina, and medium bombers attacked static objectives in the rear of the battle area.

The continuous operation of Kittybombers from Malta was difficult while the Spitfires still remained there, and it was therefore essential that the Spitfires should be based in Sicily (and the Kittybombers in Malta) as soon as possible. These squadrons were to operate on both Army fronts until the fighter-bombers of XII (U.S.) Air Support Command could move from Tunisia to Sicily. Adequate resources for airfield construction had been arranged in planning; twenty-one strips being in operation by the end of July, and altogether about forty squadrons were in Sicily by 25 July 1943.

The whole of Tactical Bomber Force remained in the Cape Bon Peninsula until 21 July, when two Wings and a Group moved to Malta to replace the fighter-bombers that had moved out. This brought the whole of Tactical Bomber Force within operational range of the battle by day or by night. The bombers on Malta were placed under A.O.C. Desert Air Force and operated through a Forward Bomber Control at Desert Air Force H.Q. back to Advanced H.Q. T.B.F. on Malta. The bombers in Tunisia were placed under C.G. HQ XII Air Support Command and operated through a similar Forward Bomber Control at H.Q. XII Air Support Command back to Main H.Q. Tactical Bomber Force. Those in Tunisia moved to Sicily on 4 August and were joined by those from Malta so that by 12 August the whole of Tactical Bomber Force was in Sicily and again united.

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- (1) The policy was followed, later, at Salerno of putting in a full fighter control organisation right away without first landing a nucleus organisation. The first G.C.I. was landed on D+1 and H.Q. 64th Fighter Wing was landed on D+3. Two G.C.I's and four L.W.S's were ashore by D+3, but no reserve control organisation was provided.

A general advance took place in all sectors on 13 July but the Eighth Army thrust towards Catania met stiff opposition on 16 July and the only forward movement thereafter in the Eighth Army area until the end of July was made by the Canadian division on the left flank. The airfields in the Gerbini Plain were thus denied but the Seventh Army successfully thrust north and west and captured Enna on 20 July and Palermo on 22 July. The Seventh Army turned eastwards on 24 July, against increasing German resistance but pressure was being exerted on the enemy in all sectors at the end of the month and Catania was occupied by Eighth Army on 5 August. This was followed by a further movement northwards and the Seventh Army, against strong opposition, continued its advance eastwards, took Troina on 6 August, Caesaro on 8 August and quickened the tempo by two successful seaborne landings along the north coast. By 13 August, Randazzo, the key to the enemy position was captured and enemy resistance virtually broken. Except for mines and demolitions, further progress met little opposition but an attempt by Eighth Army to trap the remaining enemy elements by a seaborne landing at Scaletta was just too late. Messina was entered on 16 August and firing ceased early on 17 August.

125,000 Italians had been taken prisoner but only 6,500 Germans. The enemy had begun to withdraw from Sicily early in August, thinning out his resources prior to his final exit, and making use of favourable ground, mining and demolitions for delaying tactics that prevented pressure by ground forces. He built up a tremendous concentration of flak on both sides of the narrow Straits of Messina and thus restricted the Allied air effort against ports and shipping; and he operated an intense traffic by night across the narrow straits (into which the Allied Navy could not penetrate) and thus offered few targets by day.

Probably the most outstanding feature of operation Husky was the success which attended the attacks on enemy airfields. These proved conclusively the lessons of the Tunisian Campaign, that an airfield can be so damaged by air action as to be rendered unfit for flying. In at least two cases, Milo and Biscari, the damage caused by heavy bomber attacks was so extensive that no effort was made to repair them. Other airfields were frequently made unserviceable for periods of from 12 to 48 hours. Fragmentation bombs caused severe losses to enemy aircraft on the ground, even when in pens, and the disorganisation caused by attacks on airfields was proved invaluable to a seaborne assault.

Perhaps the second most useful lesson learned in Husky, was the value of the G.C.I. mounted on L.S.T. and located off the assault beaches. The introduction of this advanced control station enabled night fighters to operate with a high degree of efficiency. In consequence the losses caused to shipping by enemy night attacks were negligible.

The control of A.A. gunfire by warships, landing craft and merchant vessels proved most unsatisfactory, despite elaborate regulations. It was recommended "that when aircraft are forced to be routed over shipping in the assault area that all A.A. fire be prohibited at certain fixed times when aircraft are due to pass; this particularly applies to transport aircraft used in airborne operations." (A number had been shot down).

In order to assess the scale of protection required over the beaches and to avoid the undue employment of fighters in a defensive role over a long period it was recommended that a senior air force officer in each main assault area be briefed to render a short situation report to Tactical Air Force H.Q. at least twice a day.

The main role of the fighter bomber force was to paralyse enemy movement toward the assault area and this was achieved by using formations of twelve aircraft at the beginning when good targets were found and by using formations of eight and four aircraft as targets became smaller and more scattered. The number of vehicles destroyed was small but road movement was practically brought to a standstill. Similarly, owing to the simplicity of the Sicilian railroad system, the object of stopping rail traffic was soon achieved and attacks finally had to be discontinued in order to avoid further damage to a means of transportation that would later be required by the Allies.

The role of the Tactical Bomber Force demonstrated that such a force must be equally well prepared to undertake day or night operations; initially, during the moon period and when fighter escort was difficult, Tactical Bomber Force was used principally against road movement by night, as a complement to the day effort. It was only during the later stages of Husky, that it was employed mainly in the role of supporting land operations by day.

Air force units were transferred quickly from their pre-assault bases to airfields in Sicily by air transport. Units were usually called forward at short notice and frequently at times which did not exactly follow those anticipated in the planned build-up. This was to be expected and, in order to keep air transport formations fully in the picture of events and requirements, Troop Carrier Command and No. 216 Group had a Command Post alongside H.Q. Tactical Air Force.

The provision of an officer with operational flying experience for liaison duties with the airfield construction groups was proved to be essential. Unless the Engineer Officer in charge of airfield construction could obtain immediate advice as to the operational suitability of any sites selected, there was bound to be delay in commencing construction and a definite risk in starting work on fields which were unsuitable for operations. The Air Force commander had to be informed at the earliest possible moment that sites had been found, and that these were likely to be ready by a certain date, and it was suggested that the best means of obtaining this information was from the Air Force Liaison Officer, using Army channels of communication.

Plans for the invasion of Sicily provided for the issue of luminous triangles to individual men, red panels surmounted by a white star to platoons, and special pennants to A.F.V's and, thereafter, particularly in set-piece ground attacks, the tendency was toward greater elaboration and the use of a combination of all systems together. By mid-1944 the coloured "Fluorescent" Panel was in use in combination with other methods, in all theatres, and in the majority of close support operations. It largely solved the problem of air/ground recognition of A.F.V's and being unmistakable at almost any altitude, was far in advance of any similar device.

Salerno - 9 September to 1 October, 1943

Operation Avalanche (1) was the amphibious assault by Fifth U.S. Army, mounted from North Africa and Sicily, against the Italian mainland with the primary object of establishing air forces at Monte Corvino and neighbouring airfields, of

(1) Report on Avalanche by M.A.T.A.F.

seizing Naples, and of developing a base from which operations could be conducted against the remainder of Italy. It was preceded on 3 September 1943 by an Eighth Army assault across the Straits of Messina (Operation Baytown).

Up to D minus 1 the Tactical Air Force had the task of assisting the Strategic Air Force to neutralise the enemy air forces in Southern Italy and of imposing the maximum interference upon the movement of forces and supplies towards the assault area. These tasks were continued on D minus 1 when additional assistance was given to the Coastal Air Force in the protection of convoys and from D, Day (9 September) onwards the role of the Tactical Air Force became the protection of shipping and beaches, the prevention of enemy movement in or to the assault area, and the attack of military targets.

The elements of the Tactical Air Force were given the following responsibilities:-

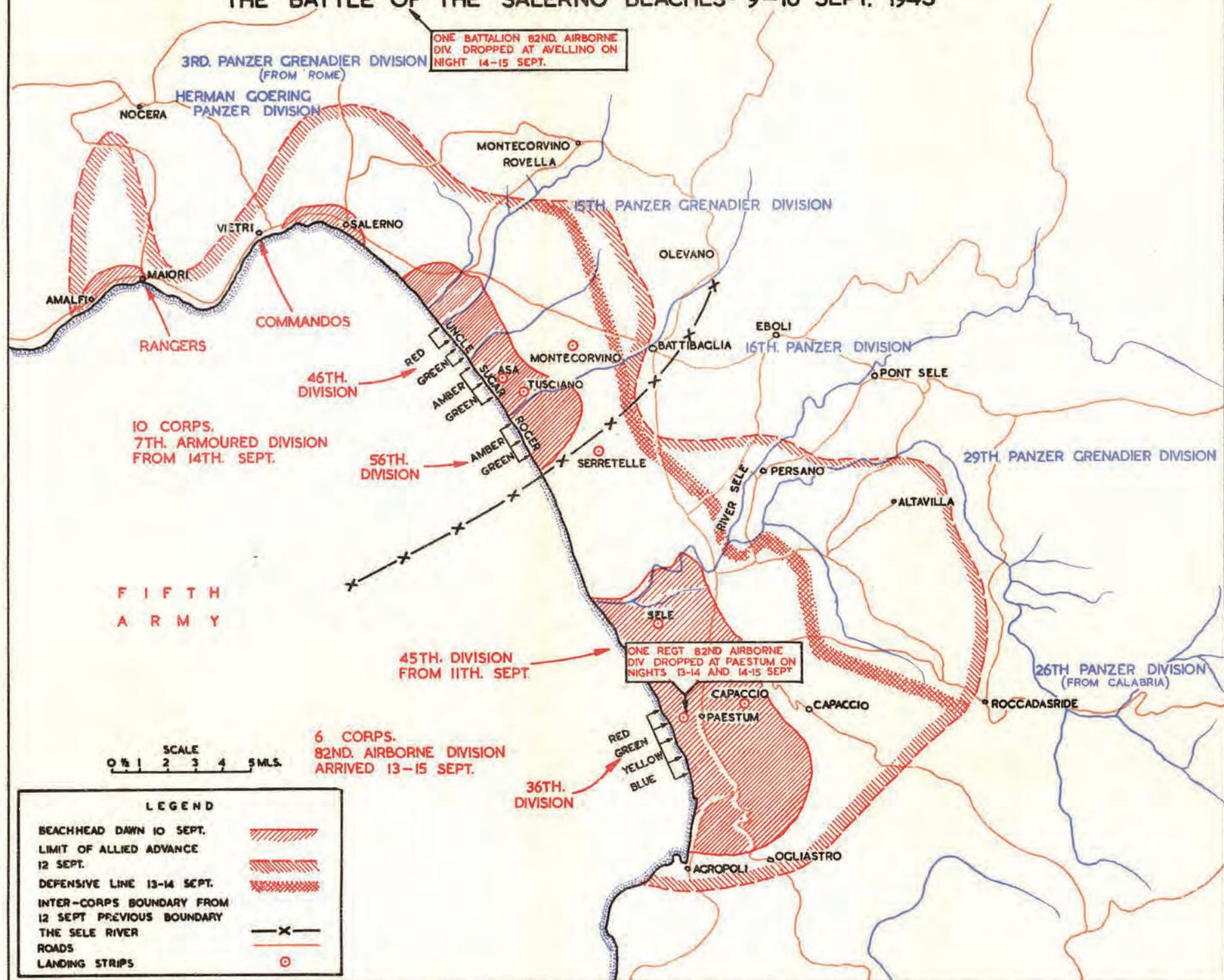
- (a) Desert Air Force was responsible for the air effort in support of Eighth Army's crossing of the Straits of Messina and exercised operational control over the Tactical Bomber Force from D-8 to D, Day. Thereafter it retained control of six light bomber squadrons.
- (b) XII (U.S.) Air Support Command was responsible for the operational control of all fighters and fighter bombers from D-7 onwards but up to D, Day all fighters in North-eastern Sicily were controlled by D.A.F. through No. 1 M.O.R.U. From D, Day onwards XII Air Support Command operated a despatching agency for fighters and fighter bombers and these were controlled in the assault area by a Headquarters Ship, until 64th Fighter Wing was established ashore on D + 3.
- (c) H.Q. Tactical Bomber Force therefore played no commanding role in the operation. It was under D.A.F. until D, Day, and thereafter was divided between D.A.F. and XII A.S.C., while operating against tactical targets. Small advanced headquarters were located alongside Advanced XII A.S.C. and Advanced D.A.F. Headquarters from where requests for support were initiated and fighter escort was arranged.
- (d) Air Transport was provided by No. 216 Group alone up to D, Day but Troop Carrier Command undertook to meet additional tactical requirements for the transport and maintenance of airborne forces thereafter. Transport operations in the forward area were undertaken only at the request of C.G. XII Air Support Command, or A.O.C., Desert Air Force, who co-ordinated all demands and provided routes and protection. Conflicting demands were referred by No. 216 Group to Tactical Air Force for decision in consultation with 15th Army Group. Airborne operations were carried out on the nights of 13/14 and 14/15 September when part of the 82nd Airborne Division was dropped in a threatened zone of the beachhead.

At first light on 3 September, troops of the Eighth Army crossed the Straits of Messina and entered Reggio. The following day Commandos landed at Bagnara and linked up with the advancing troops; on 7 September, Rosarno was captured; and on 8 September another bridgehead was established at Pizzo.

FIGURE 5.

THE BATTLE OF THE SALERNO BEACHES- 9-16 SEPT. 1943

~~OPERATIONAL NARRATIVE OF THE ITALIAN CAMPAIGN~~



Avalanche took place as planned at 0330 hours 9 September 1943, and the assault stage lasted until 17 September when the bridge-head was secured and the German counter-attack of 13 September was finally liquidated. The advance of the Eighth Army up the centre and East of Italy and the vigorous Fifth Army attack on 17 September caused the enemy to withdraw from the right flank of the Salerno beachhead, and by 21 September, a line was formed from Salerno to Bari. The rugged hill country covering the Naples Plain was crossed by 28 September, the first elements of the Fifth Army entered Naples on 1 October, and the simultaneous consolidation of positions stretching across Italy, to include the landing grounds at Foggia, concluded Operations Avalanche and Baytown.

Sufficient airfields had been constructed in Sicily in time to accommodate the whole of Tactical Air Force for the operation; thus bringing the fighter force within operational range of the beachhead; although the primary task was the securing of airfields in the Montecorvino area, it was in this important respect, that the assault was a disappointment, for Montecorvino was not captured as planned, on D.Day. Even when it finally fell, the airfield remained for several days under German shellfire. The need for new construction had been anticipated by the inclusion of airfield construction personnel in the D.Day landing parties and mechanical equipment followed on D + 1. Engineers were nearly always within enemy artillery range but most of the work was restricted to the laying of "prepared landing strip" and the first airfield was ready by 11 September and nine were employed by the end of the month.

The Strategic Air Force had been attacking airfields and lines of communication in Italy throughout the summer of 1943 and these attacks were concentrated at the end of August against those areas from which the enemy was expected to oppose the Salerno landings. At the same time, 31 August to 8 September, the operations of the Tactical Bomber Force, in support of the Eighth Army, were being co-ordinated with those of the Strategic Air Force and airfields, marshalling yards; bridges, and road and rail bottlenecks were bombed. On 8 September, 131 Fortresses attacked the German Headquarters at Frascati and from 9 to 17 September the whole bombardment effort was devoted to the support of Fifth Army. For five days the effort was applied against railway junctions, communication bottlenecks and lines of supply, but during the crisis of 14 to 15 September, the targets were the towns and nearby roads of Battipaglia and Eboli, directly in front of the Allied troops. The encouragement and assistance thus given to the land forces was largely responsible for the success of the Allied counter-attacks of 17 September and, thereafter, the bomber effort reverted to the attack of communications and airfields off the battlefield.

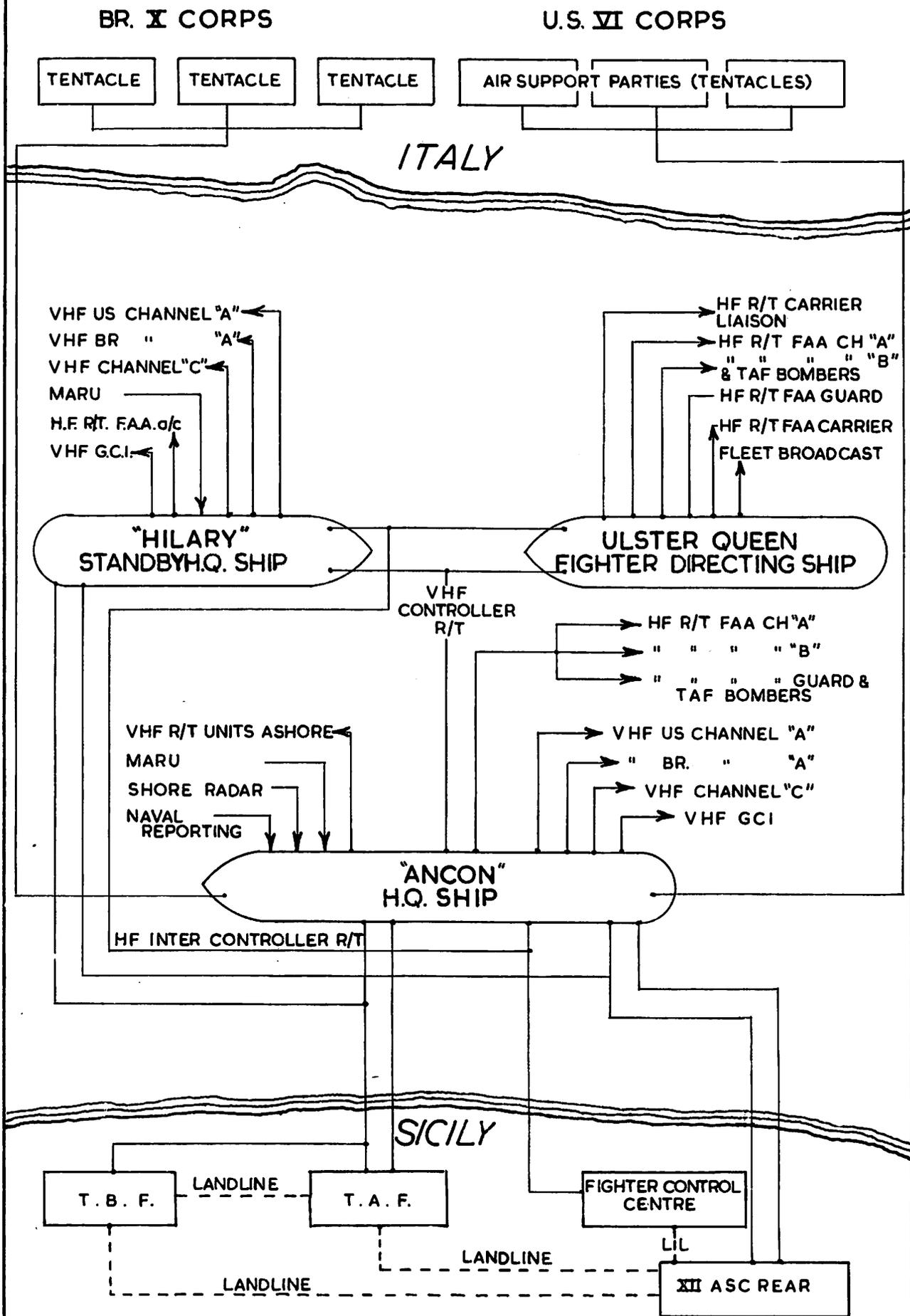
Enemy fighter opposition to the pre-D.Day bomber operations was slight and indicated that the Luftwaffe's limited resources were being conserved for an inevitable clash on Salerno. The nearest Allied airfields were 150 miles away from the beachhead but, by using long range tanks, Spitfires were able to patrol for up to 45 minutes each at 16 - 2,000 feet while American fighters provided the medium and low cover. The Headquarters ship control, U.S.A. Ancon, was unable to pass much useful information to fighters because she did not get it, but night fighters found the seaborne G.C.I. to be most accurate. The enemy resorted to low flying attacks whereby fighter bombers were able to take advantage of the mountainous character of the country to avoid being detected by radar. It was therefore recommended that, for similar conditions, a visual fighter control with V.H.F. and a

controller should be made available and sited on a suitable point of observation, probably alongside a W.U. post. Two land G.C.I/C.O.L's were landed on D-Day and the control of fighter aircraft was handed over to H.Q. 64th Fighter Wing ashore on 12 September. Very little of the G.A.F. was encountered on the first day (9 September) but resistance increased thereafter with the main effort being directed against shipping and a lesser effort against ground forces. The enemy would not fight in the air unless forced to but during the first nine days, when some 30 ships were damaged, Tactical Air Force destroyed an estimated 77 aircraft for a loss of 39. From 17 September the German effort was in the decline and, as the Luftwaffe was forced back to more distant airfields, finally dwindled to negligible proportions.

The first five fighter squadrons were ashore by 12 September and the number had increased to twenty-three by 16 September (including one reconnaissance and one fighter bomber squadron). Headquarters Fifth Army, Advanced XII Air Support Command and Fifth Army Air Support Control were carried on board the headquarters ship U.S.S. Ancon, and, by the evening of D-Day, five tentacles on land were in good communication with control. Owing to the complete commitment of fighters to defensive tasks and the consequent lack of escort by bombing operations, no close support day bombing was possible during the first five days. But the provision of the Air Support Net was fully justified by its use for the regular passing of Tac/R results and changes of bomblines. The Tac/R aircraft called Ancon when returning from their missions and detailed results were passed by wireless from XII Air Support Command Rear H.Q. in Sicily to Ancon after the aircraft had landed. Requests for Tac/R were also received over the Air Support Control Net and on certain occasions the system was used for passing administrative messages. The Army and Air Headquarters and the Air Support Control went ashore on 12 September and the British system of operating the Air Support Control organisation was put into effect. Demands for support and changes of bomblines were submitted to G.3 Army for decision and agreement and were passed to A.3, XII Air Support Command for action direct with bomber wings/groups. On 14 and 15 September, a large Strategical and Tactical Bomber effort was concentrated on the Battipaglia and Eboli areas and long range P.38's were used to search out opportunity targets near the bomb line. The Air Support Control net was used to pass the results of pre-arranged effort, bomblines changes and the results of Tac/R but until fighter bombers were based on the mainland, on 16 September, it was impossible to accept opportunity targets. Thereafter it was possible to accept opportunity targets according to the number of aircraft available and with the beginning of regular Tac/R broadcasts from reconnaissance squadrons it became less necessary to pass the results of reconnaissance over the tentacle net to the tentacles (which could now receive the broadcast). An air support programme for the following day was agreed at an Army/Air/Air S.C. meeting each evening (when the telephoned requests of Corps were considered), and the intentions together with as much detail as possible were subsequently sent in high grade cipher to Corps over the Air Support channels.

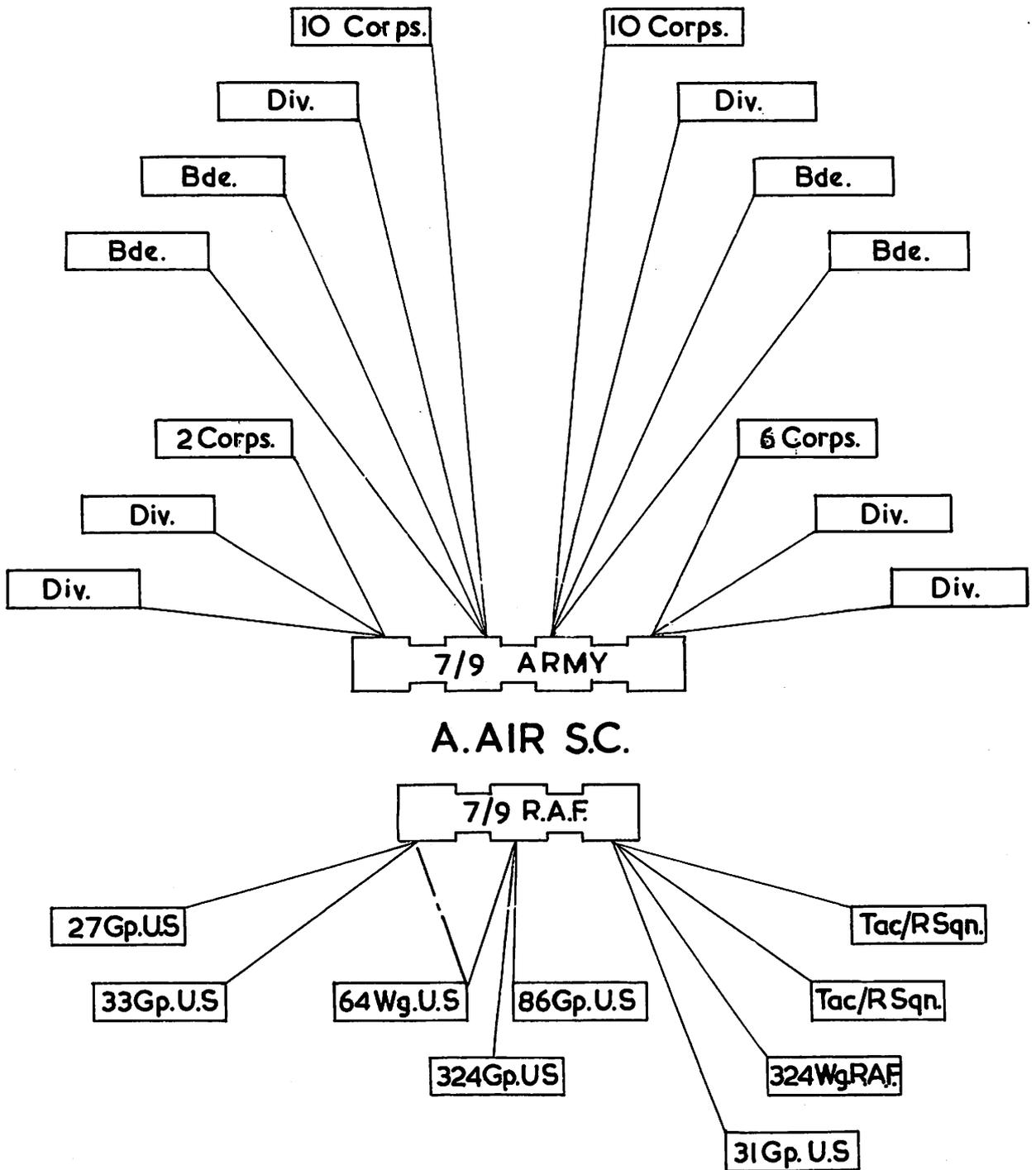
As a result of the successful operation of the British System XII Air Support Command agreed to accept rear links and A.L.O's at all XII Air Support Command formations in order that the results of missions might be received more quickly and in more detail. No. 7 A.A.S.C. was strengthened by amalgamation with No. 9 A.A.S.C.; the joint 7/9 A.A.S.C. was given an establishment to bring its status up to that of 2/5 A.A.S.C. with Eighth

H.Q. SHIP COMMUNICATIONS "SALERNO"



From App. "B" to Sigs. Report on Avalanche II J5/8

No. 7/9 A. AIR. S.C. OPERATING AT
 H.Q. 5TH ARMY/XIII A.S.C.
 15 NOVEMBER 1943



NOTES:-

- (a) - - - - Listening Watch only.
- (b) By this time American tentacles (Air Support Parties) were double banking 2 and 6 Corps and their Divisions.
- (c) Taken from Appendix "A" to MATAF report on Avalanche.

Army; and Fifth Army decided to create an American Air Support Control which was to be trained by 7/9 A.A.S.C. and eventually to relieve it.

On 10 October 1943, the control of all tactical bombers reverted to the Tactical Bomber Force, but Desert Air Force and XII Air Support Command continued to make requests direct to H.Q. Tactical Bomber Force and were each given a temporary allocation of bomber effort in order that they would have prior knowledge of their resources and escort commitment irrespective of faulty communications.

In order to avoid as far as possible abortive raids due to misunderstandings and mistimings at rendezvous a new procedure was laid down on 7 November 1943 between fighter escorts and bomber formations. It was decided that the fighter escort leader should be in charge of the rendezvous and the combined formation at the rendezvous. He would lead the formation away only when satisfied that all bomber formations had sufficient escort. To do this he would form the aircraft on the starboard wing of the bomber leader, rock his wings and remain in position until the bomber leader set course for the target, returning to his escort position when course was set. If it were necessary to cancel the mission after the combined formation had set course, the fighter leader would turn back the formation by flying in front of the bomber leader, rocking his wings and turning off towards base. All bomber formations were to carry out a left-hand circuit of the rendezvous point and continue to orbit until led out, a fairly tight circuit being preferable. A red Verrey light was to be fired by the leader of the first squadron to indicate to the fighters that he was the lead squadron. If desired the signal cartridge could be green or yellow for subsequent rendezvous in the same locality. Adherence was emphasised to the strictest punctuality in rendezvous times and it was emphasised too that heights should only be varied when there were clouds - bombers flying 1,000 feet below the cloud base at rendezvous to give the escort sufficient height. The escort in the rendezvous area would fly 500 feet above the bombers and over the fighter box of six so as to help the fighter leader in identifying escorts with their squadrons in large formations. Second boxes of bombers would fly the closest possible formation on the leading box, particularly in the rendezvous area, and if the boxes split in the target area only the leading box would be escorted by the fighters when the escort was less than eight in number - formations flew in boxes of six up to a normal maximum of 24 aircraft. If the fighter leader was not satisfied that there were sufficient fighters for the escort he was to call up Commander on the appropriate channel and request instructions. Bomber leaders would also call up Blackmail after five minutes and report "No friends" if applicable, then await instructions. If no R/T instructions were received bomb leaders would, at their discretion, return to base after fifteen minutes and bombers would in no circumstances proceed from rendezvous to target without escort.

Cassino - 15 February and 15 March 1944

In January 1944 the Allies in Italy were held south of the Fuhrer or Hitler Line of which the stretch covering the Cassino Area and main front was known as the Gustav Line. There were only two routes to Rome - by sea and up the Liri Valley and the Allies chose to take both. The bastion of Monte Cassino stood at the entrance to the Liri Valley. Its "Keep" was a monastery and most of its acreage was protected by high thick stone walls. Before the war the Italians had considered

Monte Cassino to be almost impregnable, even without any artificial works, and the Germans had been developing and fortifying it for the past four months. The monastery overlooked and dominated the strongly fortified town of Cassino, extensive field works covered the slopes and a wide area of the hills summit, two further features to the west were also strong points, and the whole constituted an intricate system of defences from which accurate cross fire from several points could be brought to bear on any line of approach. (1)

The first attempt to force an entrance into the Liri Valley was begun in January. Gains were made in all sectors and by 6 February leading troops were on the outskirts of Cassino and within 300 yards of Monastery Hill. The offensive did not however, go according to plan; the defensive network was too strong; and on 11 February the last attack had failed.

The second battle for Cassino was preceded by air attack. It had been possible to give little direct support while the Anzio beachhead was being secured and consolidated and, until the second battle, the main weight of air effort affecting the main and Anzio fronts fell on communication targets. The Commander 4th Indian Division, who was detailed to capture Monastery Hill and Cassino from the West represented an urgent need for heavy bombs to breach the Monastery walls which rose sheer from the face of the rock. On 15 February 1944, nearly 450 tons of bombs were dropped on the buildings standing 1,700 feet above Cassino town by 143 Fortresses, 47 Mitchells and 40 Marauders. 4th Indian Division did not receive sufficient warning of the attack to allow it to withdraw to safe positions but fortunately the bombing was so accurate that few casualties were incurred. The ground attack followed that night but was brought to a halt by the enemy cross-fire. It can be safely assumed that the defenders had filtered back to their defensive position from the underground tunnels which ran through the hill and town. Anzio was absorbing almost the whole available air effort but on 16 and 17 February, the heap of rubble that now comprised the Monastery was attacked by fifty and sixty-three fighter bombers in order to drive the Germans to cover in advance of ground attacks that again followed by night. Neither of these assaults was successful and only the New Zealanders attack on Cassino Town from the South made appreciable progress before being halted.

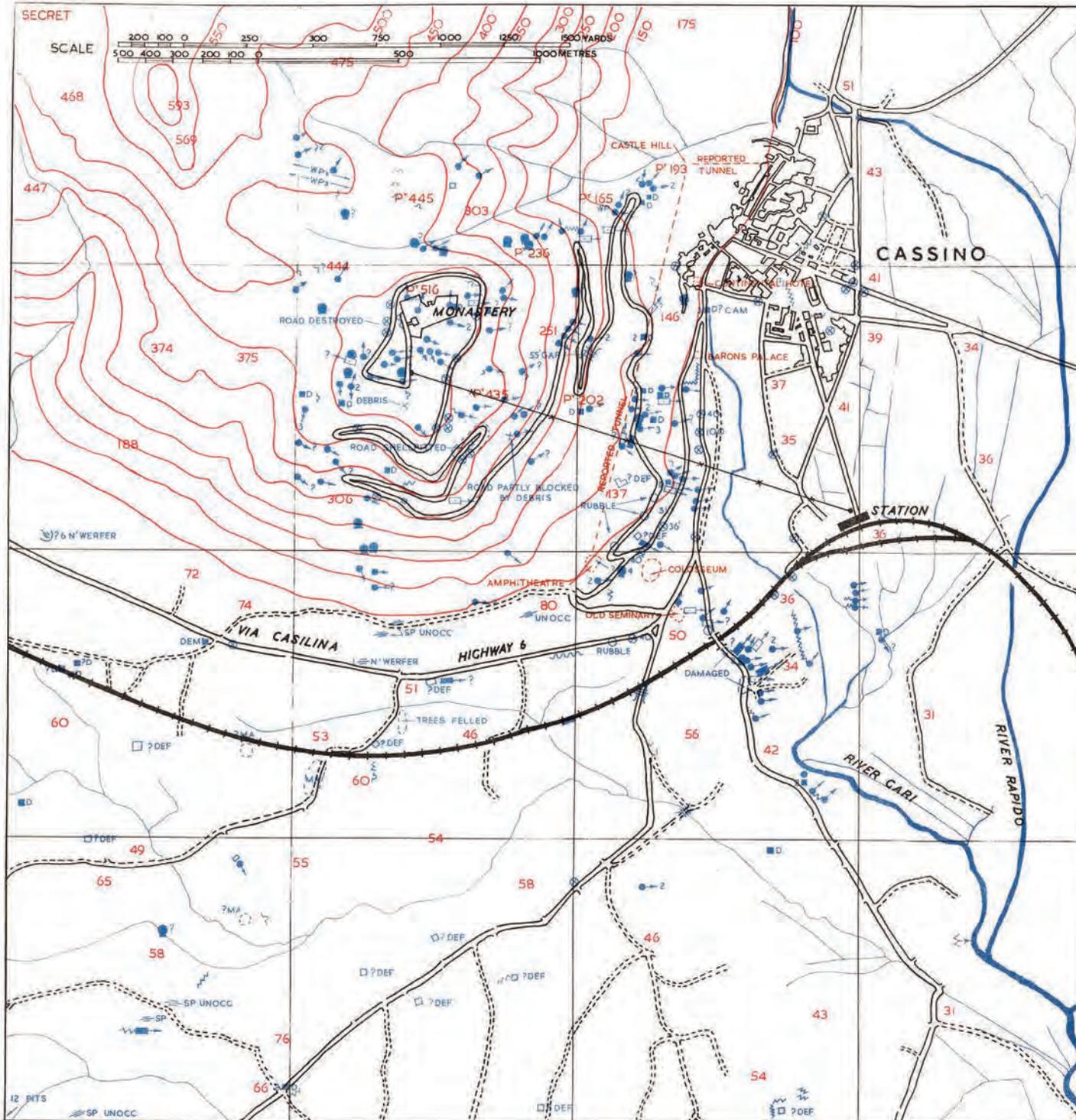
In view of the strongly held Army theory that air bombardment might function in an artillery role on occasions of offensive action, the Army Commanders suggested a mass air and artillery bombardment of Cassino followed by an infantry attack and a secondary tank operation. It was clear that bomb craters and rubble would obstruct the passage of tanks but armour was intended only for the "third" phase break through into the Liri Valley and General Freyberg was content that bulldozers should clear the way. As is well known, the ground attack failed and the unarmed bulldozers and the bridge engineers, working on the Rapido crossings, came under such continuous fire that the passage remained blocked and no tanks got through.

Contrary to general belief, the obstruction of tanks was of only minor concern. The agreement that an attempt should be made to surprise the enemy by an intense and concentrated air bombardment, followed by a heavy artillery concentration, is understandable. It was hoped, so to stupify and demoralise the

(1) A.H.B. Narrative. The Italian Campaign, Vol. I.

THE DEFENCES OF CASSINO AS AT 25 MARCH 1944.

FIGURE 8.
MAP No. 8



ENEMY DEFENCE OVERPRINT
N°20
TO ACCOMPANY
G-2 PERIODIC REPORT N°201
HQ. FIFTH ARMY 25 MAR. 1944
G.S.G.S. 4228.

LEGEND

- FIELD GUN
- AT. GUN
- M.G. POSITION
- PILL BOX
- BUNKERS
- FIRE TRENCH
- SLIT OR COMM.
- WIRE TRENCH
- MINES
- ANTI PERS. MINES
- TELLER MINES
- MORTARS
- STRONGPOINT
- BLOWN BRIDGE
- CRATER
- DUGOUTS

RAILWAY
SPOT HEIGHTS
CONTOURS
OVERHEAD RAILWAY

SOURCE

BLUE AERIAL PHOTOGRAPHS
AS OF 20 MARCH 1944.
BROWN OTHER SOURCES

defenders that ground forces would be able to attack successfully against the enemy's superior observation system, with a minimum of loss.

It was agreed that the Allied troops should withdraw about 1,000 yards before dawn on D-Day and that they should advance into Cassino, under cover of an intense rolling barrage, immediately after the air bombardment ceased at 1205 hours. Eleven Heavy Groups of MASAF and five Medium Groups of MATAF were to attack between 0830 and 1200 hours and no bombing was to take place after 1205 hours. The object was the complete reduction of Cassino Town and no bombs of less than 1,000 pounds or with long delay fuses were to be used. Operating heights were 15,000 to 16,000 feet for heavy bombers and 7,000 to 9,000 feet for medium bombers but there was no marking of artificial landmarks or bomblines (although Fifth Army had expressed willingness to display smoke at the mouth of the Carigliano River and the type of operation was rare for the Strategic Air Force which had to employ a number of "Freshman" units in order to attain the required weight of bombs). On the other hand the axes of attack were all perpendicular to the front, briefing was thorough and carried out with the help of photographs, and a radio link was established between the bombing aircraft and a XII A, S.C. ground control.

No specific aiming points were assigned but the target "area" was divided into two halves which were to be attacked alternatively at 15 minute intervals - a timing which was calculated to allow for manoeuvring and for dust to clear from the limited target. The mediums maintained close formation and attacks were generally punctual, concentrated and accurate but the heavies were reported as being "all over the sky" and attacks were frequently unpunctual, dispersed and inaccurate. One group failed to find the target, 13 Liberators dropped 40 bombs in friendly territory causing some 105 military casualties and at least some 60 civilian casualties, the spacing of attacks varied from one to forty-one minutes, smoke interfered, and out of a total of 988 tons of bombs dropped, only about 300 tons fell in the target area. This was followed by artillery fire from 890 guns of all calibres, of which 144 twenty-five pounders provided a rolling barrage for about two hours, and by several accurate fighter bomber attacks against specific targets.

Cassino was reduced from an area of broken buildings, few of which could afford adequate cover for either men or equipment, to a scorched weal over which clouds of smoke and dust hovered for many hours. Nevertheless, neither the German's resistance nor morale was greatly reduced. Machine guns, mortars, and artillery were only partially neutralised and the heavily fortified area of the defending artillery was not cleared. Furthermore, all traffic routes were blocked and the rain that followed that night, filled in the craters and reduced the debris to a consistency that made removal practically impossible. The air bombardment had destroyed Cassino as planned and by dusk 15 March the infantry were only a little behind schedule. Complete success and consolidation were prevented, however, by the non-acceptance of greater risks in the Army plan and the lack of weight in the attack. The Germans were allowed time to recover from the shock and the torrential rain during the night ruined any chance of success. Allied casualties for the first day were only four killed and eleven wounded - which gives an indication of the scale and forcefulness of the Allied land attack and of the apparently over-optimistic view of what air and artillery action could do.

The struggle went on for another eight days but despite the intervention of tanks and fighter bombers only slow progress was made against stiffening resistance. On 23 March, after long deliberation, the attack was abandoned (and the fortress did not fall until two months later when it was by-passed and isolated before capture). The scale of bombing in support of the third attack on Cassino was subsequently shown to have been heavier than necessary; allowance should have been made for the great previous damage in the town and, added to the massive artillery fire, the air effort caused greater material destruction than was desirable from the land force point of view. The defenders were not destroyed owing to the solid nature of their shelter system, enemy morale remained high, the Allied army took too sanguine a view (in spite of Air Force representations) of the extent to which air bombardment could reduce resistance, and was not prepared to attack in sufficient strength immediately after the cessation of bombing. The air lessons were stated at the time to be:-

- (a) The bombing of an enemy strongpoint should be followed as quickly as possible by a determined ground attack. Bombing cannot flatten a point or seriously affect an enemy protected by deep shelters. It is only a means to an end and will inevitably create impediments to the advance of troops and tanks.
- (b) An air force will carry out an operation best when it is trained and experienced in that type of operation. When heavy bombers are used the bomb leaders and leading navigators should fly over the target and route the day before. Bombing was from too high an altitude and specific bombing altitudes should be selected according to the type of target. Clearly visible bomb-line markers should be provided and there should be direct contact between heavy bombers and one of their own observers in the battle area. The interval between groups should be decreased and the whole attack should either be more concentrated in time or reach a climax toward the end.
- (c) The ground forces should be taught to understand the powers and limitations of air forces.
- (d) Commanders should have a clear conception of the difference between the justifiable use of heavy bombers in emergency such as at Battipaglia and Eboli and their use in offensive operations when all arms and weapons should normally be kept to their basic roles. So long as adequate Tactical Air Forces were available the heavy bombers should not be used in close support operations.

Strangle and Diadem - 19 March to 4 August 1944

The results of Cassino hastened a restatement of the role of Air forces and on 15 March 1944 the Army was directed to accept a switch of emphasis from direct support to anti-communications operations. (1) Operation Strangle began on 19 March, as an intensification of the anti-communications war but was later referred to as the introductory stage of the offensive against Rome, which opened on 11 May 1944. Operation Diadem lasted from 11 May to 4 August 1944.

(1) A.H.B. Narrative, The Italian Campaign, Volume I,

A panel of British scientists, headed by Professor S. Zuckerman and known as the Bombing Survey Unit, had issued, on 28 December 1943, a report on the effects of Allied air bombing of land communications in the Sicilian and Italian campaigns up to October 1943. This included the following four conclusions:-

- (a) If the measure of success of air attacks on enemy rail and road communications is taken as the destruction of the means of communication, then the offensive carried out against rail targets in Sicily and Southern Italy must be regarded as an outstanding success. If, however, the measure of success were taken as the complete cutting and blocking of the railway lines and roads, then the offensive could be regarded as having partly failed in its purpose. There is little indication that the attacks prevented the enemy from moving from place to place within the limits imposed by the capacity of transport at his disposal.....
- (b) The strategical effect of destroying the enemy's means of rail communications is best achieved by attacks on large railway centres which contain important repair facilities and large concentrations of locomotives and rolling-stock. The sub-targets (e.g. tracks, rolling-stock, warehouses, repair sheds etc.) in a large railway area are very concentrated and, as a result, the general risk of damage from bombing, if the attacks are carried out in adequate strength, is very high.....
- (c) A far more costly air effort would be needed to achieve a tactical success, in the sense of a sudden blocking of communications at a given series of points, than has proved necessary to produce the strategical effect of reducing traffic potential by the destruction of rolling-stock and repair facilities.....
- (d) Railway and road bridges are uneconomical and difficult targets, and in general do not appear to be worth attacking except where special considerations demand it in the tactical area.

The conclusions of the report received wide acceptance, but a misinterpretation of the report arose from the moment of its publication. The report recommended the attack of large railway centres that contained important repair facilities and large concentrations of locomotives and rolling-stock. It did not recommend the attack of marshalling yards as general proposition and a number of marshalling yards were suggested only because they contained the forementioned objectives. But nevertheless, it was illogically assumed that the Zuckerman Theory gave marshalling yards, as such, as the best targets.

Genuine dissentients from the scheme were therefore given a free advantage in propounding the alternative course of "interdiction". It was estimated (and the figure is sound enough for practical purposes) that only five per cent of the normal rail traffic was required for purely military needs and to be effective all rail lines had to be cut quickly and simultaneously. In October and November 1943 the XII (U.S.) Bomber Command carried out a first attempt to establish a line of interdiction across Italy, North Rome, by cutting bridges; three major rail lines down Italy were successfully cut but

two minor lines were left open; the effects were not fatal, and the Germans continued to get their necessary 2,100 tons of supplies daily.

Opposition to the Zuckerman proposals grew in December 1943. The attack of marshalling yards was described as involving the destruction of locomotives and rolling-stock that the Allies needed themselves and the attack of bridges and viaducts was mooted as the only type of operation that could successfully stop the enemy's rail traffic. Some decision had to be made and this was done, in February 1944, in the form of a compromise in which the strategic Air Force was to handle marshalling yards, the Tactical Air Force was to take on the task of interdicting the railway lines (and the Coastal Air Force was to interdict the sea-lanes). The debate was not over, however, and in March evidence was produced which appeared to show a paucity of supporting facts and faulty conclusions in the Zuckerman Theory and to assert the greater effectiveness and economy of attacks on rail bridges and viaducts which were more difficult to repair. In view of these facts, the medium bombers continued their task of cutting the enemy's lines of supply, and the heavy bombers continued to assist by striking marshalling yards and some bridges in Northern Italy (beyond the reach of the Tactical Air Force) whenever weather prevented them from striking their higher priority strategic targets.

The Northern Italian railway system was vulnerable to interdiction but the system of repair facilities, rail centres and rolling-stock bases was too extensive to be put out and kept out by air attack. Furthermore the Germans had an ample call on rolling stock to meet their minimum requirements and the locomotive position was comfortable. It was believed that if the weight of air pressure on communications could be maintained, and an Allied attack could be made on the whole length of front, the German commitments would increase to such an extent that he would be so short of fuel that a crisis would descend on him.

The main plan for operation Strangle concerned the Tactical Air Force which was to interdict the rail system south of Pisa-Rimini. Whenever possible, main lines were to be cut at points more than 100 miles from the Anzio area in order to impose a maximum strain on motor transport and all lines across Italy had to be cut in order to prevent the diversion of traffic; medium bombers were to attack bridges, marshalling yards and repair shops, and fighter bombers were to attack active trains, troops and major bridges under repair, and secondary bridges. In addition, fighter and night bombers were to operate constantly over the whole road-net of Central Italy with the object of destroying motor transport and disrupting movement by day and by night.

Operation Diadem was a logical continuation of Strangle and was planned with a major frontal attack in view. The enemy was not to be allowed to create or retire to a defensive line but was to be destroyed on a field of the Allies own choosing. The frontal assault was to provoke an expenditure of enemy supplies in excess of that trickling through the interdicted transport system and in this battle the role of the Tactical Air Force was to be:-

- (a) Maintenance of destruction and disruption already caused to land and sea communications and counter air force operations during the main offensive.

- (b) Direct support by isolation of the immediate battle area on the Fifth Army Front and neutralisation of gun positions commanding the crossings over the Rapido River on the Eighth Army Front.
- (c) The attack of German Army Headquarters on D-Day (11 May 1944).

The land offensive began on 11 May 1944 and Fifth Army crossed the Garialiano River two days later. On 17 May Highway 6 was out and the next day Monte Cassino, now isolated, was taken. On 23 May a breach was effected in the enemy line at Montecorvo, two days later the Anzio and main Fifth Army forces met, and, on 4 June Rome fell. The Eighth Army then advanced towards Perugia and the Fifth Army towards Siena, which fell on 20 June and 3 July, and on 4 August Florence was entered. Heavy and medium bomber attacks on headquarters had been reasonably successful in causing disorganisation behind the enemy's lines and for the first three days the medium and fighter bombers had concentrated upon such targets as command posts, strong points, gun positions, main towns on the road net, bridges and defiles. One medium bomber wing was again employed against road junctions from 21 to 25 May but otherwise the two bombardment wings of Tactical Air Force were employed from 15 May onwards against rail bridges in Central Italy. The fighters and bombers kept up a steady pounding of gun positions, roads, road bridges, railway tracks, towns and bivouac areas but once the break-through had been accomplished the fighter bombers began armed reconnaissance mainly against M.T. and troop concentrations and the light bombers went over to dumps. The German Tenth Army was, in fact, subjected to a pulverisation from the air such as had never yet been experienced by a well organised army.

The Tactical Air Force effort against lines of communication was closely co-ordinated with a Strategic Air Force effort against marshalling yards north of the Appenines. By the end of March the average number of cuts in the railway lines was 25 per day and during May the average rose to 71 per day, (1) Photographic cover of every line was attempted every forty-eight hours (so that each block could be cut again as soon as it shows signs of repair) but the enemy, after neglecting a damaged area for days, could be very quick in effecting the simultaneous repair of several multiple cuts - and no stretch of line was completely abandoned until the opening of the offensive in May. Furthermore, the Germans devised ingenious systems of trans-shipment whereby motor and animal transport was impressed to carry goods from one train to another - on the other side of a break - and motor transport was used to supplement rail transport. As shuttling from trains to M.T. fell off the road movement increased in sympathy but owing to Allied strafing and bombing the supplementary traffic (road and sea) had to travel as much as possible by night and the four light bomber squadrons (of the R.A.F.) that were employed by night were hard pressed to maintain a 24 hour schedule of air attack. On the whole, it is probable that the Germans suffered no serious shortages during the static phase before Diadem.

On D-Day, 11 May, all rail traffic was blocked north of the line Cecina-Fano and in the first week no rail traffic approached closer than 50 miles from Rome. By the end of May the only route from the Po Valley was via the East Coast to Fano

(1) A.H.B. Narrative, The Italian Campaign. Volume I.

and thence inland by a branch line on which trans-shipment was probably necessary at some points. On 1 June 1944 there were 124 cuts north of Rome of which 47 were major bridge cuts and until the middle of June, the situation remained very satisfactory. The operations of Tactical Air Force were extended when it became evident that the Germans would attempt to hold the Spezia-Rimini line and, consequently, the medium bombers cut all the rail and road lines across the river from Piacenza to the sea. These cuts were extended so that there were about 90 rail cuts north of a line through Florence by 4 August when the city was entered. Railway interdiction was absolute. No more than two or three road bridges remained across the Po east of Torreberreti, and the road system was disastrously disorganised.

Strangle and Diadem were never expected to secure a withdrawal of enemy ground troops but were so designed to weaken the enemy that the forthcoming ground operation would be materially facilitated. (1) So long as the front remained static the enemy's supply situation was probably not highly critical but long before D-Day he was short of food and clothing, and both fuel and certain types of heavy ammunition were severely rationed. Stocks of ammunition still remained however. Food was made up at the expense of the Italian population, and considerable tonnages of material were moved forward by M.T., horse drawn vehicles and small coastal craft. With the opening of the land offensive it was ironically, the dependence upon M.T. that appears to have been the cardinal factor in the collapse of enemy supply; for the progressive withdrawal of transport from the forward communication zone made it impossible to supply the front line troops - and, once the lines of communication had shifted from rail to road, the intermediate supply depots and convoys became the principal tactical targets.

The fighter bombers were switched from mainly close support missions to enemy communications and quickly proved their worth in the new type operations. "On a number of days over 100 track cuts were created by their effort alone, and throughout the period they averaged over 30 cuts per day..... No less valuable was the ability of fighter bombers to continue operating during periods when the medium bombers were grounded by weather. (2) This ensured that traffic would remain frozen even though a major block created by medium bombers might be repaired during a period of enforced activity..... In addition the fighter-bomber further restricted enemy supply by virtually stopping all road movement by day on the roads, and on the railways before complete interdiction had been achieved. They were in fact an essential complement to the medium bomber without which it would have been impossible to bring rail movement to a standstill".

The Strategic Air Force was used only sporadically, usually when weather prevented attacks against higher priority targets. Its efforts showed that: "Attacks caused temporary inconvenience to enemy communications in the Po Valley but accomplished no reduction in the flow of supplies to the battle area other than the destruction of the relatively few cars that happened to contain military supplies at the time of attack". In 16 attacks on bridges and viaducts 12 targets were rendered unserviceable and the tracks of all 16 were cratered. In each case, at least temporary interdiction was accomplished and in two-thirds of the

(1) M.A.A.F. Report on Diadem. Vol. VIII.

(2) M.A.A.F. Report on Diadem. Vol. VII.

attacks interdiction was accomplished which lasted 10 to 25 times longer than the average 4-hour interdiction period following on an attack on marshalling yards,

The most difficult problem was to prevent enemy movement by night during Strangle. Whereas by day as many as six groups of medium bombers and an equal number of fighter bombers were concentrating almost their entire effort on the interdiction of enemy communications, the same task had to be accomplished at night by two squadrons of Bostons and two of Baltimores,..... The night harassing effort was inadequate, although the four squadrons contributed an essential part to the success of the operation.

The main conclusions drawn at the time from Strangle and Diadem were that:-

- (a) Air Power could not by itself defeat a highly organised and disciplined army even when that army was virtually without air support of its own, enforce a withdrawal by drying up the flow of essential supplies when the enemy was not being forced to expend his supplies at a high rate, entirely prevent the movement of reserve or other troops, or, in short, absolutely isolate the battle field from enemy supply and reinforcement. It also could not guarantee the immunity of forward formations or back areas against occasional air attack or reconnaissance.
- (b) Air Power could make it impossible for the most highly organised and disciplined army to offer prolonged resistance to a determined offensive on the ground. It could turn an orderly retreat into a rout and could virtually eliminate an entire army as an effective fighting force.
- (c) An Army could not by itself defeat a highly organised Army on the defensive. The power of defence on land had not been overcome by the tank or by improved artillery technique, but by air power. If there had been no air force on either side the German Army could have made impossible the invasion of Italy except at a cost in national effort and human life that the Allies would have been unwilling if not unable to face.
- (d) The Zuckerman Theory that as a long term policy the most vulnerable railway targets for attack were large railway centres which contained important repair facilities and large concentrations of locomotives and rolling-stock was accepted. But complete interdiction of the railway systems leading to the front line was essential in order to cut into the minimum flow of supplies required to maintain an army in battle. This could be achieved only by actually cutting and keeping cut the railway lines themselves and M.A.A.F. concluded that the most effective method of producing continuous interdiction was the complete destruction of selected bridges and viaducts with long spans.
- (e) Furthermore, the attack on all routes should be continuous throughout the twenty-four hours and, for the night effort, against land and sea routes, a strong night bomber force was required.

Wowser 9 to 19 April 1945

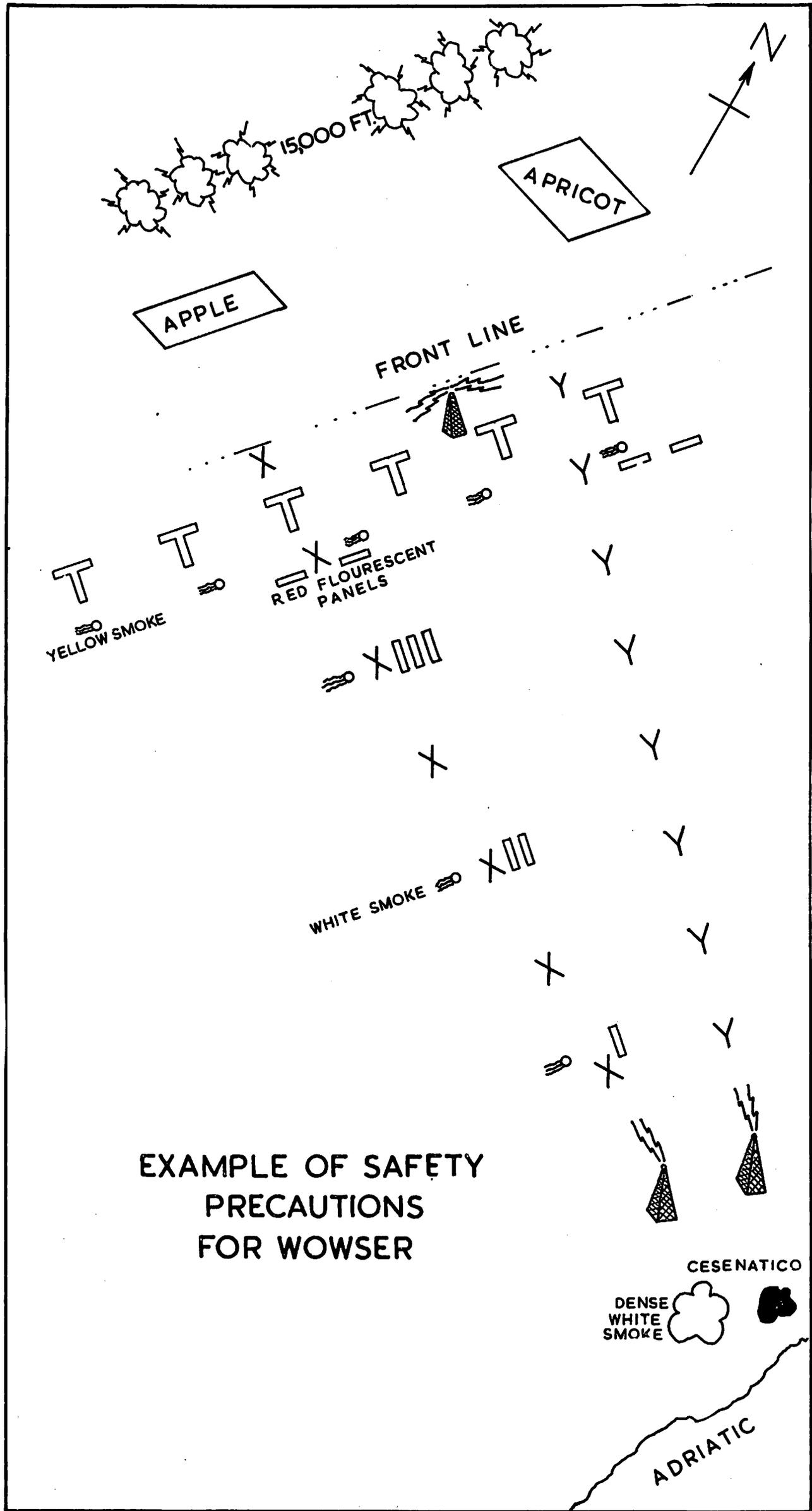
During operation Wowser, (1) which included the effort of medium, light and fighter bombers, the Strategic Air Force flew six major day missions to assist the Eighth Army to cross the River Senio and Santerno, to facilitate the subsequent advance of the Fifth Army on the left, and to close the enemy escape routes. Two of these heavy bomber missions were against targets on the Eighth Army Front and four missions on the Fifth Army Front, three rail diversion bridges North and Northeast of Venice, and the ammunition factory and stores at Ghedi (15 miles S.W. Lazo Di Garda). In addition, Liberators (of No. 205 Group R.A.F. made possible round-the-clock strategy by operating on seven nights against areas containing front line military targets and against the communication centres with the object of closing the escape route through the Argenta Gap and with interfering with movement on the Fifth Army Front.

All day bombing was by visual means and on 15 April the XVth (U.S.) Air Force put up the largest force in its history - when 98.6% of all the heavy bombers in Italy were airborne. Area bombing was adopted on the Eighth Army Front where precise targets could not be identified from high altitudes; specific tactical target areas were adopted on the Fifth Army Front where the objectives were of a more confined nature; and all but one of the close support missions were limited to a duration of ninety minutes. The minimum bombing altitude of 18,000 feet imposed the greatest need for safety precautions and navigational assistance and consequently bombers were required to open their bomb doors while over the sea, axes of attack were made perpendicular to the front line, initial points selected at Cesonatico (Eighth Army) and Pistoia and Prato (Fifth Army), a safety margin of 3,000 yards was left between the targets and the Allied forward positions, artillery was turned on the enemy forward gun positions to reduce the expected flak curtain, visual aids and radio aids were employed on an unprecedented scale, lead bombardiers and navigators were flown over the course once or twice (in modified P.38 "droop-snoots") before the operation and given first hand experience of locating the initial point, course markers and target, and pilots were trained in making use of the radio aids at high altitudes.

Visual aids varied in details but were similar in principle on each front. The following aids were available on the Eighth Army front.

- (a) Heavy concentrations of white smoke at a pinpoint adjacent to the initial point, beginning 15 minutes before the operation.
- (b) Three sets of ground markers comprised of white bars with white smoke downwind along the bomb run. The first had one bar the second two bars and the third three bars.
- (c) White 'T' letters 100 yards long and 1,000 yards apart marked the front line along the whole of area "apple", as close to the Senio River as possible, and supplemented by yellow smoke cannisters along the line of the 'T' letters.

(1) Report on Wowser by 15th Air Force.



- (d) Small red fluorescent panels in front of "Apricot" and "Apple" area.
- (e) Indication AA bursts along the Faenza-Bagno-Cavallo highway - three lots of four bursts 300 yards apart opposite each target area (salvo at each end and one in the middle). The shell bursts in each salvo were at 30 seconds interval and at 15,000 feet above sea level.
- (f) If necessary, flak bursts in the form of an 'X' at 15,000 feet above the initial point were to have been used to indicate cancellation of the operation.

Additional methods were used during the subsequent pursuit and instances of the bombing of friendly troops were due to human errors rather than to any intrinsic fault in the system adopted. When time was available to plan a set piece attack the arrangements were very effective but following the break-through, the fluid nature of the battle and the use of captured German vehicles by the Allies made the pilots' task one of great difficulty.

Radio aids comprised SCR-299 point to point communications between Headquarters 15th Air Force, M.A.T.A.F. and a Command Post at Loiana; V.H.F. at Desert Air Force and XXII Tactical Air Command Headquarters for the recall of bombers if necessary, and three MRN-1 vans (runway localisers) on each front for use as follows:-

- (a) To give a beam on the east target approach line on each front.
- (b) To give a beam on the west target approach line on each front.
- (c) To give a bomb line by transmitting a beam along the line of the visual bomb line markers.

The overall results of the Strategic Air Force attacks on tactical targets were excellent, especially with regard to effects on gun positions, personnel, supply dumps, troop concentrations, maintenance installations and communications. Bomb craters from 9 to 14 feet in diameter and 3 to 6 feet deep rendered communications wholly useless, in many cases gun positions received direct hits, many occupied buildings and strong points were destroyed, and dug-in troops were buried or became casualties. The 20-lb. fragmentation bombs rendered useless all supplies, vehicles, and lightly protected equipment in the area of attack; in many instances heavier guns and motorised equipment had to be abandoned; wire communications were cut and disorganised; and enemy movement was thrown into confusion by the blocking of roads.

The tactical employment of heavy bombers came as a complete surprise; the lack of resistance in the air was discouraging to the enemy; and, in addition to the casualty effect of the attacks, the bombardment had a shattering effect on morale which in many instances led to surrender without a struggle. The enemy's ability to withstand the Allied land forces, which advanced immediately after bombs ceased to fall, was destroyed and only scattered and ineffective resistance was met.

WOWSER - 1945

Target	Date	Time of Start	Duration in Minutes	Effective Heavy Bomber Sorties	Tons Bombs	Results
Tactical targets in area Apricot and Apple about 9 miles by 1-2 miles and parallel to Santerno and Senio Rivers	9 April	1342 just prior to opening of Eighth Army Offensive	92	825	1,692 mainly frag.	Excellent
Tactical targets in area Baker and Charlie along Santerno River	10 April	1100	60	848	1,792 frag.	Excellent
Nineteen specific tactical target areas on Fifth Army front south and south-east of Bologna	15 April	1257	91	830	1,577	Excellent on eighteen areas
Three rail diversion bridges, ammunition factory and stores	15 April	1200	108	312	797	Good
Tactical targets south of Bologna	16 April	1321	39	98	216 G.P.	One good concentration but 692 aircraft failed to attack owing to weather
Twenty-one specific tactical target areas south of Bologna	17 April	1254	125	751	1,607 G.P.	Good on twenty targets
Thirteen specific tactical target areas south of Bologna	18 April	1548	61	473	1,091 frag. and RDX	Heavy concentration on most areas

On the average each effective heavy bomber dropped 2.2 tons bombs. Non-effective sorties were normally only about 5% of the force despatched but the over-all effectiveness was reduced to 86% owing to bad weather conditions on 16 April. Losses amounted to 3/10 of one per cent.

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During the seven night attacks between 9 and 19 April, 507 heavy bombers dropped 1,402 tons of bombs, including 2,000 lb., 1,000 lb., 500 lb. and 500 lb. incendiary clusters. On each occasion approximately eight Liberators were used for illuminating and marking the target but on the first attack at 0400 hours 10 April (prior to the crossing of the Santerno) the army marked the centre of each area with red marker shells. The duration of attack was from two to eight minutes and all subsequent attacks took place shortly after 2100 hours. The results were good to excellent, the escape route through Argenta was blocked with rubble and craters, the bridge at Casalecchio was destroyed and communication through the town disrupted. The escape route through Porto Maggiore was blocked by rubble, craters and broken bridges, and the destruction at Malabergo was sufficient to end its value as a communication centre. On the whole, the enemy was denied the possibility of regrouping after the day attacks and could not make large scale movements under the cover of night. The cutting of his escape routes added to the congestion and made the enemy more than ever vulnerable to daylight attack.

All the safety aids were effective. The red fluorescent panels stood out well but were decidedly secondary to the white panels along the approach line and the 'T's along the front line. (1) The yellow and white smoke markers successfully attracted attention to the panels and 'T's and the A.A. line and radio beams were useful, but not fully used owing to the good visibility at the time. In spite of all precautions there were two accidents; one wave of 18 bombers bombed short killing 40 and wounding 120 forward troops; three bombers bombed short and caused a further 50 casualties. The reason for these mistakes were obscure but the incidents again demonstrated that hazards must be accepted if heavy bombers were to operate in close support.

The methods used for identification during this operation marked the biggest advance to date in this important aspect of air/land warfare and it is not out of place to trace briefly how the various systems had been developed during the campaign.

The Wann-Woodhall report of late 1940 recommended that each tentacle should be supplied with a stock of simple signs in the form of a white cloth arrow fifteen feet in length. (2) This was to be pointed towards the target and bars were to be placed across the arrow to indicate a distance of 500 yards. In September 1941 the first issue of Middle East Training Pamphlet No. 3 indicated that simple maps references and time codes would be used for the location of forward troops and that bomb lines would be expressed in terms of ground features and not grid lines. Formations of aircraft were to be met by a recce. aircraft at a pre-arranged rendezvous and guided to the target, at the same time being directed by R/T and ground strips. Recognition between ground and air was to be based upon a flying height of 6,000 feet and included the use of coloured Verey lights and ground signals. Aircraft had to announce their presence by visual signal and the Army had to indicate the position of ground signs by the display of light or smoke signals in return. On 29 October 1941, an instruction was issued, on the subject of ground/air recognition, which combined all the systems so far tried in the Middle East.

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- (1) M.A.T.A.F. Monthly Air Intelligence and Operation Bulletin for April 1945.
 - (2) Chief reference. School of Land/Air Warfare. Study No. 9.

Illuminating cartridges, smoke bombs or cannisters, large "T" ground strips, "V" direction indicators and Code words were included. Nevertheless, with aircraft flying at 6,000 feet or more above ill-defined country, smoke proved to be the only really effective ground signal and, under certain conditions, the day bombers could not give support nearer than five miles from the forward troops. In a fluid battle, and at lower altitudes, the recognition of closely enmeshed vehicles was a constant source of concern. Red and yellow paint on the tops of A.F.V's had failed to produce the answer in the Desert battles of 1940 and thereafter the use, by the enemy, of captured British vehicles served greatly to complicate this problem. Four foot black flags, surmounted by a white "T" were issued to A.F.V's during Crusader but the quantities issued were insufficient and, in any case, when in battle the tank crews could neither see nor hear an approaching aircraft and were naturally disinclined to stop in order to tie on the flag in accordance with instructions.

Lack of definite information from the Army with regard to friendly troops had prevented the full use being made of the day bomber force. The methods in use for recognition and target indication were not encouraging and early in 1942, Air Marshal Tedder wrote: "The Army fully realise the difficulties, but the solution depends on better control of land forces, which depends on better communications and training, and better recognition methods." The system of detailing bomb lines, which followed salient ground features and defined the forward limits of safe bombing, had not been able to contend with the confusion and fluidity of the Crusader operations but, during the subsequent lull, a more satisfactory scheme was introduced whereby movements in the forward area were to be forecast two hours ahead and sent hourly through the Air S.C. (1)

It was also decided that ground indication should be increased in size and that both indicators and ground strips should be issued on a more extensive scale. An artificial "V" sign with sides 100 yards long, constructed of lighted petrol tins 25 yards apart, was introduced for use by night (and proved of great assistance in helping fighters to fix their positions) and the enemy's extensive use of coloured smoke by day brought the conviction that this device should also be introduced. The use of smoke shells for target indication met with some opposition on the basis that targets within artillery range should normally be engaged by the artillery but, nevertheless, white smoke was being used by July 1942 and "V" target indications, illuminated by red smoke generators, were officially introduced a month later.

The use of canvas strips, 1½ feet by 15 feet and painted red and white in three feet sections, continued in use for some time for the marking of the vehicles of the Long Range Desert Group but a white St. Andrew's Cross on a black background was painted on the majority of Eighth Army vehicles during the lull at Gazala. In the meantime the R.A.F. continued to use the Roundel and this in turn, gradually replaced the St. Andrew Cross on all British vehicles. Vehicle marking continued for the remainder of the war but by this time the Roundel was to some extent replaced by the American five-pointed star. With mounting air superiority the advantage to be gained by this method of recognising friendly vehicles was invaluable and the possibility of a few captured Allied vehicles being thus able to escape from air attack was of minor importance.

(1) A.H.B. Narrative. The Middle East Campaigns, Vol. II.

The provision of a continuous up-to-date expected line of forward troops - in the form of a bomb line - continued as the basis of ground recognition but, in the period leading up to the battle of El Alamein, the forementioned methods were put to a more comprehensive use and artillery smoke came to be accepted as the most efficient method of marking close support targets. In addition, forward defence lines were marked by smoke candles, Aldis lamps and "T" panels pointing towards the enemy; and night navigation was improved by the use of magnesium flares, vertical searchlights and a variety of letters constructed of lighted petrol tins; and, during the advance through Tripolitania large "V"s were bulldozed in the ground and strips of road were painted alternately black and white. At El Hamma and Mareth, in the Spring of 1943, large and well defined landmarks in the forward area were marked by red and blue smoke and, simultaneously, the front line was marked by yellow smoke. Important enemy strong points were marked by artillery smoke and, as the advance began, the bomblines were automatically defined by a creeping barrage consisting of high explosive and a small proportion of smoke and moving at a rate of 100 feet per minute.

Army Air Support Controls - Development in the
Mediterranean Theatre

Small composite support flights were used to good purpose in Abyssinia against indifferent Italian opposition and, even without this refinement, the first advance into Cyrenaica was adequately supported. Mobility was the problem of the day but so long as the prevailing movement was forward the shortage of transport could be remedied, often to a most considerable extent, by the use of captured vehicles. A crisis did not develop, therefore, until the German Army and Air Force entered the field. The immature British organisation then found itself outstripped by a relatively superior German organisation and faced with multiple problems which included not only mobility but a need for an organisation that could meet the Army's requirement for quick and accurate close support.

This was especially needed to meet the fluid conditions of armoured battle and it was undesirable that the Air Force should in any sense be broken down into small support formations. The problem was therefore primarily one of signals and the period of the 1941 lull was devoted to arriving at a satisfactory solution. The information and materials available consisted of the results of the Wann-Woodhall experiments in Northern Ireland and an agreed establishment for an Air Component wing, that had been established on paper in the Spring but not filled. By July 1941 it was possible to post personnel to the new formation - renamed No. 253 Army Co-operation Wing - and to allot some Blenheim bombers and some Hurricane fighters and reconnaissance aircraft. The trials were carried out under the aegis of an inter-service committee and in September 1941 there emerged an agreed organisation, for adoption before the next major battle (Crusader). (1)

The initial proposal was to decentralise the control of impromptu support to the level of Corps but prior to Crusader it was decided that the A.O.C. should retain full control of his air forces and for this purpose a Direct Support Section was formed at Army/Air Headquarters out of the equipment and personnel of H.Q. No. 253 Wing. This established the normal level of control at the joint headquarters - while making

(1) Middle East Training Pamphlet No. 3A.

provision for the A.O.C. to exercise control at lower levels as necessary - and provided an assurance that the requirement for direct air support should not prejudice that for air superiority. The revised statement on the subject read as follows:-

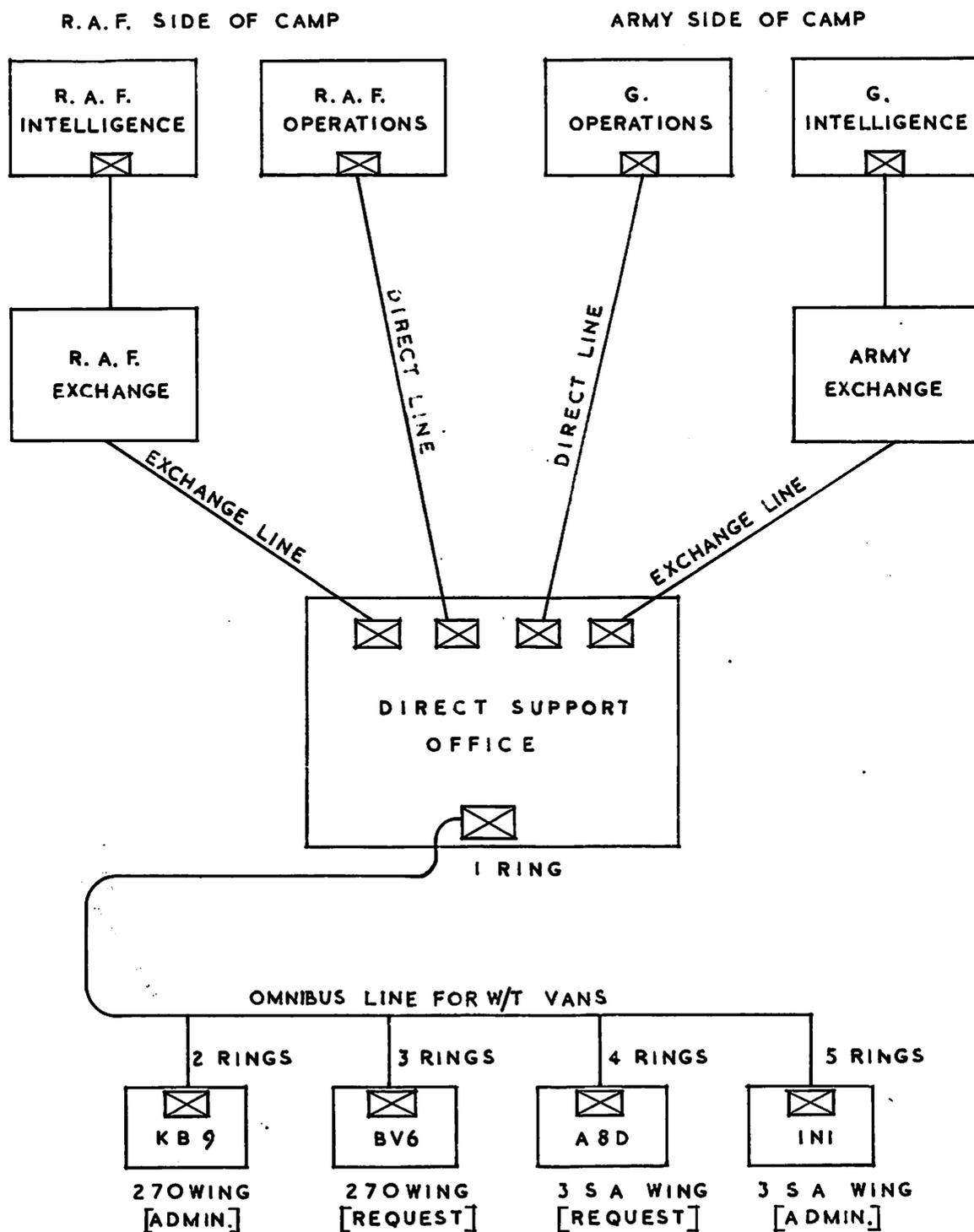
"Air support to be effective requires the employment of concentrations of aircraft. It also requires a careful assessment of the general air situation and of the degree of fighter support that will be required for any bomber task. (1) It is therefore necessary that the allotment of air support should normally be concentrated at the combined Army/Air H.Q. which is fighting the battle under the A.O.C. He alone can allot the correct proportion of fighters and bombers for the attack of each target. The combined H.Q. will be at Army or Corps H.Q."

An Air Support Control (Air S.C.) was to be allotted to each corps and armoured division but, as the latter already possessed good communications, no army element was to be provided for armoured divisions. The Army element for Corps was originally to be comprised of a small staff and seven tentacles but after experience in Crusader the standard number of tentacles was increased to nine, (those for armoured divisions being armoured). The R.A.F. element was to form a mobile advanced air headquarters comprised of the air commander or his deputy, a small operational staff, and equipment including two wireless sets known as Rear Air Support Links for communicating with landing grounds, four sets for these landing grounds and eight wireless sets for the control of air support aircraft in the air and for listening to reconnaissance aircraft. These latter eight sets, known as Forward Air Support Links (F.A.S.Ls) were to be made available for brigades of infantry and divisions but only three were provided in armoured form for Crusader and owing to vulnerability the remainder could only be used as stand-by links between Corps and Army/Air H.Q. (2) The three armoured links were allotted to XIII Corps, 7th Armoured Division, and XXX Corps during Crusader but owing to the need to co-ordinate bombers with fighters, it was impossible to delegate control and all briefing was done on the ground. The F.A.S.Ls therefore went untried in their intended role and when the organisation was reviewed after the battle they were limited to two in number (both armoured) - for the re-direction of aircraft in the air by a R.A.F. Liaison Officer at Divisional Headquarters - and the army became solely responsible for the receipt of reconnaissance information from aircraft at the tentacles.

During Crusader the light bomber and mobile fighter wing headquarters were linked by wireless to the Direct Support Section and to air S.Cs and calls on the Air S.C. net were intercepted and acknowledged by the appropriate bomber wing. (3) These requests came in a standard form (reconnaissance and map references codes and abbreviations were used) in which the number of aircraft required was left blank for insertion at Adv. Air H.Q. or at a controlling Air S.C. and, although not executive, served as a preliminary warning upon which aircraft were got ready and crews were briefed in anticipation of acceptance. Target information received at the Direct Support Section (and at Air S.Cs) from tentacles and airborne or landed aircraft was passed immediately to the R.A.F. and Army operations rooms for acceptance or refusal, and in either case the decision was then

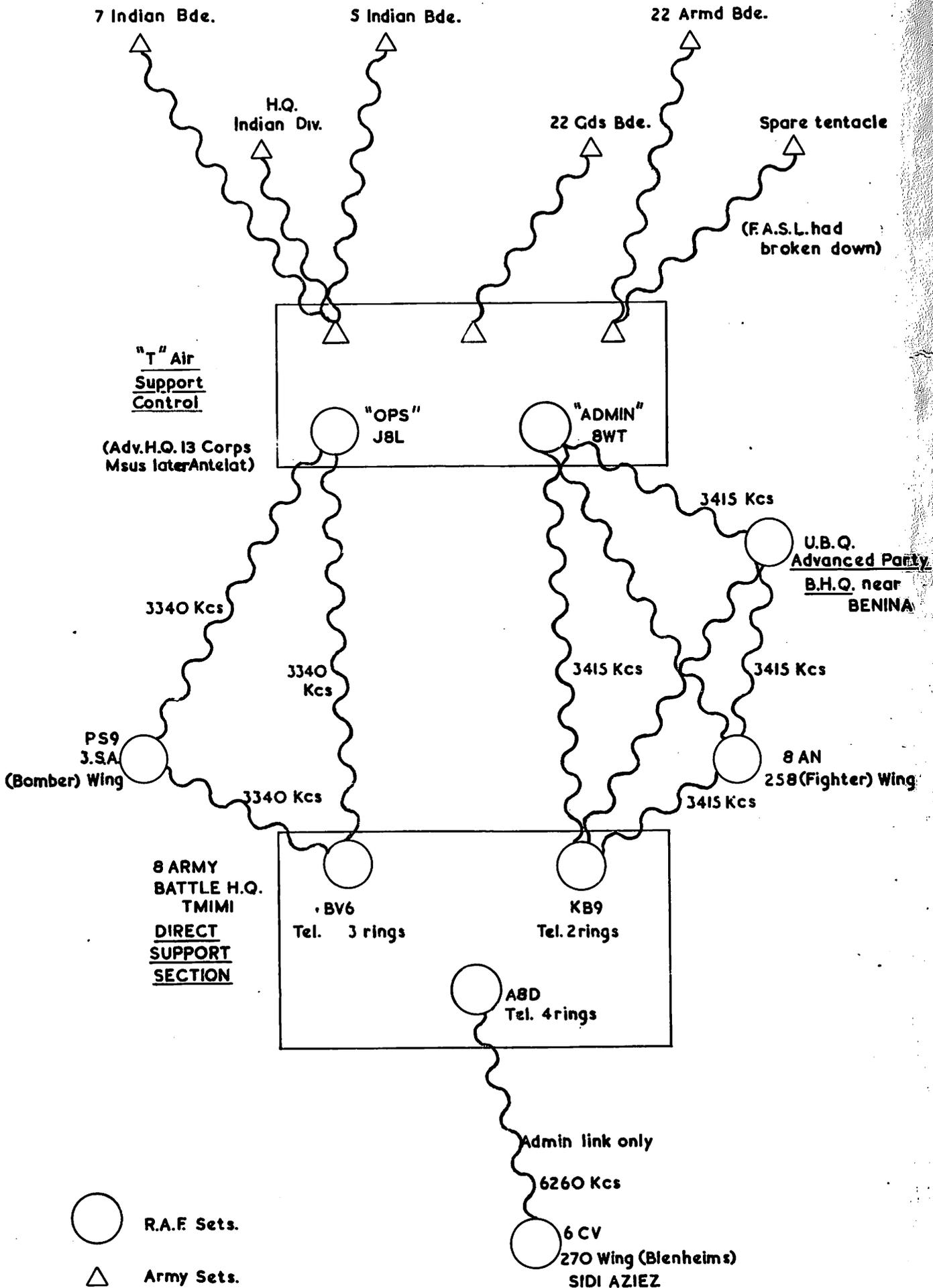
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- (1) Middle East Training Pamphlet No. 3A.
 - (2) Geddes Report.
 - (3) Geddes Report.

TELEPHONE COMMUNICATIONS FOR DIRECT SUPPORT AT BATTLE HQ. 8 ARMY. DURING CRUSADER

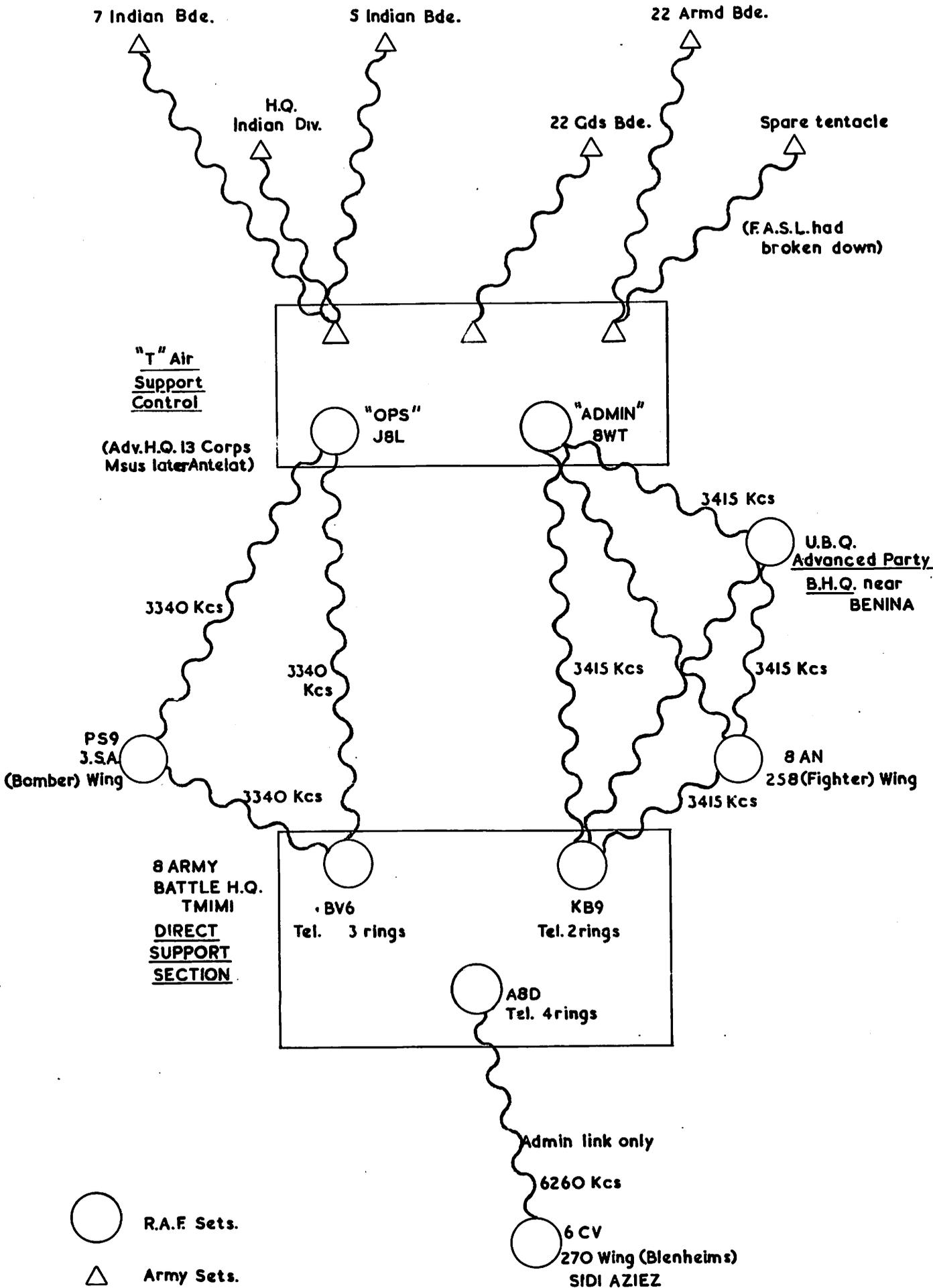


ALL THESE OFFICES WERE CONTAINED WITHIN AN AREA
ABOUT 400 YARDS SQUARE.

DIRECT SUPPORT ORGANISATION DURING CRUSADER. WHEN 270 WING MOVED TO SIDI AZIEZ UNDER 30 CORPS TO BOMB BARDIA.



DIRECT SUPPORT ORGANISATION DURING CRUSADER. WHEN 270 WING MOVED TO SIDI AZIEZ UNDER 30 CORPS TO BOMB BARDIA.



passed to the Wing concerned and to the Air S.C. These acceptance or refusal messages were referenced in accordance with the original report in order to avoid any misunderstanding - the text of an executive message referring to a target reported by reconnaissance being prefixed by the squadron letter, pilot's number, and time of origin, "Ref. J2 1210 support 9 aircraft" A further message would then be sent from the wing to the Direct Support Section and the Air S.C, stating the expected time of arrival over the target. The latter would relay this message to the tentacles concerned and the forward troops would then be prepared to display recognition signals at the correct time. Bombers flew en route, with their escort, to within R/T range of divisional headquarters to pick up any additional target information from the R.A.F. Liaison Officer at division and, after attack, reported the results to him in order that further effort might be requested as necessary. Additional information was reported to the Direct Support Section and the Air S.C. after landing.

The positioning of the Air S.C, at Corps tended to be strengthened by the preponderance of requests originating from ground sources during the early Crusader fighting along the coastal escarpment, where observation from the heights was good. In these circumstances the interposition of Corps as a filtering agency seemed justifiable; on the other hand, under more normal conditions, air reconnaissance was acknowledged to be the pre-eminent provider of information and targets so that the interposition of Corps introduced a less acceptable time-lag. It therefore followed that, sooner or later, the Air S.C, was bound to end up alongside the Direct Support Section at Advanced Air Headquarters/Army Battle Headquarters and this decision was no doubt accelerated by the decimation of No. 1 (Australian) Air S.C, while working with XXX Corps in Crusader. "T" (largely New Zealand) Air S.C, worked with XIII Corps throughout the advance to El Agheila but, during the lull at Gazala, control was decentralised at Advanced Air/Battle Headquarters. This was accomplished before the arrival of a replacement for No. 1 Air S.C. (No. 5 Air S.C.) and, subsequently, the two controls were combined to form a single No. 2/5 Air S.C, which eventually operated twenty-four tentacles and operated with Eighth Army until replaced by the Air Support Signals Unit. (1)

The requirement for fully mobile and efficient ground and air communications for use in the field had not been met by the summer of 1941, and the need for V.H.F. had to await supply from home. But local facilities offered the possibility of improving upon the unsuitable transport in which semi-obsolescent equipment was still housed for the use of advanced Wings and landing grounds, the supplementary pack sets made up from R.A.F. equipment, and the insufficiently mobile radar equipment which took three days to set up. The mobile communications, as prepared for Crusader, gave on the whole efficient service throughout the advance and subsequent retreat. The newly developed general purpose W/T vans proved the mainstay of signals in mobile operations despite the difficulties arising from a shortage of low pressure sand tyres. Captured German Diesel-electric power plants did much to alleviate the trouble arising from continual failure of the petrol-electric equipment supplied for the R.A.F. and, although a good deal of Signals transport was lost during the retreat to Gazala owing to casualties, all undamaged equipment and much of the enemy's was successfully withdrawn. W/T channels were

(1) War Office Monograph on Air Support.

duplicated landline circuits of more than a local nature were given a stand-by W/T channel, the improved pack-set gave a W/T range of about fifty miles, and the grouping of fighters and bombers close to their Wing Headquarters permitted considerable use to be made of landline communications within Wings.

Although landlines of more than twelve miles in length were prone to give excessive trouble - owing to breaks caused by the passage of heavy vehicles including tanks, the earthing effect of desert dews and, in certain circumstances to damage caused by strafing or bombing - the principle was followed of connecting Advanced Air Headquarters to fighter Wings by field telephone cable for urgent operational use and a teleprinter service was operated back to Rear Air Headquarters, and eventually back to H.Q. R.A.F. Middle East. All these landlines were the responsibility of Air Formation Signals sections permanently detached from the Royal Corps of Signals to Air Force formations down to Wing level and a large portion of the signals traffic passed by this means during the more static periods. The highest peaks in W/T traffic were naturally reached during periods of rapid movement. Delays were comparatively light and were mainly attributable to poor night reception, the coincident evening pressure of operational signals passing through the cipher bottleneck and, on occasion, to the impracticability of opening forward stations before the move of a main party.

In Northwest Africa the slowly expanding Allied Force had the services of No. 7 Air S.C. operating first at Divisional level, then at Corps level and, finally, with the assistance of No. 9 Air S.C. at First Army/No. 242 Group Headquarters. No. 7 Air S.C. operated on board the Headquarters Ship and then on land during the Salerno operations by Fifth Army (tentacles were at first provided by No. 2/5 Air S.C.) and, eventually Nos. 7 and 9 Air S.C. were amalgamated and established as No. 7/9 Air S.C. on the same lines as No. 2/5 Air S.C. Once on land, the U.S. Fifth Army and XII (U.S.) Air Support Command adopted British methods and began to form an American Air Support Control organisation which double banked and was trained by No. 7/9 Air S.C. and finally took over from the British organisation.

The decision to centralise the control of all operational aircraft at Advanced Air Headquarters (in this sense H.Q. No. 211 Group and No. 1 M.O.R.U. were a part of A.H.Q.) and then to place the Air S.C. alongside Battle/Adv. Air H.Q. changed the function of the Air S.C. The real control, thereafter, was Operations staffs at Army/Air headquarters. The Air S.C. organisation quickly came to be regarded and used primarily as a specialist communication network which notified Army/Air Headquarters of calls for air support and distributed certain intelligence information. (1) It was not used as a control and the rear links were not used for their intended purpose of ordering off aircraft ----- but as an additional communication network.

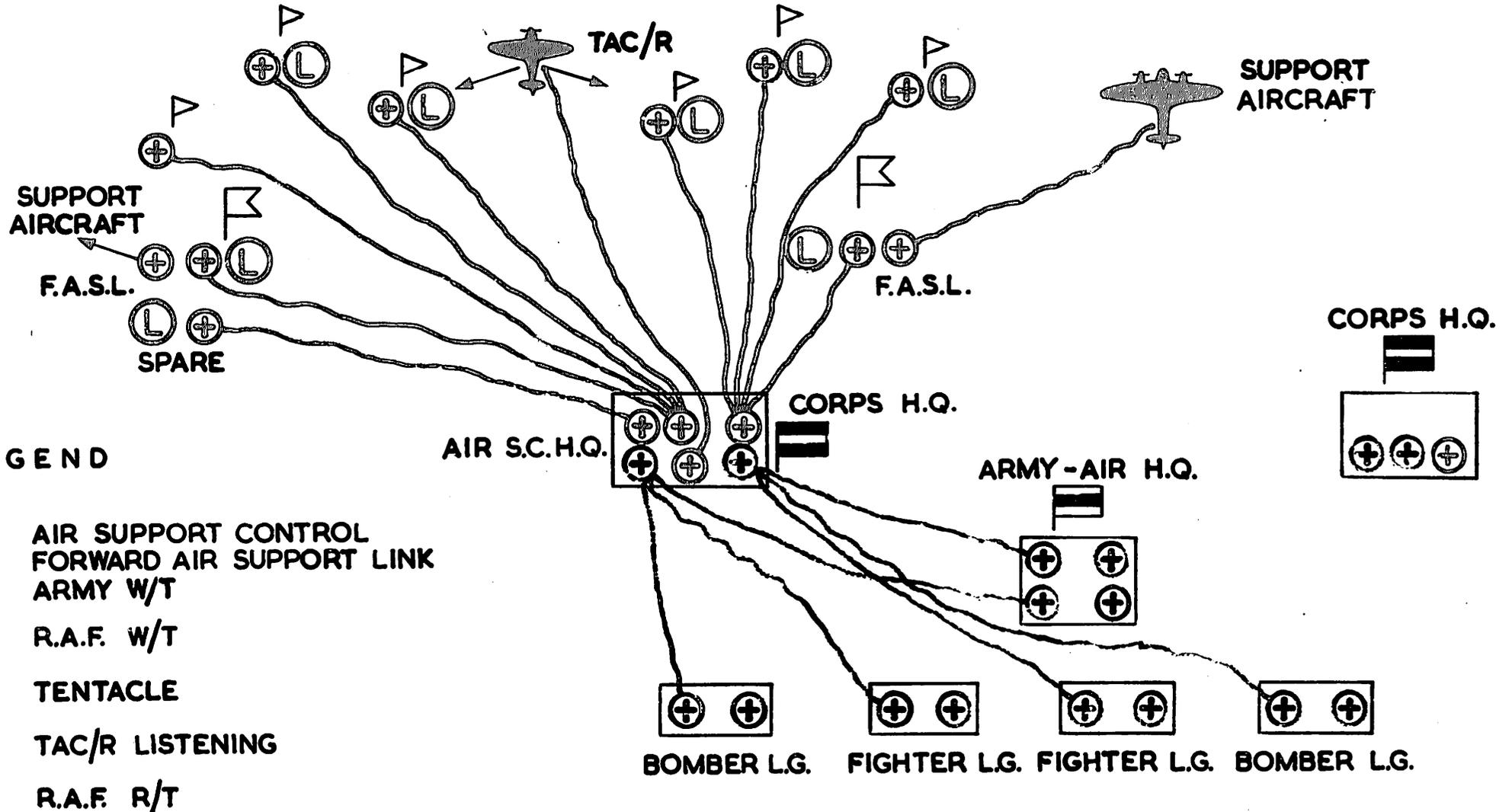
The adoption of the Air Support Signals Unit (A.S.S.U.) in October 1944 was therefore more of a change of name than a re-organisation and provided Army rear-links to airfields for the exclusive use of the A.L.O.'s.

Rover was a development of the Air S.C./A.S.S.U. system and was operated either as a visual control post or as a forward (blind) control post from which aircraft could be briefed and

(1) Leigh Mallory Report. II J15/15.

SIGNAL DIAGRAM - AIR SUPPORT CONTROL

AS SHOWN IN MIDDLE EAST TRAINING PAMPHLET No.3A



SECRET

FIGURE 13

A.H.B.I. DIAG. No. 55

assisted to the attack of targets close to the front line. (1) The aircraft were of the fighter-bomber variety and carried H.E. fragmentation bombs, fire bombs or rockets as dictated by the tactical situation. In January, 1945, on the Fifth Army front most Rover missions were flown by flights of four P.47 (Thunderbolt) aircraft.

A fundamental part of the organisation was the provision of a "Cabrank" of aircraft timed to arrive in the area at regular intervals of about 30 minutes. These aircraft would be briefed at their airfields to attack pre-selected targets but, for a period of about 20 minutes before attack, they would be required to orbit close to the forward line in order to give Rover an opportunity to call and brief them for the attack of priority "fleeting" targets. If no call was received the aircraft would attack their original targets and return to base.

Rover began in Italy as a normal armoured tentacle carrying a R.A.F. controller, an A.L.O. and V.H.F. for communicating with aircraft. It was sited on a height overlooking the battle area and the controller, by means of visual observation and a knowledge of the positions of forward troops (as obtained by the A.L.O. by wireless from the Air S.C. at Army) was in a position to contact aircraft and to brief them to attack fleeting targets, which he could observe on the battlefield, (2) But this he did without regard to the tactical situation and, sometimes, he could order the attack of only the most obvious targets for fear of confusion in briefing. A large-scale map, overprinted with a small grid, helped to clear the situation to some extent but the cockpit got cluttered up and the problem of briefing was not really solved until a handy sized gridded photo-mosaic was produced. Nevertheless, with additional communications the British "Rover David" was able to play an important role in the fighting before the Gustav Line.

The American Rover Joe was of a similar pattern to its British counterpart and, likewise, was able to act as a Visual Control Post in static warfare and mountainous country. It consisted of radio and telephonic communications from the supported units to the Rover Joe personnel and of radio communications from Rover Joe to the aircraft making the attack. Constant voice communication with the regiments making the main effort was provided by means of three or four radio jeeps and over and above this voice net, a carrier wave net (was) maintained with Air Support Control (at) Fifth Army and the Divisions and Corps. Squadron C.O's took turns as controllers for a period of ten days and each took an experienced pilot as an assistant. Army liaison, technical assistance and administration were provided by ground personnel.

Missions were requested by the ground units and were referred by the liaison officer to the controller who, with the help of maps, photographs and a knowledge of the location of friendly troops, decided whether to refuse or accept the target. If the target were accepted, the A.L.O. would notify the ground unit of the expected time of attack and keep it posted on changes in plan, and the controller would decide how to guide the attacking aircraft in relation to land marks. If necessary, he would

(1) War Office Monograph on Air Support and M.A.T.A.F. Monthly Air Intelligence and Ops. Bulletin for January and March 1945.

(2) M.A.T.A.F. Bulletin March 1945.

ask for artillery smoke to indicate or bracket the target at the time when aircraft would be ready to attack. Aircraft were normally available every half hour and, when the pilots reported to the controller, they were notified of the target to be attacked. The flight leader was given the co-ordinates of the target, its nature, checkpoints and advice on any special characteristics of the terrain or target, and informed of any smoke signals that were to be displayed. The controller would do his best to ensure positive identification of the target by the flight leader but, even when direct observation was possible, he had normally to rely in the end upon the pilot's ability. When all worked satisfactorily, calls for support could be answered by dive-bombing in as little as seven minutes. The flight leader then reported the observed results to the controller and supplementary information was obtained by interrogation after landing and by ground reports.

The British Rover David when used as a Visual Control Post and provided with communications to Corps, Divisions, the nearest field battery for ordering indication smoke, and to A.O.Ps., was ideal for the first stage of a set piece battle and sometimes in the slow exploitation of success. It was, however, an unwieldy and large-staffed unit, normally sited in a large building, and consequently some modification of procedure and organisation was necessary to cope with mobile warfare such as develops in comparatively flat country. Under these conditions good sites for observation and within a reasonable distance of Corps were likely to be scarce and consequently Rover had to be prepared to operate as a Forward Control Post rather than as a Visual Control Post.

Fortunately, the gridded photo-mosaic on a scale of 1/30,000 proved of great value for "blind control" and during the advance in the Po Valley, where good observation posts were rarely found, it was possible to brief pilots with great precision working entirely from a photograph. During one day's heavy fighting a Rover Control working in the dim interior of a cornstore, directed aircraft on enemy strong points sometimes only 200 yards from our forward troops, chased many tanks to death, and broke up at least one heavy, unexpected and inconvenient counter-attack. The controller was kept fully in the battle picture by his senior A.L.O., in touch with Corps and Divisions and with the local tactical situation through forward troops, A.O.P. and Tac/R.

Further mobility was required, however, to deal with a highly fluid and mobile ground situation and for this purpose Contact Tanks and Contact Cars were developed and consideration was given to control from light aircraft,

Two Sherman tanks had their six-pounder guns replaced by dummy guns and were each fitted with V.H.F. and an Army No. 19 R/T set. One was the control and carried an R.A.F. Controller, the senior A.L.O., an R.A.F. wireless operator and two Army drivers, one of whom acted as an R/T operator. The other, the "Tentacle Tank", was fitted with an additional Cdre No. 9 W/T set on the normal Air Support net and carried an A.L.O., a Signals N.C.O., two operators and a driver. The No. 19 sets were on the armoured regimental net and their component "B" sets were used for communication between tanks. It proved possible to operate on the move at speeds up to 15 m.p.h.

Contact tanks had a limited role and the war ended before they could be thoroughly tried in Italy. They were not intended as a substitute for the normal sited Rover but were expected to be of use in the following circumstances:-

- (a) "In support of an armoured breakthrough where the intention (was) one of rapid exploitation with little, if any, regard to flanking formations.
- (b) In support of an armoured attack, e.g., an Armoured Brigade with limited objectives where a definite allotment of air effort (had) been placed in support."

The Contact Car as used in Northwest Europe was not developed in Italy until late in the campaign. It consisted of a White Scout Car (half-tracked) fitted with V.H.F., an Army No. 19 set and a Cdre No. 9 W/T set. It carried a Controller, an A.L.O., three operators and a driver and was intended to provide support during a rapid and extensive pursuit when little determined opposition was to be expected. It was to be detached, as necessary, from the normal "Rover" and could operate as a self-contained Forward or Visual Control Post. It was to be in touch with "column cover" of fighter bombers or with Tac/R. aircraft working ahead of the column and was to use its Army sets to keep contact with the pursuit armour and with Army. The practice became to allot two contact cars in support of the Rover David (F.C.P.) at Corps, deploying them as necessary to brigades, and during the final pursuit the contact car was, in fact, used in its intended role. Aircraft were allotted to the contact cars by the F.C.P. as necessary, but in general the contact car was limited to the function of a forward observation post or leap-frog unit for the V.C.P., which was the lowest level to which aircraft and briefing could normally be de-centralised without involving waste.

The Horsefly system of placing a Rover control in a light aircraft was not generally favoured. It offered the advantages of visual observation but briefing was extremely difficult from a moving platform and the facilities for quiet study and consultation with the A.L.O. were not available. In any case the controller on the ground could at any time call for the assistance of, or be given targets by an A.O.P. aircraft and this information could be passed on to the fighter bombers if desired.

The British Rover Frank was an extra Forward Control Post situated alongside the Counter Battery Officer A.G.R.A. for the purpose of re-directing aircraft engaged on the attack of enemy gun sites. Guns were not good targets for bombs of 500 lbs. or over and it was not always possible to use the more effective anti-personnel bombs but, on the other hand, the mere presence of aircraft in a hostile role was known to have kept down the enemy heavy artillery sufficient to enable infantry to attack. In Northern Italy the enemy's usual reaction to air attack was to change his sites overnight and, consequently, it was necessary to devise a system whereby pre-planned air attacks did not need to be held up while the changes were being analysed. Rover Frank was the answer to this problem and all that was necessary was for the pilots of aircraft to inform the controller of their intended targets, whereupon the Counter Battery Officer would either "confirm" or allot new targets.

The American Midnight Rover was not a Rover in the usual sense but was an aircraft equipped for night photography and backed by a quick ground system of development, interpretation and diversion of aircraft to targets so found. A small

detachment of one A.20, three B.25's, and photo interpreters from No. 3 P.R. Group and No. 3 Photographic Technical Squadron was operated from an advance base. The A.20 operated from 1,500 to 3,000 feet using an Edgerton Flash unit and the B.25's operated from 7,500 feet with magnesium flash bombs and a photo-electric shutter control. Photographs were taken of pontoon bridges, ferry sites, marshalling yards and other possible choke points and the films were developed and interpreted (no printing at this stage) immediately the aircraft landed or, in the event of bad weather, the exposed film was dropped in an illuminated carrier on the airfield. Any important targets found by the interpreters were passed to the Tactical Control Centre (equivalent to M.O.R.U.), which in turn called XXII T.A.C. and D.A.F. to have subsequent night bomber/fighter sorties diverted, and called the Sector Controller (equivalent to Forward Direct Post) by radio to have airborne aircraft vectored to the target.

The P.R. aircraft could also call the Sector Controller by radio should visual sightings be obtained.

CHAPTER 6

BURMA AND MALAYA

Following the opening of the War in the Far East by the attack on Pearl Harbour, it had been decided that any threat to the Malayan Peninsula from a Japanese move to occupy Siam should be met by an advance into the Singora-Patani area. (1) In the event, the political factors involved and the weather conditions at the time of the Japanese landing prevented this plan from being put into operation. In any case the enemy had to be met with resources that were more than inadequate. Radar, for early warning, and radio for the maintenance of communications, were insufficient and the provision of further equipment was slow. As far as defence was concerned the British single-seater fighter strength was limited to but five squadrons, whilst they were supported by only half the number of anti-aircraft guns that had been deemed necessary.

It is not surprising, therefore, that the R.A.F. soon found itself involved in a series of withdrawals to the South. Such action inevitably led to congestion on the airfields from which they were forced to operate, and this in turn led to a higher rate of casualties from enemy attacks. The tasks required of the air forces were more than they had the means to fulfil and, as the morale of the hard-pressed Army declined, calls for support were answered to the detriment of their concentration on more important duties. By 23 December 1941, what aircraft remained in Malaya, and they were few indeed, were withdrawn into the perimeter of Singapore Island, and operations were continued from the forward airfields in the immediate North.

The lack of aircraft had contributed much to the state of affairs, but the priority demands of the United Kingdom and the Middle East had been too great to allow of any rapid build-up of the Far East Command to its estimated requirement of 336 first line aircraft and 327 reserves. Of photographic and transport aircraft there were none, whilst reserves of pilots were equally non-existent.

By 18 January 1942 the strength of the Air Forces showed just over 100 serviceable fighters and bombers to stand against an estimated weight of some 400 enemy aircraft which subjected their confined base in Singapore to sustained attack. Such a state of affairs could not continue for long and, by 10 February the remaining aircraft had to be withdrawn from the island, which fell some five days later.

The main reasons for the Japanese successes were the unpreparedness of the Empire as a whole, which had left the Far East in bad shape to withstand attack. (2) The enemy's quick moves, in accordance with a single plan never gave the Allies time to collect the forces necessary to remedy their initial weaknesses. "Air was the vital factor on both sides", wrote General Wavell; and although the Japanese air arm was not, in his opinion, a really formidable force and caused only small casualties and material damage, it had a sufficiently great superiority in numbers to restrict severely the operations of Naval forces within range of shore based aircraft, and to produce a great moral effect on land forces, which was aggravated by the enforced retreat.

(1) Brooke-Popham Despatch.

(2) Despatches of A.V.M. Maltby and General Wavell.

Much the same story was repeated in Burma. (1) Time, and the requirements of Singapore, Sumatra and Java, ruled out the hope of building the Air Forces to the numbers estimated as necessary. Against such forces as there were, was thrown what appeared to be an almost unlimited supply of aircraft. As in Malaya, the forward surge of the enemy brought with it calls for support from the Army which were accepted by the R.A.F. despite the unsatisfactory nature of the task. It was difficult to find targets with any certainty, and the risk of attacking our own troops was always high. The puny force of fighters held the Japanese off from Rangoon until, with the collapse of the warning system the fall of the city became only a matter of time. (2) By 27 March the activities of the R.A.F. in Burma were terminated and the final two months of the Army's withdrawal via Mandalay and Kalewa to Imphal had therefore to be supported from India, requests for bombing and reconnaissance being made to Calcutta.

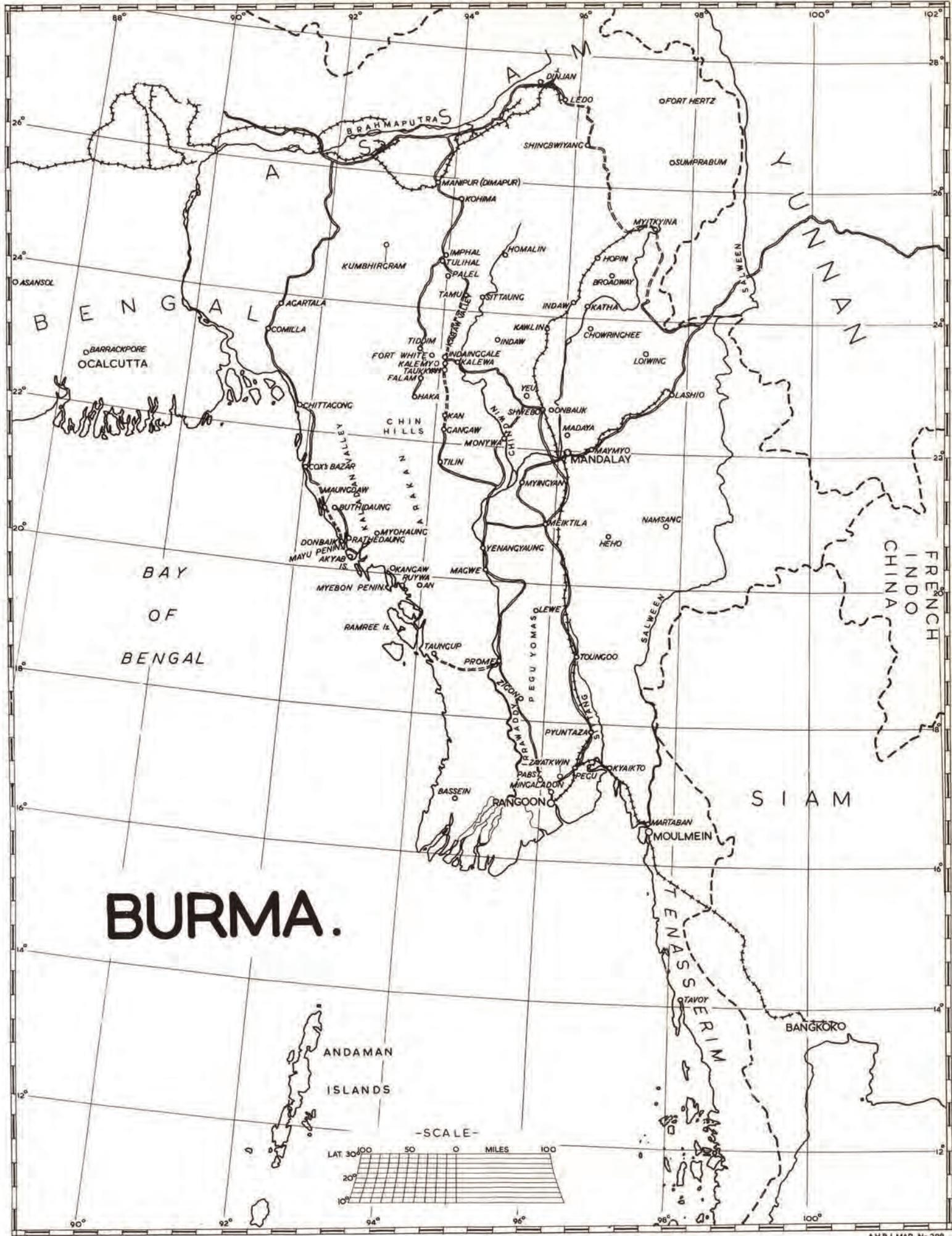
It was fortunate that the Japanese did not fully appreciate the victories at Magwe and Akyab, and failed to follow up their successes. Instead, their air effort was spread over a wide area and their policy was apparently to use the Army Air Force for mopping-up and garrison duties. The recognition for the need for an expansion of air power came too late, and even then was over-ridden by the Army and, after early 1942, the Allied bombers were at no time seriously embarrassed by Japanese attempts at interception.

The first active steps to establish a close support doctrine and to prepare a suitable organisation in the Far East in accordance with the proposals distributed from England had been taken during the autumn of 1941, and training was begun. (3) The Army Commander was to decide, in consultation with the Air Commander, upon the tasks to be undertaken in support of the Army, and the Air Commander was then to implement these decisions. The Air Force was to be prepared to provide close support bombing on beaches, in support of a mobile column, to extricate a hard-pressed detachment, and to support a staged land attack. Close support bomber controls with R.A.F. rear units and Army tentacles were to be provided and arrangements were made for the detailing of bomb lines 500 yards ahead of the leading troops, and for the display of white "V" target indicators. The system was analogous to the contemporary organisation used during Crusader in the Western Desert: its success in application has already been discussed, but in all fairness it must be remembered that the lack of training and experience of those involved, the chronic dearth of aircraft, and the poorness of communications were the major restrictions in implementing the requirements in this theatre. Furthermore the mobility demanded by a retreat put an added strain on such organisation and forces as were available.

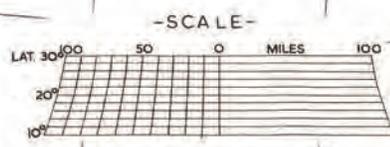
During the latter half of 1942 the air effort (fifty-two British squadrons and eight American, of which only twenty-nine and two respectively were operational) was controlled from Calcutta by the A.O.C. Bengal Command. The Air Support Control Organisation was centralised at Corps/R.A.F. Group Headquarters owing to the wide separation of the Corps/Group fronts. There

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- (1) Stevenson Despatch.
 - (2) II J54/1.
 - (3) II J50/41/3. 60S/S/5/2/Air.

FIGURE 14.



BURMA.



was little military activity along the Burma frontier until the autumn, when the Wings of the two Groups Nos. 224 and 221, were made mobile and No. 224 Group was reorganised into a composite fighter and light bomber forces for support of the Army in the field.

No direct support was provided against enemy formations engaged in battle with the Wingate Force who had penetrated into Burma in the Spring of 1943, and the likelihood of such close support being required by such forces, apart from supply dropping, was considered to be rare. In any case the distance from airfields and the absence of R/T ground to air communications for the notifications of changes in the ground situation ruled out such operations as some form of Visual Control Post (with adequate ground to air and ground to ground communications) was required if close support was to be afforded from distant airfields. The existing W/T facilities for communicating with India were reasonably satisfactory for the engagement of less intimate direct support targets.

In the autumn of 1943 Wavell launched a limited offensive in the Arakan, with the object of recapturing the island of Akyab with its port and airfields. Combined operations on a large scale were not possible, but air support for the ground forces was "extremely satisfactory", despite the difficult types of target that had to be attacked. (1) Targets were indicated to bomber and fighter pilots either by pin-point positions, by bearing and distance from a given object, by smoke, smoke mortar bombs or, when close to the forward troops, by smoke candles. The control of aircraft onto targets by a forward-sited R/T control was not yet practicable. The results of attacks on jungle targets could rarely be observed, but ground reports often indicated a high degree of success. Enemy air activity was surprisingly small and the morale effect on the land forces of seeing the R.A.F. operating unmolested was very great.

The Air S.C. Organisation for requesting impromptu support appears to have functioned satisfactorily and, in principle, was almost identical to that of the Western Desert and, depending upon terrain, a considerable reliance was placed upon reconnaissance as a source of targets. Reconnaissance was either flown under the orders of the Military Commander to whom the reconnaissance aircraft were allotted, or under orders of the Air Commander in accordance with the requirements of the joint Army/Air plan. The usual procedure was for the major portion of the following days effort to be detailed as the result of an Army/Air conference held in the evening, and the remainder would be held available to meet impromptu demands. If the acceptable targets exceeded the capacity of the force available, the surplus requirements would be passed to the next higher air headquarters for implementation, on the understanding that operations in front of the bomb-line would be co-ordinated by the Group Commander.

When light bombers and fighters attacked the enemy's lines of communications in the direct support area, considerable success was achieved. (2) The nature of the country forced the enemy to rely to a large extent on waterways and sampans and small boats. Within a very short period movement of any description by day (or in moonlight) by water, or by the better

(1) Williams Despatch,

(2) Williams Despatch.

defined land routes, was completely stopped. Every sampan, bullock cart, or other vehicle was destroyed on sight, chiefly by low-flying fighter sorties, and the enemy was forced to move by night, in non-flying weather, or in the thickest jungle.

The land forces made good progress as far as Donbaik and Raithdaung, where rock-like defences brought the advance to a standstill. Meanwhile the monsoon set in, the Japanese mustered their reserves and drove powerfully up the Mayu Range, and succeeded in outflanking the Allied forward troops and cutting communications in the rear. The Allied force was compelled to fall back and take up new positions South of Chittagong to forestall any attempt at the invasion of India.

Early in 1943 the Lysander had been replaced by the Hurricane II for reconnaissance, and this aircraft remained in use until the end of the war. (1) The three Tac/R squadrons were either retained directly under Group, or attached to a convenient fighter or fighter-bomber Wing. Tasks were tactical, photographic, contact and artillery reconnaissance, as well as supply dropping. In the latter case one container "Apparatus Supply Dropping Mk.Vb" could be carried on each wing-rack, each container carrying a load of 140 lbs. (2) This method was used to supply small isolated parties operating independently of the main force. Initially a squadron was divided between two Corps on the Fourteenth Army front, but the more usual practice was for one squadron to operate with each Corps and for flights to be detached to Divisions as necessary. An Air Liaison Section was attached to each squadron and the squadrons were located on air strips as close as possible to the Army formations from which the tasks were to be received. Pilots were fully briefed as to escape routes, evasion, and enemy and Allied troop dispositions, and sorties were sent off at all times, though the best results were generally achieved at dusk and dawn.

Target indication in close country was a major problem owing to the lack of landmarks and the enemy's skill at camouflage, but artillery and mortar smoke shells proved effective in combination with ground to air R/T communications between forward troops and support aircraft. The ideal was to mark all four corners of the target area, unless outstanding landmarks existed to mark one or more corners, and for aircraft to be told over the R/T the exact time when smoke would be put down. Later, in January 1944, however, trials were carried out to find out the best method of directing dive-bombers on to concealed ground targets, by smoke indication and R/T control. (3) Various methods of indication were tried (some nine in all), but it was concluded that the 3" mortar smoke bomb was the only satisfactory indicator. This could be used in the following ways:-

- (a) One bomb on the target. The smoke could be clearly seen provided the enemy did not make confusion smoke.
- (b) Five bombs to make a smoke pillar, maintained as required so as to be easily distinguished from the air.
- (c) A square pattern 200 yards square, laid by two mortars.
- (d) Two bombs, one over and one short.

(1) II J50/47/34P.376. A.C.S.E.A. Study on Tactical Operations.

(2) II J50/99/7.

(3) II J50/99/7.

Coloured smoke was also tried in order to counter enemy attempts at laying diversionary smoke and also because, in the smoke and dust of bombardment, it gave a more lasting indication. In practice, however, coloured mortar smoke was rarely available and either white or yellow 25 pdr. artillery smoke or white mortar smoke continued to be employed. When mortar smoke had to be used, lack of range often prevented the marking of more than the nearest corners of the target area and, when the control of marking from the ground was not possible, aircraft, such as the A.O.P., had to be used. As regards R/T reception, freak cases were known of contact being established with the R.A.F. A.L.O's Army 22R/T sets at a range of up to 130 miles, but instructions were usually given to aircraft about thirty miles from the target area.

Tactical reconnaissance over jungle country was a feature peculiar to the campaign. On both fronts the Tac/R squadrons, operating as far forward as possible, flew in pairs of aircraft mainly in order to lessen the strain of flying over inhospitable country. Sorties over jungle were flown at 150 feet or less, as positive results could only be achieved by effecting surprise, but activity in villages, on roads and on waterways could be located from greater heights, and such reconnaissance was largely instrumental in deterring the enemy from making use by day of his main lines of communication. Sorties lasted from forty minutes to four and a half hours, for which jettison tanks had to be carried,

Photographic reconnaissance was an important part of the work allotted to the fighter-recce squadrons, and most of the aircraft carried an oblique camera. Aircraft flew at 2,500/6,000 feet for vertical photography, which was a reasonably safe height from small arms fire. The absence of opposition made it possible for aircraft to spend as much time as necessary over a target, and the work done made a substantial contribution to the survey programme.

By the end of 1943, when Air Command South East Asia was formed, the squadrons in the theatre had increased to a grand total of forty-eight British and seventeen American squadrons, many operating with new aircraft such as the Spitfire Vc and Hurricane IIc. By then air superiority had been obtained over the forward areas and, with the withdrawal of the bulk of the Japanese Air Force during the monsoon, the R.A.F. was left with undisputed air superiority. Success in this sphere did not relieve the fighter force of the wearisome task of "standing-by", but it did clear the air for all forms of activity in support of the Army, and allowed a large proportion of both the fighter and bomber efforts to be concentrated upon the vital task of interrupting the flow of enemy supplies and reinforcements. The greatest proportion of the R.A.F. losses was incurred by fighters engaged in the attack of ground targets - a task which paid untold dividends in both the battle for air superiority and the battle for supplies, fully justifying the employment of the Royal Air Force in a preponderantly aggressive role.

Allied convoys were now able to move along congested roads in safety, and air support, reconnaissance and supply and the evacuation of casualties by air were performed with little hindrance. The Arakan and Imphal battles were fought and won with Allied fighters providing cover for vast streams of air transports; and when the battle went into its next phase the efforts of the J.A.F. continued to be no more effective and its losses remained high. Out of an estimated rate of effort of less than three per cent of that of the Allied the Japanese lost (between November 1943 and May 1944) an estimated 400 aircraft against 230 of the Allies.

The end of 1943 saw the scale of operations stepped up in support of the second offensive in the Arakan. The Allies had planned an attack to clear the enemy completely from the area. 5th Division were on the West side of the Mayu Range, and their role was to push South with all speed after capturing Maungdaw. They were to be supported in this by 7th Division, who were in the Kalapanzin Valley on the other side of the Mayu Range, and whose subsequent role was to advance South and capture Buthidaung. The 81st West African Division was in position to safeguard against any outflanking move such as was effected by the Japanese in the first Arakan campaign.

Reconnaissance was extended by the use of Ceylon-based Liberators to include Malaya, Sumatra, the whole of the Andaman Island and the Nicobar Islands. Objectives such as airfields, railways, rivers, ports, large towns and oil installations were covered revealing the extent of the enemy's preparations and dispositions. On the results of such valuable reconnaissance from November 1943 onwards, thirty-five per cent of the heavy, medium and light bomber sorties, eight per cent of the fighter-bomber sorties, and a considerable fighter effort was directed against communications and supplies. Owing to the great distance and dispersal of shipping little could be gained by attempting bombing missions against targets on the high seas, and it was therefore against such ports as Rangoon, Bassein, Bangkok, Mergui, Taungup and Akyab, that sorties were directed. The mounting air superiority of the Allies deterred the Japanese from sailing large vessels into the Andaman Sea, and bombing and mining was a threat that could not be faced by the dwindling tonnage of the enemy. The full use of sea transportation was denied by the potentialities of the Allied Air Forces, and one of the Japanese life lines was thus severed.

In the Burma theatre, Army support absorbed about 90% of the fighter-bomber effort and 60% of the light/medium/heavy bomber effort. The Hurribomber was the back bone of this effort, but Vengeances, Mustangs, Kittyhawks, Thunderbolts and Spitfires were scarcely less important. The Japanese, forced by attacks on Rangoon and Akyab, to curtail their use as ports, had to place greater reliance on land and river routes. (1) Of these two alternatives, travel by land routes had been drastically hampered during the summer of 1943 by the combined effort of weather and air attack. (2) This meant that increased reliance had to be placed on water transport. This was met from July onwards by an intensive R.A.F. attack, featuring Beaufighters and Hurricanes, which can best be illustrated by a statement of fighter claims against all forms of transport during the period 21 June to 15 November 1943.

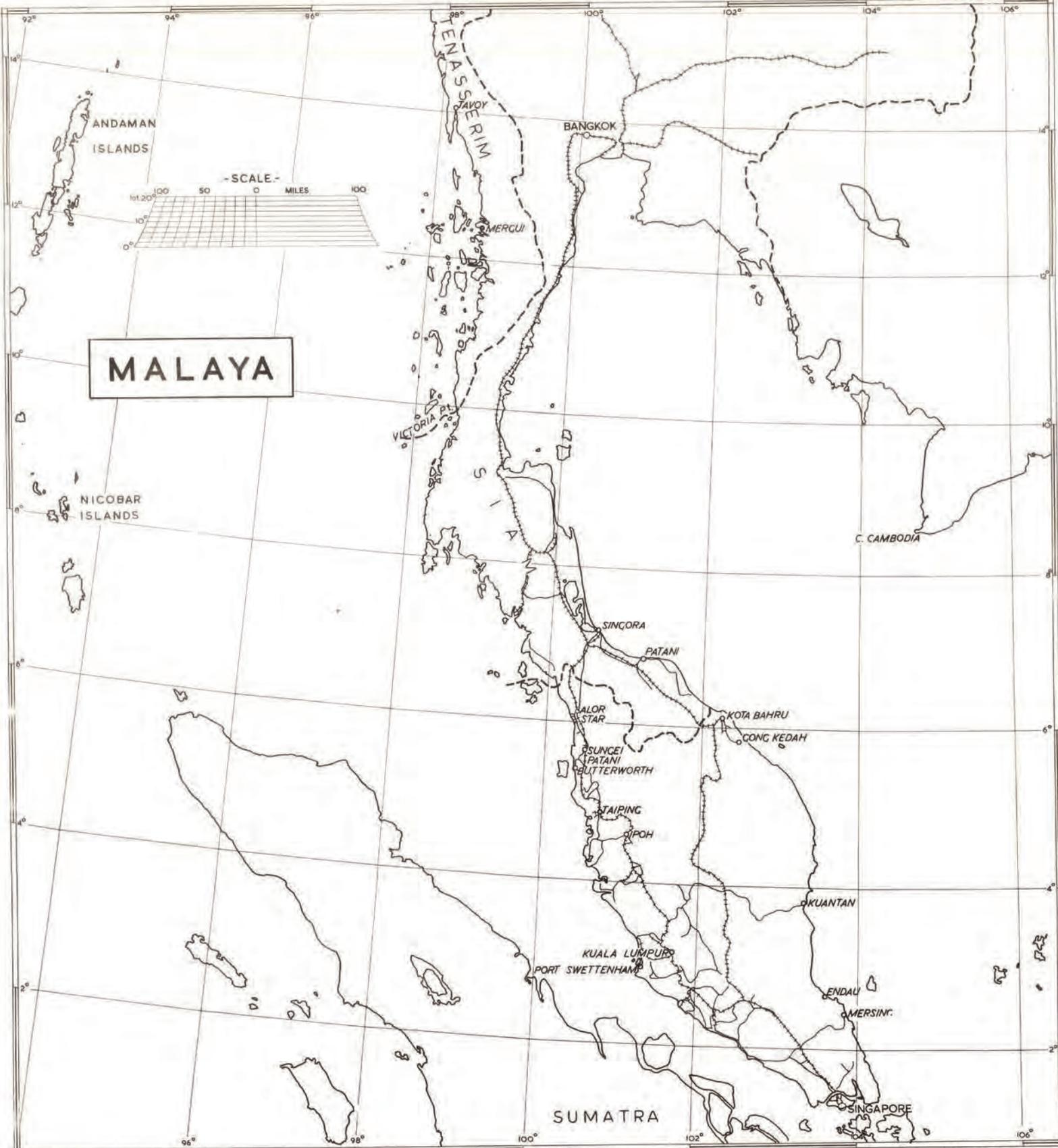
Sampans	160 destroyed	2,624 damaged
Motorcraft and Barges	12 "	193 "
Locomotives	9 "	143 "
Rolling stock	27 "	464 "
Motor Transport	42 "	142 "

Thus, while the Japanese Air Force was idle in air operations the R.A.F. not only made use of the bad weather restrictions to advance its training, but continued active operations as far as was practicable, and learnt that the monsoon conditions over Central Burma in particular were not likely to be so bad

(1) Peirse Despatch.

(2) Williams Despatch.

FIGURE 15.



as to prevent a well-equipped air force (radio and visual aids to navigation and all-weather airfields were necessary) from operating. British communications also suffered badly from the effects of the monsoon, but there could be little doubt of the superior ability of the Royal Air Force to play a title role in the battle for supplies. Targets included concentrations of troops, foxholes, bunkers, machine gun posts, artillery emplacements, fortresses, towns and villages offering cover to the enemy. (1) The fighter-bombers tackled the problem of locating these targets by approaching from a height in order to locate the pin-point by reference to surrounding features before delivering a dive-bombing attack. The ground attack fighters approached less difficult concentrations from the rear at low level in order to deliver their machine-gun and cannon attacks.

On the Arakan front the advances at Buthidaung and Maungdaw were preceded by intensive dive-bombing of strong points, with the assistance of Liberators and Mitchells. In February, 1944 the Japanese made a determined effort to encircle XV Corps and thus separate the 5th and 7th Divisions, cut the overland communications, and destroy the British in detail. The critical situation was saved after three weeks bitter fighting, and during that month Vengeances and Hurricanes flew over 1,400 sorties against concentrations, bunkers and lines of communication. Also, in February, the Vengeances and Hurricanes made many attacks on the Imphal front against storage areas across the Chindwin River, and small vessels and concentrations of rafts upon it. In March, when the Japanese began their offensive against IV Corps and after the first Long Range Penetration Brigades had been safely conveyed to their operating area, and the Arakan battle had subsided, the bulk of air support was switched to Imphal. The British 2nd Division of XXXIII Corps arrived at Dimapur on 1 April with urgent orders to relieve the garrison then besieged at Kohima. The forward airfield at Tamu had been quickly lost, but four Hurribomber and four Vengeance squadrons gave a maximum of support, and during April flew over 4,200 sorties against close support targets, dumps and camps. In May 1944, the effort was mainly centred round Kohima and a further 2,700 sorties were flown by Hurribombers and Vengeances in addition to 243 Wellington, Mitchell and Liberator sorties against tactical targets. Attacks were made against any concentration of Japanese found in the foothills about Imphal and L. of C. tracks through the jungle, and the enemy was never able to muster his full strength against the plain. Positive results were difficult to achieve against a well-camouflaged enemy, but the Army's confidence in air support and the effect on morale were incontrovertible. In retreat, the formerly high standard of Japanese camouflage could not be maintained, and by the end of the year the enemy was completely routed in Burma.

An innovation during 1944 was the introduction of the Air Observation Post, to which reference had already been made. Communication was by V.H.F. R/T on the reconnaissance frequency, and each squadron provided V.H.F. and W/T H/F equipment in a Jeep, a G.D. Officer and an A.L.O. to work with the Brigade or Division. The 1942 R.T./R procedure was used, but modified by such expedients as the use of air burst smoke in the opening rounds and "creeping" procedure when the nature of the terrain made "bracketing" impossible. (2) Otherwise the same procedure

(1) II J50/47/2.

(2) II J/50/47.

found favour as was used in other theatres, namely the passing back of opportunity targets to squadrons on the H/F link, or the briefing of aircraft whilst in the air to deal with targets of a fleeting nature. Impromptu shooting, however, was not a frequent occurrence owing to the inability of the pilots to see targets worth engaging in the difficult country.

The only special signals aid to close support was the Visual Control Post (V.C.P.) which was first used with the Long Range Penetration Groups of 1944. Later in this year, after the Squadron Leader Liaison Officers at Divisional Headquarters had been supplied with light man-pack V.H.F. sets, exercises with heavy medium and fighter-bombers demonstrated the usefulness of the V.C.P. and an establishment of one per Brigade was approved. By the end of the year ten teams were in operation, and by the beginning of May of the following year, this number had risen to thirty-four. The V.C.P. comprised an Army element with a Liaison Officer, signals personnel, and a H/F set on the Brigade net; also an R.A.F. element which at first consisted of a Flight Lieutenant G.D. Controller, a wireless mechanic, two operators, a jeep, and V.H.F. and H/F sets mounted in a jeep trailer. The trailer, however, proved too cumbersome, so the signals equipment was eventually transferred to the jeep and the trailer used for kit and spares, and a driver mechanic was added to the establishment in order to drive and maintain the vehicle. Later in the year it was decided to adopt the name "Contact Car(Air)", and to limit the R.A.F. teams to one G.D. Officer, one wireless operator mechanic, one member of the R.A.F. regiment who was to drive and service the vehicle, and R/T equipment consisting of one Type 1143 set and one Type 22 set. Anything required in support of this unit was to be an Army responsibility.

The inaccuracies and possible counterfeiting of smoke indication, to which reference has already been made, were obviated by the V.C.P., which was both flexible and accurate, and made smoke largely unnecessary except for targets which were invisible from the air and not determinable in relation to any obvious landmark. The main purpose of the V.C.P. was to assist pilots to find and destroy targets or to stop attacks if such action was made necessary by a change in the battle situation. The range of functions was as follows:-

- (a) To assist aircraft to identify targets for which they had been briefed on the ground, or to adjust the target.
- (b) To cancel or delay operations as necessary.
- (c) To direct aircraft to secondary targets for which they had previously been briefed. (1)
- (d) To direct aircraft from "cab-rank" and to re-direct aircraft on to a new target as necessary.
- (e) To co-ordinate and control heavy bomber operations.

Light aircraft were used successfully to assist the V.C.P. to direct aircraft to the target, particularly when the V.C.P. Controller was unable to find a satisfactory observation post on the ground. In these circumstances the light

(1) II J54/10.

aircraft spoke to the V.C.P. over H/F R/T, and the Controller, using the information thus supplied directed the strike aircraft by V.H.F. From this it was a step to making the V.C.P. airborne, and two such were in operation by the end of the campaign. Cases did occur where Divisional Commanders attempted to control operations through the V.C.P., but instructions were issued to prevent such action, and control of operations was clearly vested in the Group Headquarters. (1)

The V.C.P. system proved a success from both the air and ground points of view. It provided for close and efficient co-operation between ground and air forces, but during heavy bomber or combined attacks it was only used to give permission to attack to late aircraft if the target was still open. It led to the use of "cab-ranks", in which aircraft patrolled continuously over selected areas in constant touch with the V.C.P., there awaiting instructions to attack opportunity targets; but although this had a good morale effect on our own troops, and air support was available at a moment's notice, the lack of suitable targets introduced a wasteful expenditure of flying hours and petrol. The weight of attack was diminished, generally to two aircraft at a time, and consequently "cab-ranks" could only be regarded as a secondary alternative to airfields situated well forward.

By the end of 1944 the position on the various fronts was that 5th Division was well beyond Tiddim, and advancing towards Falam in a thrust aimed along the Gangaw Valley. A solid bridgehead had been established on the East side of the Chindwin opposite Kalewa, which was to serve as a starting-point for an offensive to the plains of Central Burma. The 36th Division had captured the enemy bases of Indaw and Katha. From the North Chinese forces were developing a distant threat to Mandalay.

On the 1 January 1945 the Allied Air Force had increased to sixty-four British squadrons (inclusive of one Dutch squadron), and forty-two American squadrons - exclusive of two internal air line R.A.F. Dakota squadrons and ten non-operational R.A.F. squadrons - making a total of one hundred and six operational squadrons. (2) On the other hand Japan, in spite of her initial successes, had remained at least twenty years out of date in her conception of the role of the Air Force in modern warfare, and at no time after the initial invasion was the J.A.F. able to take the initiative again. In preparation for the planned advances of this year Nos. 221 and 224 Groups were organised on a mobile basis. Tactical squadrons were organised on a servicing echelon basis, administration and most of the first-line maintenance became the responsibility of Wing Headquarters, which were given numbers instead of static place-names. Subject to the availability of airfields and air transport the fighter squadrons were thus able to move forward in step with the advance, an organisation that was also a feature of the campaign in The Middle East and North West Europe (q.v.). By the middle of January 1945, the Allied advance was well under way, and a Wing was operating from airfields near Yeu and nine squadrons were located at Toungoo and four at Magwe by the end of April. On 10 January four Mitchell squadrons and thirty-four Hurribombers, with cover provided by Spitfires and Thunderbolts had attacked an enemy stronghold at Gangaw, and within ninety minutes five out of six

(1) II J50/47/57.

(2) II J/50/47/20.

Japanese positions were captured. (1) During the week 12/19 January 234 fighter-bomber sorties were flown against village positions, hill positions, bunkers, beaches, boats and bridges at Myebon on the XVth Corps front.

The degree of mobility achieved was good, but not perfect. (2) The provision of additional servicing echelons might have eased the strain imposed by intensive operations on squadron maintenance, while the slow-moving road parties were trying to make progress along the congested and narrow roads. For instance, later, in April, when over eighty R.A.F. units moved forward, the allotment of vehicles was so inadequate that one Wing was forced to resort to the use of bullock carts.

Unlike the Western Desert Air Force the M.O.R.U. was not employed by the R.A.F. Groups in S.E. Asia until 1945. At this stage a Mobile Control Centre became necessary due to the speed of the advance and a Group Control Centre was formed on the European model and deployed at Meiktila and Toungoo. (3) A.V.C.P. H/F ground network was organised in 17 Division, connecting the V.C.P.'s with Brigades to a master V.C.P. at Divisional Headquarters. This was also in contact with the offensive readiness flight at Meiktila by landline or H/F. A direct link was also established on the A.S.S.U. network at advanced Headquarters No. 224 Group. It was considered that as a result of this planning for the offensive that the organisation was sufficiently flexible to deal fully with all requirements including, where really advisable, the decentralisation of air support to the Corps and Divisions. This decentralisation, however, was to function only as an emergency and not as a normal procedure. It also ensured the most efficient use of the aircraft available to the whole Army front, and the Combined Headquarters, accordingly, fully endorsed the principle of centralised control.

During the beginning of the year the main attacks on the XIVth Army front were in support of bridgeheads across the Irrawaddy. The policy adopted was a first priority to the neutralisation of the Japanese Air Force, followed by the provision of strong support against the enemy, the destruction of his positions, supplies and installations, and the isolation of the battlefield. (4) A serious threat to the 20th Division brought about by a Japanese thrust from a concentration of tanks was stemmed; in a single day, 19 February, Hurricanes of No. 20 squadron put out of action or destroyed no less than thirteen tanks, using rocket projectiles and cannon. Mention must also be made of another successful action in support of the Irrawaddy crossings, namely the deceptive tactics undertaken by the R.A.F. in support of IV Corps. The most ingenious deception devices such as delayed action parafex, instantaneous pintails and delay action aquaskits were to be dropped in specified target areas, each approximately 10,000 yards square. Dummy parachutists were also to be dropped in the fading light of dusk. The purpose of the devices was to simulate the effect of rifle and grenade fire and the effect of Verey cartridges fired from the ground or water. The operation was a complete success, putting the enemy on the alert for days in the fear of heavy night attacks to the extent that he even went so far as

(1) Park Despatch.

(2) II J54/10.

(3) II J50/47/57.

(4) II J50/47 /57.

to pull reinforcements down South from their defence positions further North. One result of this deception was that IV Corps were already across the river and striking East by the end of the month.

During March 1945, the number of sorties flown and the weight of bombs dropped put up new records for No. 221 Group. An advanced Headquarters of this Group had moved with Fourteenth Army to Kalembo on 1 January and on 9 February the whole Headquarters was at Monywa, arriving jointly at Meiktila about the middle of April. It was here that the 9th Brigade had been flown in under the protection of the Group in twenty-eight Dakotas of the Air Commando Provisional Troop Carrier Group: a notable undertaking.

Japanese attempts at re-grouping in this area had been immediately harassed by a continuous "cab-rank" of fighter-bombers, re-established road-blocks were attacked prior to ground attacks, an enemy attempt at build-up was dispersed, and Fort Dufferin - the last stronghold in Mandalay - fell after five days bombardment by fighter-bombers and Mitchells. Air bombardment was here a contributing factor, (1) Rocket projectiles, bombs up to 2,000 lbs, fragmentation bombs and strafing attacks were thrown against the fortress. The walls were forty-five feet thick, and though Thunderbolts, Hurricanes and Mitchells dropped about sixty-five tons of bombs, they failed to breach the wall sufficiently for the infantry. Nevertheless the fortress fell on 20 March.

Attacks on communications had continued throughout the advance, some 3,846 successful engagements, for instance, being recorded during the twelve months ending May 1945. During the same period some 11,822 water craft, including 302 power-driven units, were successfully attacked, mainly in the favourite hunting grounds of the Irrawaddy, the Arakan coast and the waterways of South-West Burma. Heavy bombers also contributed their part; in February, at the request of the Army, some two thirds of the Liberator operations were in support of the ground forces in attacks on stores. Forty-five of these aircraft bombed the stores dumps at Madaya; in March and April the enemy's six months reserves of stores in the Rangoon area were attacked in conjunction with Superfortresses of XXth Bomber Command, reducing the stocks to an estimate fifty per cent or less. The destruction of these stores had been considered vital in order that the advance on Toungoo should not be delayed, and, in the event, no delay occurred. So great had been the effort that the Army feared that the Air Forces would exhaust their stocks of bombs, but such fears were not justified and the air effort was stepped up even more. On 21 April Toungoo was raided by forty Liberators and fell on the following day.

By the end of March the Japanese in Central Burma had been completely defeated, and by 3 May Rangoon was captured. A Japanese Staff Officer who was captured in Burma attributed the defeat of the Japanese to the superior mobility of the Allied Army. The mobility of the ground forces was almost entirely provided for by the Allied Air Forces, whose record tonnage had exceeded 2,900 tons per day during April 1945. Fighter protection for the transports had required 1,667 defensive sorties over the same period. (2) A total of 4,813 bombing and

(1) Stratemyer Despatch.

(2) II J50/47/57.

low attack sorties were flown during May and June in a drive to destroy as many enemy troops and animal transport as possible. With the fall of Rangoon the air forces were turned to face the large concentrations of the enemy left between the Irrawaddy and Mandalay railway corridor. His plight was desperate indeed as he struggled against starvation, malaria, and other diseases and, in July, an attempt to create a diversion to assist the planned break-out from Pegu Yomas by an offensive West of Sittang was broken with the assistance of intensive air support. Spitfires and Thunderbolts operated under V.C.P. control in "cab-ranks" against gun positions, troop concentrations and river craft and, as the month advanced, Spitfires, Thunderbolts, and Mosquitos were guided by ground indicators and flags to large concentrations of troops which were reported by guerilla bands using portable W/T.

Then came the moment for which the Allies had been waiting when, on 21 July, the Japanese in the Pegu Yomas began their attempted break-out. The whole of the air support was switched to the area, and in the short period of almost nine days the enemy lost a total of 10,000 troops killed, of which about 2,000 were directly attributable to No. 221 Group. Much of the success was due to the "Earthquakes" inaugurated in 1944. (1) This form of attack had been designed to clear some particular area immediately prior to a ground attack, and varied in strength. The principle of the "Earthquake" was a relatively heavy bombing attack followed by fighter-bombers, directed against the target in sections, receding as the ground forces advanced and finishing with dummy attacks. Many of the difficulties that had been discovered in trials during that year were overcome with increased success in 1945. Conferences, at which all interested parties were represented, were held at least thirty-six hours before an operation was due to take place, the degree of concentration was increased to between 0.3 and 0.5 lbs. of bombs per square yard, and the safety limits were modified to 800 yards for Liberators, 700 yards for Mitchells, 300 yards for Thunderbolts, and 200 yards for Hurribombers. The best start lines were those running parallel to the bombing run. It was found that bombardment which produced 20% casualties was sufficiently demoralising to the remaining 80% to permit the attacking troops, if they went in immediately afterwards, to mop up the position with very little opposition. In practice, six to eight minutes were allowed for four Mitchell squadrons to attack, three minutes for each fighter-bomber squadron, (2) and, at the conclusion of the bombing, the fighter bombers were employed as necessary on strafing across the front just ahead of the advance. The Liberator and Mitchell attacks were planned to provide the degree of saturation required, and fighter-bombers, under V.C.P. control if necessary, were employed against specific targets.

It is of interest to denote the three main types of target for which the Army could request concentrated bombing, namely:- (3)

- (a) Organised defensive positions astride the only road axis through hilly country covering some tactical feature or features. These were combinations of bunker and foxhole localities protected by wire, well camouflaged and hidden from the air: difficult to locate even on the ground.

(1) II J50/47/57.

(2) II/70/16.

(3) Coryton Despatch.

- (b) Organised defensive positions covering important road or rail communications in open country and at the crossing of major rivers. The defended locality was again of the bunker and foxhole type, with wire protection and all timber construction. They lay within areas of about 4,000 by 3,000 yards and would probably be held by one regiment.
- (c) Organised defensive positions in towns and built-up communications centres, where the outer fringe of defences was invariably of very strong bunkers with overhead cover that necessitated heavy bombs and a short delay fuse. They lay in areas of up to 8,000 yards by 8,000 yards and held up to one Division.

The occasion for the use of "Earthquake" bombing in jungle warfare was rare, but it increased when the enemy was compelled to concentrate in open country. (1) More use was made of large scale operations against heavy gun emplacements, heavily defended villages, supply dumps, headquarters and barracks during the spring of the year (1945) and they continued to be so used throughout the remainder of the campaign.

Weather was at times perhaps the greatest obstacle for the R.A.F. to overcome in Burma, a factor which is beyond control; and this was particularly so in the last stages of the campaign during the advance down the railway corridor to Rangoon when, in a race with the monsoon to get all-weather air bases established in Southern Burma the entire leap-frog movement was interrupted by the slightly earlier than usual arrival of the rains, which rendered the strips unusable. (2) Even so, the longer ranged aircraft were able to fill the gap which had thrown the shorter range fighters temporarily out of action so that throughout their advance the Army could not lack for the support on which they depended so much.

(1) Stratemyer Despatch.

(2) II J50/47/57.

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CHAPTER 7

THE INVASION OF NORTH-WEST EUROPE

Ever since the retreat from France in the summer of 1940 the strength of the Allies, later so strongly fortified by men and material from the United States, had been gradually built up towards achieving the aim of meeting the enemy once again on the soil of Europe, sweeping him clear of the countries that he had occupied, and eventually accomplishing his defeat either within or outside his own frontiers. To this end the Germans had been forced out of the North African coast and been driven back up the difficult Italian peninsula. In Holland, Belgium, Luxembourg, France and other countries, patriots worked unceasingly for the day when they could come out into the open to join forces with the liberating Allies. The invasion of Europe was, therefore, the most critical operation of the war; for on it so much depended that the possibility of failure could not be entertained. It had to succeed. Nothing could afford to be overlooked, nor, within human limitations or the hazards of war, could anything be left to chance. A vital pre-requisite to the assault was the massing together of an Allied Air Force so powerful that it could guarantee the mastery of the skies beneath which the other two arms could sail unmolested to the attack against an enemy confused and battered by a stunning and carefully planned bombardment. This is confirmed by General Bayerlein, who stated, "Without the overwhelming air power of the Allies it is my considered opinion that the invasion could never have succeeded."

The appointment of General Eisenhower as Supreme Commander Allied Expeditionary Force (S.C.A.E.F.) became official on 12 February 1944, when he was directed to "enter the continent of Europe and, in conjunction with the other United Nations, undertake operations aimed at the heart of Germany and the destruction of her armed forces." (1)

Such an operation called for certain changes in the control and disposition of the forces to be used, and two major changes were made affecting the air forces in England. The first was a reversion to the pre-war Air Defence of Great Britain, and the second was the formation of an Allied Expeditionary Air Force for the express purpose of the invasion closely linked with the armies it would support. A.C.M. Leigh Mallory was appointed to command this force and, to simplify control, the American forces were also placed under his command. However, both the American and British Strategic Air Forces were excluded from this arrangement with the exception that it was agreed that they should come under the direction and command of the Supreme Commander - instead of the combined Chiefs of Staff - for a period preceeding, during, and subsequent to the actual assault; furthermore the Commander was allowed to state in what way the efforts of the Mediterranean Air Command could best be interlocked with those made from the United Kingdom in order to prove most effective. The result of this decision was that for the critical period of the invasion the whole of the Allied air power could be called upon to ensure the success of the assault on the Normandy beaches.

In the early stages of planning and preparations there was a C-in-C Air Forces and a C-in-C Naval Forces, each with integrated Staffs, but the Army had no equivalent and was under

(1) Despatch by A.C.M. Leigh-Mallory and Report on Air Ops by Air Staff S.H.A.E.F.

the direction of the Chief of Staff to the Supreme Allied Commander (C.O.S.S.A.C.). In February 1944 the C-in-C, 21st Army Group was appointed to co-ordinate the planning and execution of the assault for both the U.S. and the British Army Groups, and was thus raised to the level of the C-in-C Land Forces. He naturally used the Staff of H.Q. 21st Army Group but the staff of S.H.A.E.F. still continued to exercise direction of land operations from the point of view of general policy and to effect co-ordination with the Navy and Air Force at the high levels. The C-in-C Land Forces and his staff had therefore to work on two levels with two large Army Staffs. The situation was further complicated by the geographical situation of the headquarters concerned with the planning of the operation, housed as they were in London, Bushey Park, Portsmouth and Stanmore. An Advanced H.Q. Allied Expeditionary Air Force was established at Uxbridge alongside the H.Q. of the U.S. and British Tactical Air Forces in order to direct and co-ordinate the operations of these forces and to form a convenient link on a tactical level with the C-in-C land forces during the initial phases of the assault. It moved to the Continent on 9 August 1944, where it was located alongside the U.S. Tactical Air Force (Ninth Air Force) and 12th U.S. Army Group, until being merged into Main H.Q. A.E.A.F. which moved to Julouville alongside S.H.A.E.F. on 8 September 1944. It was thus only when the various headquarters were united at Julouville in Normandy that the co-ordination of operations became smooth and easy and, in the opinion of Air Chief Marshal Leigh Mallory one of the major lessons of the assault was that the Staffs of the Supreme Commander and of the Air, Naval and Land Commanders in Chief should be very close together during both the planning and the executive stages. Each Service should be prepared to sacrifice and compromise, good communications are essential, and an Advanced Air Headquarters is needed in the field in order to co-ordinate on the spot the work of the Air Force with the requirements of the Army.

Whilst the plans for the assault were taking shape the air forces were already active on a number of tasks whose accomplishment was to contribute in varying degree to the success of the operation. As early as 1942 trials had been carried out with units on a fully mobile basis (1) and exercises were held to accustom personnel to working in the primitive conditions they could expect to encounter in the continental bridgehead, and later when the advance began. There was also much preparatory work to be done of an operational nature; work which at every stage of its execution, in all its methods and results, must not excite the suspicions of the enemy nor give him any clue as to the time and place at which the blow would ultimately fall. These operations varied from major strategical tasks spread over a long period and involving considerable effort, to single sorties flown by only one aircraft. The effectiveness of the G.A.F. in defence had to be reduced by bombing the German factories where the aircraft were produced, by decreasing the availability of his oil supplies, and by throwing the gauntlet of challenge in the very teeth of his fighters in an effort to force them to give battle and thus inflict losses which he could ill afford, and would find difficult to replace. The German Staffs had to be kept in ignorant suspense of the vital area of the European coast from Norway to Spain that had been chosen for the Allied attack and, if possible, made to believe that the thrust would be made elsewhere than actually planned.

(1) Operation Spartan. See page 42.

The chosen beach-head had to be kept under constant aerial surveillance so that the Allied Staffs could have an up to date picture of the terrain, the defences and obstructions of the coastal strip, and the suitability of the ground in the rear of the beach-head for the movement of troops and the construction of airfields. As the day approached, to the air forces fell the task of isolating the battle area, disrupting communications, neutralising coast defences, including enemy radar and "Y" stations, and generally striking at the enemy's ability to anticipate the attack and reinforce his defences rapidly and in force. In addition, the assembly of the invasion armada, the movement of troops and aircraft had to be concealed from enemy air reconnaissance. To describe these operations at length and in detail is outside the scope of this monograph, but it is essential to bear in mind the number of different tasks that had to be apportioned between the aircraft and crews available, and also the fact that the Allied Air Forces had been operationally active in preparation for the mounting of Operation Neptune many weeks before 6 June 1944.

Briefly, the whole of the available strength of the Allies in the air, apart from aircraft operating remote from the theatre, was available for the operation although, due to other considerations, such as the launching of the German "V-weapon" offensive, careful consideration had to be given to the priority of targets and the best use of the aircraft available. The great weight of the Strategic Air Forces of Britain and America, as has already been said, was at the disposal of the Supreme Commander if he considered that their use would materially assist in the achievement of any particular objective and, as will be seen later, the American day and the British night bombers were employed on more than one occasion in a purely tactical role, though their employment as such was by no means simple nor looked upon with favour by many who felt that this interfered with their long-term strategical tasks. There were also available the fighters of Air Defence of Great Britain to protect the bases in the United Kingdom and, later, the shipping in the Channel and off the French coast or to act as escorts to aircraft of other Commands. Those aircraft most intimately connected with the invasion were those of the British and American Tactical Air Forces (2nd T.A.F. and U.S. Ninth Air Force and 1st Tactical Air Force). The British element was assigned to work with the 21st British Army Group and included No. 2 Group's light/medium day and night bombers, No. 85 Group operating day and night fighters, No. 34 Strategic Reconnaissance Wing, and two day fighter Groups, namely No. 83 Group consisting of fighters and fighter bombers to work with the British Second Army, and No. 84 Group to work with the Canadian First Army. The aircraft of the United States and the First Free French Air Force were assigned to work with the ground forces of their respective nationalities.

Operation Neptune can be divided into three phases; the preparatory phase lasting for about three months; the actual invasion of the beaches on "D" Day; and the follow-up period from "D" Day to D+11. Launched prior to the preparatory phase were the strategic operations against the power of the German Air Force (Operation Pointblank) which, however, in March 1944, gave place in priority to Operation Overlord, the code name for the overall strategic plan designed to bring about the defeat of Germany, of which Neptune was the overture. In addition as early as 5 December 1943, Operation Crossbow had been initiated as a counter-measure against the attacks by flying bombs and rockets against London and the South Coast. The launching of this offensive might have been a real threat to the invasion

preparations and it was essential that strong measures be taken to prove it ineffective. Although it demanded the allocation of some of the air forces to cater for this particular aspect of the war it nevertheless provided admirable training for the air-crews as well as serving as a diversion to the preparatory bombing of targets in the assault area.

One of the first air tasks before the invasion was that of photographic reconnaissance. (1) Although the invasion had not started, this task was as much in the nature of support for the Army as if the battle had already been joined, for only a narrow strip of water separated the opposing armies. Coverage was required, and obtained, of the whole of the enemy coast line from Holland to the frontier of Spain. Vertical and oblique photographs had to be made showing beach gradients, beach obstacles, coastal defences and batteries. In some cases obliques were taken at wave-top height at varying distances from the beach to provide low-level views of the shore for the use of the incoming assault crews and troops. Further coverage of the hinterland was also made for the use of troops striking inwards from the shore. In addition, coverage was required for the selection of airfield sites, of bridging points for the Army Engineers and of likely dropping points for the Airborne Divisions. The flooding areas of the Low Countries and France were not neglected in this last work, the extent of which may be judged by the fact that in the two weeks prior to "D" Day one R.A.F. Mobile Field Photographic Section alone made for Army requirements more than 120,000 prints. It should be mentioned also that all the photographic sorties were by no means flown for the Army. The special requirements of the other two Services had to be studied and catered for. So great was the demand for this aerial reconnaissance that the Central Reconnaissance Committee was set up at S.H.A.E.F. in the Spring of 1944 to co-ordinate and allot the tasks. (2) During the period 1 April 1944 to 5 June 1944, aircraft of the A.E.A.F. flew 3,215 sorties, whilst aircraft of other Commands, including the U.S. Eighth Air Force flew a total of 1,519 sorties during the same period on photographic missions. As a result, the Allied Command was given a comprehensive and up to date picture of the ground they had to assault and attack over, and a fair idea of the enemy's resources available to resist them, together with their dispositions.

Other tasks which fell to the Air Forces prior to the launching of the attack may be briefly tabulated as follows:- (3)

- (a) Protection of the assault craft mustering in U.K. bases.
- (b) Destruction and dislocation of the enemy's detection devices so that the approach to the beaches could achieve the maximum surprise.
- (c) Protection of the invasion fleet as it crossed the Channel and the movements of shipping after "D" Day.
- (d) Neutralisation of the enemy's coastal batteries.
- (e) Interdiction of the battle area.

(1) A.C.M. Leigh Mallory's Despatch. Para. 139.

(2) II M/AL9/LYY. S.A.E.F. Op. Memo. No. 19.

(3) A.C.M. Leigh Mallory's Despatch. No. 11 Group Ops. Order.

- (f) Dislocation of the enemy's communications system in order to obstruct the German Staff in their appreciation of the situation and the mobilising and moving in of reinforcements.
- (g) The landing of airborne forces in the neighbourhood of the battle area.

A number of these tasks can barely be described as taking the form of an Air Support commitment except insofar as almost all operations during the Spring of 1944 were in the nature of support for the Army on whom had to fall the final and critical responsibility of storming the enemy beaches and there establishing their bridgehead.

A carefully worked-out plan was made to disrupt the enemy's communication system. A total of eighty rail targets of primary importance was scheduled for attack by the A.E.A.F., R.A.F. Bomber Command and the U.S. Eighth Air Force. (1) By "D" Day fifty-one of the eighty were categorised as being damaged to such an extent that no further attacks were deemed necessary until repairs had been effected; twenty-five were severely damaged, but with certain vital installations still intact, thus necessitating further attack. The remaining four had received little or no damage. (2) In addition to the damage done to the actual rail targets, rolling stock was attacked by fighters and fighter-bombers, 3,932 sorties being flown between 19 May and "D" Day. The result of this effort was to deny to the enemy his capacity to move his reinforcements quickly and decisively in counter attacks against the invaders. (3) On 21 April 1944 the first of a series of sorties against bridges was made. The tempo of these attacks and their weight was stepped up as "D" Day approached, so that by that date twelve rail and twelve road bridges over the Seine had been made impassable. In addition a number of other vital bridges elsewhere had been destroyed.

The stage was now set; the site of the attack had been selected and surveyed, the area of the great battle isolated as far as possible from the rest of the European fortress, and the ability of the G.A.F. to interfere with the operation seriously impaired. The day of the attack had been provisionally decided. All that remained was to intensify the effort and pray that the one unpredictable feature, namely the weather, would be suitable for the operation. In the event the weather was not as good as had been hoped for but, after a twenty-four hour postponement the Supreme Commander made what was probably the most responsible and far-reaching decision of the campaign and gave the executive order for the attack to be launched.

Before the assault force of five Divisions left its various anchorages and steamed towards the Normandy coast certain preliminary operations, apart from those already briefly mentioned, were initiated to prepare the ground for the main attack. One of the most important of these was the neutralisation, or at any rate the disorganisation of ten heavy coastal

(1) A.C.M. Leigh-Mallory Despatch. Para. 57.

(2) During the period that this rail plan was in operation, that is from 9 February to "D" Day, a total of 21,949 aircraft dropped a weight of 66,517 tons of bombs on the targets selected.

(3) A.C.M. Leigh Mallory Despatch. Para. 86.

batteries whose fire could interfere considerably with the approach of the invasion fleet. This task fell to the aircraft of Bomber Command, who were to make the attacks so timed that the bombardment would have finished as near as possible to dawn. The second operation was the dropping of certain Airborne Units on the flanks of the assault area. This was successfully achieved and the flanks held. (1) At the same time the airborne troops, by their presence, added to the confusion of the enemy and hampered his efforts to bring in reinforcements. Two important tasks of the Airborne troops were the elimination of a heavy battery at Merville, and the seizing of bridges over the river Orne. In both these operations the ground forces were successful.

The beach itself had been divided into five sections under the code names Utah, Omaha, (American) and Gold, Juno and Sword (British) which would, as the lodgement areas increased, eventually link up one with another to form a continuous bridge-head of sufficient length and depth to allow the build up and grouping of the forces required for the thrust into France. Not only had air cover to be provided at both high and low levels over the beaches, but arrangements had also to be made to provide cover for the stream of shipping moving back and forth between England and France, and those vessels standing off the French coast. This was no mean commitment, for more than 2,000 ships and landing craft were used to lift the initial assault force and their equipment supported as they were by a task force of over 100 warships and escort vessels. (2) To Coastal Command fell the responsibility of protecting the flanks of the shipping lanes from attacks by submarines. The defensive patrols which were planned had to cater for an effort by the G.A.F. - whose strength had obviously been husbanded during the preceding months - of anything up to a thousand sorties per day. In the event the reaction of the enemy air forces was unexpectedly and gratifyingly meagre. Nevertheless it might well have proved fatal to the whole expedition to have planned on such an optimistic basis.

The major operations in support of the Army were the attacking of pre-arranged and opportunity targets in the assault area, reconnaissance of the enemy's reactions, the prevention of movement of enemy reinforcements and the spotting for the naval heavy calibre guns whose duty it was to bombard such of the coastal defences which had not been neutralised by aerial attack. As far as air support was concerned fifteen American and eighteen British Fighter Bomber squadrons were available to provide immediate support either against pre-arranged targets or such targets of opportunity as might present themselves as the battle progressed. (3) Those squadrons detailed for close support in the actual assault area were controlled by the Headquarters Ship of the force assaulting that part of the coast where the target was situated in those instances where the target was pre-arranged. When, however, the target was an opportunity one the aircraft were controlled by the Headquarters Ship which had initiated the request. Each Headquarters Ship, which acted as Flagship to the Naval Commander of the assault force concerned, accommodated the Military Commander of the assault Division and his Staff and

(1) II S/76, Page 40.

(2) A.C.M. Leigh Mallory Despatch. Para. 154.

(3) No. 11 Group Summary for June. App. 'G'.

also an Air Staff Officer representing the Commander, Advanced A.E.F. In addition to this Officer, a Group Captain, there also sailed a Wing Commander and a Squadron Leader Signals Liaison.

The duties of this small R.A.F. Staff were briefly as follows:- (1)

- (a) To keep the Commander, Advanced A.E.F. informed of the Naval and Military Commanders' intentions and requirements.
- (b) To give advice to both the other Commanders regarding calls for immediate air support or tactical reconnaissance received over the Army Support Channel from tentacles ashore, or on any other relevant air matters such as the use of smoke over the anchorage at night and the control of A.A. fire by day.
- (c) Receiving R/T reports on behalf of the Military Commander from aircraft.
- (d) Representing to the co-ordinating Fighter Direction Tender the adequacy or inadequacy of the fighter cover provided.
- (e) Directing fighters by visual control as required on instructions from the Fighter Direction Tender.
- (f) Maintaining an R/T listening watch for Naval Bombardment spotting aircraft and issuing instructions to such aircraft if they were unable to contact the bombarding ship for which they were detailed to spot.
- (g) Representing to the Naval Commander of the Force and special requirements for Air/Sea Rescue Services from naval vessels.
- (h) Re-briefing or re-directing, if necessary, aircraft which arrived in response to calls for immediate support, and maintaining an R/T listening watch for support aircraft arriving over the area.

To ensure that the striking force was employed to the best advantage against opportunity targets requests for action against them were passed by one of these five Headquarters Ships to Headquarters Advanced A.E.A.F. who decided the scale of effort to be provided in the light of forces available, and the tasks on hand or envisaged. The Combined Control Centre was then instructed to pass the executive order to the squadrons detailed to carry out the mission. In addition squadrons were available to be detailed for patrol duties on "D" Day and subsequently as required in the neighbourhood of the assault area. These Air Alert Squadrons were also under the control of the appropriate Headquarters Ships which (2) could pass R/T instructions to attack opportunity targets as required. To cater for any change in the situation which might occur between briefing and arrival at the assault area each formation leader reported to the Headquarters Ship on his arrival in the

(1) II S/89/1. Report on Operation Neptune by Air Staff Officers of H.Q. Ships and Fighter Direction Tenders.

(2) No. 11 Group. J.A.P.E.O. for Neptune. App. 'G'.

area and again when leaving it. Opportunity targets which might arise, but not of such urgency as would necessitate action by the Air Alert Squadrons were catered for by a number of Readiness Squadrons which could be brought quickly into the battle area to deliver attacks against the selected targets.

Control of all fighters in the area was through the Fighter Direction Tender. These were Tank Landing Craft which had been suitably modified as far as their lay-out was concerned to accommodate the special staff on board. They were also equipped with all the various specialised equipment required for the maintenance of communications between themselves, shore stations and the aircraft they were controlling. The control of fighters was not exercised in any way by the Headquarters Ships, though the latter were in a position to request additional fighter cover if, in the opinion of the staffs on board the Headquarters Ships, more was required. Both systems worked well, the only drawback being that some six hours after the attack had begun the Military Commander and his Senior Staff Officers naturally enough went ashore to keep in closer touch with the developments of operations. This meant that there was no Senior Army Officer left on board to represent the Divisional Commander, whereas the R.A.F. Officer, tied as he was to his communications equipment, could not move ashore with the Army Staff.

Daylight operations by aircraft under the Combined Control Centre began at 04.30 hours, an hour and a half before the divisions began to disembark. (1) The security measures, diversionary raids and destruction or confusion of the enemy's radar had been effective in ensuring a far greater measure of surprise than might have been anticipated in the circumstances, for little serious resistance was offered during the initial phases of the landing either in the air or on the ground. During the morning some enemy reconnaissance sorties were flown, but it was not till 15.00 hours that small formations of FW.190 fighters and fighter-bombers appeared in the assault area. These were attacked by Allied fighters protecting the troops on beach cover patrol, and four of twelve Ju.88's and Ju.188's were destroyed.

To the heavy bombers of the U.S. Eighth Air Force it was apparent that their plan to bomb some forty-five targets in the six mile coastal strip would be impossible of performance using visual methods, due to the prevailing weather conditions. (2) Alternative plans had been arranged which imposed the use of instrument bombing, a technique which called for the allowance of a greater safety margin to avoid casualties to our own troops. It was therefore decided that all such bombing was to be concluded ten minutes before the touch-down, and the Mean Point of Impact was not to be less than one thousand yards from the forward wave of the assault forces. As an additional precaution, bombs were fused with instantaneous fuses and no tail fuses in order to prevent cratering of the landing beaches. This might well have occurred due to the limitation in the accuracy of the bombing methods employed.

With the withdrawal of the heavy bombers the fighters and fighter-bombers took over the area in and around the bridgehead. (3) The plan called for what was virtually an air umbrella stretching

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- (1) No. 11 Group. Activity Synopsis.
 - (2) Effectiveness of Third Phase Tactical Air Operations in the European Theatre. Page 45.
 - (3) No. 11 Group. J.A.P.E.O.

from England to the beaches. Such a plan envisaged the employment of six squadrons of Spitfires on low cover, and three squadrons of P.47's on high cover throughout the hours of daylight. This commitment embraced the whole of the area of the five beaches and the area five miles inland and fifteen miles seaward. Patrols over the area were necessarily limited to fifty minutes for the low cover squadrons and an hour for the high cover squadrons.

Throughout the day attacks were made on enemy batteries, defended localities and enemy tanks and vehicles. (1) Rocket firing Typhoons were successful in attacking a German radar unit between Le Havre and Cap De La Hague which had been ranging guns on the coastal forces. Typical of the targets attacked were a Rocket Gun position at Meuvaines by Typhoons carrying bombs or rockets; defended localities in the Caen area; thin-skinned vehicles on the roads out of Caen. Armed reconnaissance flights were also carried out in the area immediately beyond the beach line. Results of the attacks were, in the main, good, and numbers of tanks, M.T. and horse drawn vehicles were destroyed or damaged. As the battle progressed further numbers of armed reconnaissance flights were flown though on many occasions no enemy activity was seen. In the majority of cases, however, suitable targets were found and successful strikes were accomplished on enemy vehicles moving into and about the battle area. Casualties to aircraft of 2nd T.A.F. and A.D.G.B. on these missions were negligible, amounting to only eight aircraft.

On the following day enemy air activity increased, although it was confined mainly to defensive patrols covering enemy forces moving up to the assault area. The number sighted over the beach head was only fifty-nine. Our aircraft continued their support operations in spite of the fact that a number of missions were abortive due to bad weather conditions. On 8 June claims were made for the destruction of at least twelve tanks and forty M.T. vehicles, in addition to the damage to a number of vehicles in moving columns which were raked with cannon fire. By nightfall a rapid deterioration in the weather was forecast and, on 9 June, air operations were virtually brought to a standstill from dawn onwards owing to 10/10 cloud at an average height of 600 feet over United Kingdom bases. (2) Nevertheless 158 sorties were flown of which 27 were offensive operations. Most of these sorties were abortive.

Already two emergency landing strips had been prepared by 8 June, and on 10 June No. 144 Wing (Nos. 441, 442, 443 Squadrons) was the first Wing to operate from France, (3) taking off from their base in the United Kingdom, returning to the R.R.S. and repeating their fighter sweep at 16.37 hours: finally returning to their home base in England. By 9 June No. 83 Group Main Headquarters had been set up at Villiers Le Ece, and by the next day two airfields were ready for use. The congestion in the restricted area of the bridgehead made it difficult to find the ten airfields required to accommodate No. 83 Group. However, by 30 June eleven airfields had been completed and work begun on a further two.

(1) No. 11 Group. Activity Synopsis.

(2) No. 11 Group. Activity Synopsis and O.R.B.

(3) 2nd T.A.F. O.R.B. (Admin.).

The preparation and use of landing grounds on the Continent was a major consideration, as much of the effective range of aircraft was unproductively utilised in flying to and from their home bases on the other side of the Channel. This flight seriously curtailed the period during which they could be usefully employed in the battle area, or beyond it. In this respect the technique between American aircraft and British differed. From the time of take off American aircraft were in close touch with the ground and were vectored about and led on to the target by the ground control. The combat operations planning staffs ordered the aircraft into the air and briefed crews for their missions afterwards. This method was made possible by the greater endurance of fuel of the aircraft employed and by an extremely elaborate control system. Such a policy could not be pursued by the R.A.F. owing to the comparatively short range of the British aircraft. Each mission had to be planned carefully and tasks allotted as specifically as possible. It was not normally possible to keep a "Cabrank" formation in the target area for more than twenty minutes, after which time an alternative target was attacked. "Cabrank" were only used when it was clear that a rapid concentration of aircraft was needed for a restricted period of time in order to assist the Army either in the attack or in repelling an enemy counter-attack. An additional advantage brought about by the rapid preparation of these airfields in the lodgement area was the ability to fly in Transport aircraft which thus made the R.A.F. independent of the Army for the provision of urgent and specialised equipment which might have become lost or delayed in transit and which the Army, who were primarily concerned with the unloading of their own stores, could not supply from their own resources. Another important non-operational feature was the ability, at a very early stage in the battle, to evacuate casualties direct from the fighting line and move them rapidly and in comparative comfort to hospitals which had staffs and equipment and all the appropriate facilities which it would have been impossible to provide in France at that stage of the campaign.

The move of the Headquarters Staffs onto the Continent was another step forward, for arrangements hitherto, as has been earlier mentioned, had not by any means been perfect. The actual operations had been controlled from Uxbridge, but the successful implementation of the requirements of the assault was largely due to the excellence of the communications. It was to obviate some of the difficulties that Advanced H.Q. A.E.A.F. had set up under Air Marshal Coningham. The movement of S.H.A.E.F. itself onto the Continent in September 1944 made the A.E.A.F. redundant and Air Chief Marshal Tedder, the Deputy Supreme Commander, became virtually the Air C-in-C, though he was not officially recognised as such.

By the middle of June, under cover of Allied Air support, the invading armies were firmly established in the lodgement area and the continued harrying of the enemy's communications and reinforcements had made the preliminary move in the liberation of Europe the success it had been planned to be. The beach-heads were firmly linked on a front of over fifty miles, varying in depth from eight to twelve miles. The port of Cherbourg was isolated and surrendered to the U.S. First Army on 27 June. The situation in the middle of July is set out clearly in Field Marshal Viscount Montgomery's book "Normandy to the Baltic". (1) He writes:-

"We were now on the threshold of great events. We were ready to break out of the bridgehead."

(1) II L/24/1.

Operation Goodwood - 18 July 1944

The approximate Army "line" prior to the operation is shown on the map on page 128, and it is essential in order properly to appreciate the part the air forces played in the battle to be aware of the problems confronting the ground troops and the objects they hoped to achieve. (1) The latter were:-

- (a) To break out of the Southern flank of the Orne bridgehead with a view to occupying the high ground South and South West of Caen, thereby enabling II Canadian Corps to capture the portion of the town of Caen that lies South of the river Orne.
- (b) Subsequently to break through into the Caen-Falaise plain with a view to an armoured thrust in the direction of Falaise.
- (c) As a result of the above operations, to draw the maximum number of enemy armoured formations into the Caen sector to relieve the pressure on the American front.

The main break-through was the task of VIII Corps, but attacks were also to be made by XII Corps on the night of 15/16 July against Evrecy, and on the next night (16/17 July) on Maizet; thereafter to exploit, as opportunity arose, to the general line Vacognes - Goupilliers. By the time operation Goodwood started Evrecy had not fallen and was still being attacked.

XXX Corps, on the right of XII Corps, was to go in on the morning of 16 July, securing the area of Noyers by 18.00 hours on that day. Thereafter it was to exploit the high ground North-east of Bocage. By the time operation Goodwood started XXX Corps had not occupied Noyers, which was strongly held by the enemy.

II Canadian, VIII and I Corps were all to operate East of the River Orne, and plans for their preliminary movement, fire support and air support were completely co-ordinated. II Corps was to capture both Faubourg De Vaucelles and Giberville, and then to exploit Southwards to the area of St. Andre-Sur-Orne. This was primarily designed to support the right flank of the main armoured break-out by VIII Corps. I Corp's task was to protect the left flank of VIII Corps by occupying the general area Toufferville-Sannerville-Banneville La Campagne-Emieville Le Quai and, subsequently, Troarn.

VIII Corps, consisting of three armoured Divisions, was, on 18 July, to debouch from the existing bridgehead East of the River Orne with a view to:-

- (a) Dominating the area Bourgebus-Vimont-Bretteville Sur Laize.
- (b) Destroying any enemy armour or other forces encountered on the way to or in this area and,
- (c) If conditions were favourable, exploiting to the south in the direction of Falaise.

(1) II L/24/1.

There were three major factors which affected the plans of VIII Corps:-

- (a) Three armoured Divisions had to be moved across the crowded bridgehead from West to East without being detected by the enemy, and without interfering with the operations and maintenance of the rest of the Army. The area available East of the river was only large enough to hold one of these Divisions at a time. Since the enemy had observation of part of this area, the arrival of the armour had to be delayed until as late as possible.
- (b) The ground was very much in favour of the defence and ideal for the siting of the enemy's artillery, both field and anti-tank. The break-through, moreover, could only be achieved after a long advance on a narrow front.
- (c) The operation was dependant upon air support, which in its turn was dependant upon the weather, and that was far from settled. A final decision on whether aircraft could operate could only be made a few hours before the battle was due to start. It was not possible to delay the concentration of armour until this decision was given. This meant that plans had to be made to conceal the large troop concentrations so that the element of surprise, upon which success so largely depended, would not be sacrificed in the event of postponement. It was firmly laid down that if their plans could not be put into effect, the attack was to be postponed.

Furthermore, assurance was given that there would be no troops within 2,000 yards of H.E. bomb targets, within 2,500 yards of areas for fragmentation bombing, or any troops not dug-in within 3,000 yards of any target area. This complicated the accommodation problem in the bridgehead area as it necessitated a slight withdrawal of our Forward Defence Lines, but this had to be accepted.

The advance was to be preceded by an air effort on a larger scale than anything ever before staged in direct support of ground forces. The plan to employ such a large force was not, in the first place, generally approved. The R.A.F. who were not strongly in favour, pointed out that there was little previous experience to draw upon, and that on two earlier occasions, at Cassino (1) and Caen, results had been disappointing. The bombing had not eliminated enemy opposition and our own troops had been hampered by bad cratering and rubble-blocked roads.

The Army maintained that in view of the considerable opposition likely to be met from enemy artillery both in front of and on the flanks of the advance and the long distance which had to be covered quickly if a break-out was to be achieved, the operation could not take place at all unless maximum air support could be given.

(1) See Page 81.

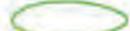
SECRET.

FIGURE 1

"OPERATION GOODWOOD." 18 JULY 1944.



LEGEND.

-  Heavy Bomber Target Areas (Bomber Command & VIIIth A.F.).
-  Medium Bomber Target Areas (IXth Air Force).
-  Fighter-Bomber Attacks (2 T.A.F.).
-  Main Concentrations of Bombs.
-  Areas of Bomb Falls of IXth Air Force.
-  100 lb. G.P.
-  20 lb. Frag.

The main features of the air plan, which was made on an Army/R.A.F. Tac. Group level, were as follows:-

- (a) Heavy bombing on the flanks of the Corps advance.
- (b) Fragmentation bombing in the path of the armoured Divisions,
- (c) Neutralisation of certain located enemy gun areas out of range of our own artillery.

This support called for great accuracy both in timing and bombing, as it was so closely related to the movements and positions of the attacking troops.

As already pointed out, VIII Corps was compelled to advance down a narrow corridor, the sides of which were held by the enemy. It was essential that the enemy positions in and along the sides of the corridor were neutralised. Cratering of these targets was not only acceptable, but desirable; but in the line of the attacking armour it was important that their advance should not be so obstructed. Targets were therefore allotted to the heavy bombers, medium bombers and the aircraft of No. 83 Group in accordance with the requirements set out above, and they are tabulated below:-

Area "A" (1) R.A.F. Bomber Command, Main target 1,000 acres, containing the steel factory at Colombelles, which was believed a strong enemy mortar position. Cratering was acceptable. Attack to be completed by 06.30 hours, or 07.00 hours according to the wind speed.

Area "H". R.A.F. Bomber Command. Approximately 940 acres, containing four villages which were believed to be strong points with important formations of enemy troops. Cratering was acceptable. Time of attack as for Area "A".

Area "M". R.A.F. Bomber Command. Enemy strong points in and around Cagny, and of about 340 acres. Cratering to be held to a minimum. Time of attack as for Area "A".

The above targets were to be marked by Mosquitos with full Pathfinder marking, and the main force squadrons were to bomb from heights of 6,000 feet to 10,000 feet. All aircraft were to carry maximum bomb load, mainly 1,000 lbs. G.P. and S.A.P. with some 500 lb. G.P. and M.C. bombs. Fuses over areas "A" and "H" were to be 0.025 seconds delay, and on area "M" 70% nose instantaneous and 30% M.44 pistol.

Area "I". U.S.A.A.F. A strip of 500 acres West of Troarn which was believed to contain a number of bomb positions. Cratering was acceptable. Time of attack 07.30 hours and, after concentration was achieved, at intervals till 09.30 hours.

Area "P". U.S.A.A.F. 1,940 acres of open country through which the advance was to be made. Three villages were believed to hold enemy gun positions. Cratering was not acceptable. Time of attack from 09.00 hours to 09.30 hours.

(1) II 1/26 and II B/9.

Area "Q". U.S.A.A.F. A smaller open country area of 540 acres with gun positions in Frenville. Cratering was not acceptable.

Areas "C", "D", "E", "F" and "G". Also U.S.A.A.F. targets, and areas in the main path of the advance. Cratering was not acceptable in any area except "G". Bombs to be used were 500 lb. G.P. for the two defended towns and 260 lb. fragmentation in the three open country areas. The attack was timed for 07.30 hours to 08.15 hours.

The importance of accurate bombing was stressed, with instructions that if markers became obscured by smoke, crews were not to drop their bombs within the smoke area, but to aim carefully at the Southern edge of the main smoke concentration. Finally, crews were not to release their bombs unless they could see the markers or positively identify the smoke concentration as being in the correct place, and in no case were crews to aim their bombs on markers which might fall North or West of the canal between Caen and the sea.

Aircraft of No. 83 Group were to attack the remaining targets shown on the map, while the other attacks were going in. (1) Their other tasks included maximum interference with any enemy movement into the battle area, with particular attention to the area South of St. Andre Sur Orne and the area between the rivers Orne and Laize around Clinchamps Sur Orne. The Air Support Signals Unit (A.S.S.U.) was deployed with tentacles, in certain cases, down to Brigades. The intention was to use a Visual Control Post which would move with H.Q. 29 Armoured Brigade but, in the event, the R.A.F. Controller was wounded in the early stages of the action and, due to the inexperience of the A.L.O., the visual Control Post was not able to function as intended.

The Visual Control Posts were originally designed to control strike aircraft on to their targets by visual means, but in practice it was found that there were few occasions when it could function in this manner and, accordingly, it tended to be used more as an A.S.S.U. tentacle in which role it was referred to as a Contact Car or Contact Tank. These vehicles moved forward with the armoured spearheads and kept the Army formations and F.D.P. or G.C.C. informed as to their positions as well as acting as a channel through which air support could be requested and, when controllers were included in their crews as in this particular case, as posts from which aircraft could be controlled.

Communications between contact vehicles and Army formations, G.C.C. and F.C.P. was by R/T, and between them and aircraft by V.H.F. R/T. The entire briefing of crews for this form of high-pressure support was done by the V.H.F. R/T channel and, if the F.C.P. Controller - in consultation with his A.L.O. - considered that a Contact Vehicle was in a better position to control a mission, the aircraft could be handed over to the Contact Vehicle. Similar handing over could also take place if the F.C.P. became overloaded with targets. Such a hand-over was carried out by R/T on normal A.S.S.U. channels and reports on the results of missions would similarly be passed by R/T from Contact Vehicles to the F.C.P. and from F.C.P. to G.C.C.

(1) II L/24/1.

Fighter cover for the operation was to be provided by ninety Spitfires of No. 11 Group, who encountered no enemy opposition during the battle. In addition a comprehensive fire plan from Army and Naval guns was co-ordinated with the air attack.

The morning of 18 July dawned bright and clear and the assault was initiated by Mosquitos of No. 8 P.F.F. Group dropping red target indicators. (1) These indicators were released on "Oboe" from heights of 22,000 to 30,000 feet. Master or Deputy Master Bombers were employed who were able to identify the aiming points visually. The marking was corrected visually where necessary by yellow markers released by the Master Bomber or his Deputy, which in turn were backed up by P.F.F. Lancasters dropping further yellow markers.

The Bomber Command aircraft flew in streams with random but fairly even spacing, each aircraft bombing individually. The Americans bombed in boxes of eighteen aircraft. Over 2,000 aircraft were over the target area during the period of the attack and over 7,000 tons of bombs were dropped on the various targets. The scale of effort and the appropriate data are tabulated below:-

Target	Time	No. of Aircraft	Height in ft.	Tons of H.E. or No. of Markers		Mean Tonnage per acre
<u>Bomber Command</u> (2)						
"A" COLOBELLES	05.36/06.04	231	6,500/9,500	1,166	56)	1.4
MONDEVILLE	05.59/06.17	228	6,500/10,000	1,087	48)	
"H" SANNERVILLE	05.41/05.57	232	5,000/9,000	1,086	56)	2.1
MANNEVILLE	05.59/06.17	230	6,500/10,000	1,126	59)	
"M" CAGNY	06.15/06.25	102	6,000/10,000	543	52	0.7
<u>VIIIth U.S.A.A.F.</u>						
"I"	07.30/09.30			(438	"	0.08
"P"	09.00/09.30	571	14,000/18,000	(633	"	0.09
"Q"	09.00/09.30			(341	"	0.23
<u>IXth U.S.A.A.F.</u>						
C, D, E, F, G		318	10,800/13,000	621	"	
Totals	05.36/09.30	1,912	5,000/18,000	7,011	251	

There was no enemy air opposition, but the following losses were sustained from enemy flak:-

Bomber Command..... 6 Bombers
VIIIth U.S.A.A.F..... 1 Bomber

The effects of this unprecedented bombardment are briefly summarised as follows:-

Area "A" (3) Conditions were clear with some haze. The markers were well placed and the bombing was well concentrated. The target could be described by any reasonable standards of bombing as "perfectly bombed". Roads were blocked in many places and buildings were demolished to such an extent that movement of armoured vehicles would have been difficult or impossible.

- (1) II B/9.
- (2) II L/26.
- (3) II 69/120 and II L/26.

Area "H". The weather was cloudless with excellent visibility and again markers were well placed and an excellent concentration of bombing was achieved. Roads in Manneville and Guillerville were completely blocked and buildings demolished preventing any movement of armoured vehicles. General examination revealed the remains of considerable German forces, including tanks, supply vehicles and mortar positions.

Area "M". The early markers slightly overshot the aiming point, but the Master Bomber instructed crews to bomb on others which fell very near. The target soon became obscured by smoke and dust. Demolition of buildings and road blocks was not as great as for the other areas. One battery of 88 mm. guns did not appear damaged and artillery fire from this area later proved an obstacle to the attacking troops. (1)

Areas "I" and "P". Bombing was somewhat scattered and extended over an area much greater than the target assigned, Area "I" being hit by only 18% of the intended bombs and Area "P" by 40%. In Area "I" road blocks were not effected, but in Area "P" some were made by craters which were easily passed.

Area "Q". This area received a better concentration, and there were some possible road blocks, but in general there were easy detours through fields.

Area "G". Two road blocks were caused by a "spill" from Area "A".

Areas "C", "D", "E", "F". A good percentage of the bombs fell in the assigned target areas and little obstruction, even in the fields, was caused by fragmentation bombs. Tracks were later seen to have run right across the marks of the bomb bursts. Enemy communications were cut and troops lost contact with their officers and were often dazed into complete stupidity, many being deaf for the following twenty-four hours. Enemy morale suffered greatly. (2)

At 07.45 hours VIII Corps, with one armoured Division up, attacked Southwards with infantry of II Canadian Corps and I Corps attacking on each flank. (3) The armoured Division moved very fast, and was followed rapidly by two more. By mid-day strong armoured formations of VIII Corps had advanced nearly seven miles to the South and had broken through the main German defences. During the afternoon, however, the rapid advance of the morning was slowed up by the stiffening enemy opposition and the need for moving forward of infantry units to assist the armour. The enemy began counter-attacks with infantry and tanks and the armoured thrust in the direction of Vimont was held. Throughout the day No. 83 Group and the IXth U.S.A.A.F. gave support to the advancing troops, attacking gun positions and movement in the battle area.

On 19 July enemy resistance slowed down still more the progress of the Allied advance, and enemy anti-tank guns and tanks in carefully selected ground resulted in slow progress by the armoured formations. By 21 July enemy resistance and counter-attacks were such that the projected sweep-through from the bridgehead had been slowed down to a halt.

(1) II. 69/120 and II L/26.

(2) P.O.W. Reports.

(3) II L/24.

There is no doubt that the heavy bombardment from aircraft, ships and artillery had a decisive effect on the morale of the enemy as well as, in a large measure, heartening the Allied troops. The effect can best be measured by reference to the remarks addressed to Hitler by Rommel in a report forwarded on 21 July by Von Kluge. He states, "My conference with the commanders of the units at Caen, forced me to the conclusion that in our present position - considering the material at our disposal - there is absolutely no way in which we could do battle with the all-powerful enemy air forces, to counter their present destructive activities, without being forced to surrender territory. (1) Whole armoured units..... were attacked by terrific numbers of aircraft dropping carpets of bombs, so that they emerged from the churned-up earth with the greatest difficulty, sometimes only with the air of tractors. The psychological effect on the fighting forces, especially the infantry, of such a mass of bombs, raining down on them with all the force of elemental nature, is a factor which must be given serious consideration. It is not in the least important whether such a carpet of bombs is dropped on good or bad troops. They are more or less annihilated by it, and above all their equipment is ruined. It only needs this to happen a few times and the power of resistance of these troops is put to the severest test. It becomes paralysed, dies; what is left is not equal to the demands of the situation. Consequently the troops have the impression that they are battling against an enemy who carries all before him. This must make itself felt to an increasing extent..... In spite of all endeavours, the moment is fast approaching when this overtaxed front line is bound to break up. And when the enemy once reaches the open country a properly co-ordinated command will be almost impossible, because of the insufficient mobility of our troops. I consider it is my duty as the responsible commander on this front, to bring these developments to your notice in good time, my Fuehrer."

Nevertheless, in spite of the effect of this shattering bombardment resistance was met by the attackers from those of the enemy who had been given a sufficient period to recover due to the lapse of time between the cessation of the air attack and their engagement by the leading ground forces. This resistance stiffened as the Allied troops moved on to those areas beyond the bombing targets, or in places where it had been impossible to neutralise his defence positions completely, as at Cagny. It has been suggested that it might be more effective to employ the heavy bomber effort in a series of attacks on previously selected areas later in the day. (2) An examination of the timing of the attacks on the various areas shows, however, that those areas further forward, in the line of the advance were bombed after the main bombing attack had been delivered, and the explanation of the increased resistance as the assault moved forward may well be that only a third of the planned weight of bombs fell in the areas "I", "P", and "Q".

The objection to a series of phased attacks on selected areas ahead of our own troops is the difficulty of manoeuvring a large force of heavy aircraft so as to enable it to throw its weight of explosives into the battle at the critical moment. A heavy attack on an area some distance ahead of the advancing troops would be ineffective if the assault was delayed at the

(1) A.H.B.6 Translation. No. VII/73.

(2) II L/26.

start, and it would be virtually impossible to apply the "Cabrank" technique to a strategic bomber formation, particularly if enemy air opposition were heavy, as was not the case in operation Goodwood.

In the employment of such a force it was for the Army to stipulate its requirements in the knowledge that no amount of aerial bombardment can guarantee to destroy all the defences of the enemy, and then to seize the initiative on the ground as soon as the last bomb has fallen on the target area, even if this imposes risks on our Forward Defence Lines.

Despite this effort the enemy ring around the Normandy beach-head remained unbroken until the end of the month. Headquarters 1st Canadian Army took the field on 23 July in order to control operations on the left flank, second British Army switched its main weight to the Caumont sector, and on 25 July First U.S. Army attacked on the St. Lo sector, taking Avranches on 31 July. (1) Headquarters Third U.S. Army then came into the operational picture and its forces were directed towards the Brittany peninsula. The powerful American attack pushed the German flank south-east and East and, one by one, the British Armies knocked out his attempted hinge points at Caumont, on the Orne, and on the high ground between Caen and Falaise. By 6 August the Americans had reached the area Laval-Mayenne-Dornfront, and orders were issued for the advance to the Seine. The First Canadian Army was to reach Falaise, if possible, and then to advance on the left axis Lisieux-Rouen; the Second British Army was to advance in the centre through Argentan and Laigle to the Seine below Mantes-Gassicourt; the First U.S. Army and the Third U.S. Army were to move on a wide front which was to swing towards Paris and the Seine. From the beginning of the campaign it had been the Allied policy so to manoeuvre and attack as to pin down and destroy substantial portions of the enemy in the immediate front in order to have full freedom of action thereafter. The plan now envisaged that the spearhead of the attacking Third Army turning Northwards from Le Mans could link up eventually with the First Canadian Army, thus drawing a net around the bulk of the enemy forces to the West.

Mortain and Falaise - August 1944

Operation Goodwood was followed by Operation Totalise in which both the American and British heavy bombers were again used to break out of the bridgehead. As a result, General Patton and his armoured columns began a rapid advance that frequently outran his communications and the supply of his forces became a difficult problem. (2) It was the precarious nature of this supply route that dictated the enemy's strategy which, though initially sound, ultimately helped in the accomplishment of the shattering of the two German Armies in Normandy. In fact, in his report to the Combined Chiefs of Staff, General Eisenhower singles out the rout of the enemy in the Falaise pocket as one of the three episodes most decisive in ensuring ultimate victory; the other two in importance being the Battle of the Normandy beaches, and the battle West of the Rhine in the Spring of 1945.

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- (1) S.H.A.E.F. Despatch.
 - (2) Effectiveness of Third Phase Tactical Air Operations in the European Theatre.

Towards the end of July the situation was that enemy armour had been massed in the Mortain area under unified command, and a formidable force consisting of the 1st S.S., 2nd S.S., and 116th Panzer Divisions, elements of the 17th S.S. Panzer Grenadier Division and supporting infantry was collected together. To assist them, long range bombers were drawn from their almost sole task of mine laying. What the enemy hoped to do was to thrust towards Avranches and thus cut the main Allied force from General Patton's troops and so effectively embarrass their supplies. On 7 August the attack, which had been anticipated by the Allies, was launched under personal orders from Hitler, but VII Corps, ably assisted by rocket firing Typhoons operating in ideal weather conditions, stemmed the attack. If the weather had grounded the Allied aircraft the enemy might well have succeeded in his intention to reach the coast.

On the day of the offensive, 7 August, there were 19 squadrons of Typhoons operating from French airfields. (1) During the day these squadrons carried out 59 missions of 458 sorties, of which 294 were in the Mortain area, firing 2,088 rockets and dropping 80 tons of bombs. Claims were made for a large number of A.P.V.'s destroyed and damaged, as well as M.T. vehicles, at a cost of five aircraft lost. The thrust was maintained by the enemy during the period 7 to 11 August, when the number of missions rose to 298 involving 2,193 sorties; 9,850 rocket projectiles and 398 tons of bombs were aimed at enemy targets inflicting further casualties on his armour and transport. After the Typhoon attacks on the first day the fighter-bombers of the U.S.A.A.F. took over the responsibility of the Mortain area, accounting for many more enemy vehicles and flying some 3,500 sorties between 6 and 12 August. (2) The fine weather contributed effectively to the outstanding success of the air forces and it may well be that the enemy was relying on a continuation of the previous bad weather which had done so much to restrict air operations. By this effort the Allied air forces broke up and partly destroyed the enemy concentrations of armour and, although a number of spearheads did penetrate westwards they were effectively dealt with after bitter and heavy fighting by the ground forces. In spite of the reinforcements which the enemy brought up the advance was held and persistent efforts to break through to Avranches were prevented.

On 10 August it was decided to exploit the opportunity for encirclement which the enemy tactics had offered. (3) Le Mans had already been captured on 9 August by XV Corps, which was now pushing North according to plan; Angers had fallen to XXth Corps on the 10th, and by the night of 12 August the U.S. 5th Armoured Division was in the outskirts of Argentan. Thus, with the Canadians at Falaise and the Third Army forces at Argentan the stage was set for the Battle of the Pocket, so soon to develop into a rout whilst the enemy struggled to keep open the narrowing gap through which to withdraw his forces from the West. This withdrawal was under way by the 13 August. Allied aircraft grasped this opportunity and crowded in for the kill. On that morning, for example, 37 pilots of the U.S. 36 Group found 800 to 1,000 enemy vehicles of all types milling about in

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- (1) Despatch by A.C.M. Leigh Mallory.
 - (2) Effectiveness of Third Phase Tactical Air Operations in the European Theatre.
 - (3) Report by S.C.A.E.F.

the pocket West of Argentan. (1) Within an hour the Thunderbolts had blown up or burnt out between 400 and 500 enemy vehicles. On that day the American XIX T.A.C. fighter-bombers accounted for more than 1,000 road and rail vehicles, forty-five A.F.V.'s and twelve locomotives. Inside the pocket they reduced ten enemy strong points to heaps of rubble. The effect of the air attack had made its mark on the enemy. On 13 August Von Kluge stated in his report: (2) "If the widely spread front line remains as it is at present, with its critical lack of resources, it will be broken through and surrounded by the enemy, with his superiority in men and materials, and his mastery of the air, and our units could not fight their way out." The situation report for that week (8 to 14 August) went on to say, "The question of supplying the fighting front in all areas has become more difficult as a result of increased enemy air activity. The lack of mobility is becoming increasingly awkward."

The pocket, hammered from all sides by the ground troops began to shrink in size. Supplies of food, petrol and ammunition trickled through in smaller and smaller quantities, and now it was leaflets as well as bombs that were dropped on the beleaguered Germans. Vehicles streamed East bumper to bumper, often two and three abreast, to be abandoned by their crews as the American and British pilots queuing up to make their attacks dived in on the demoralised streams of traffic. An abortive mass movement out of the pocket on 17 August was attacked until after nightfall, and the German's power of resistance was effectively shattered on that day.

The enemy fought frantically to hold open the narrow neck, but on 16 August Falaise fell to the Canadians. By now the enemy had lost almost all cohesion; divisions were hopelessly jumbled up and commanders were able to control no more than their own battle groups. Congestion on the routes eastwards increased, presenting Allied pilots with targets that were probably never later paralleled during the war. On 19 August American troops linked up at Chambois with the Polish Armoured Division, and the mouth of the net was drawn tight. On the 17th the enemy had made his final desperate attempt to break through the ring of the Allied forces, but without success. There was little left, except to mop up what remained of the demoralised enemy after ten days slaughter. The inability of the enemy to move Eastwards was, in a large measure, due to the Allied air attacks. The German Situation Report for the week 15 and 21 August confirms this by the statement that "enemy air activity rose to immense proportions this week, and in many cases rendered it impossible for us to move our troops. (3) For a brief period supplies could only be brought to the troops with fighter escorts. Our inferior mobility is hampering our tactical decisions." The report concludes with the significant sentences, "Our own losses have not yet been assessed."

It was inevitable, as the boundaries of the pocket grew shorter and the grim struggle within grew daily more confused, that cases arose of Allied pilots attacking their own troops.

(1) Effectiveness of Third Phase Tactical Air Ops. in the European Theatre.

(2) A.H.B.6. Translation VII/73.

(3) A.H.B.6. Translation VII/73.

Such a misfortune could not be avoided and to guard against the danger the Army Commanders fixed bomb-lines with such margins of safety that they automatically severely restricted attacks in close support of the land forces. (1) Thus many excellent targets were denied to the fighter-bombers. In spite of repeated requests for the revision of these bomb-lines in order to allow more freedom to aircraft to operate closer to the fighting the Army Commanders maintained their caution. In this decision the Army were naturally enough fully entitled to insure against the repetition of these mistakes. In the event, the restrictions imposed allowed a great deal of enemy material and personnel to make good their escape to the East, which would otherwise have been subjected to the same battering as the less fortunate remainder. As it was, the enemy pulled out as much of his precious armour as was possible, and left the infantry to their fate. (2) The countryside West of Argentan thus became the graveyard of the Army which had looked forward with confidence to the smashing of the Allied invasion, and what was left of the Seventh and Fifth Panzer Armies was in full retreat towards the Seine with the Allied columns racing after them. Mantes, on the Seine, was reached by the Third U.S. Army on 20 August, and by 26 August crossings were in progress on all Allied Army fronts.

On 1 September General Eisenhower, the Supreme Commander, assumed command and direction of 21st British Army Group and 12th U.S. Army Group (vice Field Marshal Montgomery); on 15 September the 6th Army Group, advancing from the South, also came under his command. There were thus:-

- (a) 21st Army Group - First Canadian and Second British Armies.
- (b) 12th Army Group - First U.S., Third U.S., and Ninth U.S. Armies.
- (c) 6th Army Group - First French and Seventh U.S. Armies.

In addition, all British and American airborne forces had been formed into the First Allied Airborne Army.

The Supreme Commander had decided that the main highway to Berlin lay across the plains and level fields of Northern Germany, whereas the mountainous forests to the South would be unsuitable for the rapid advance and exploitation desired. It was therefore planned, if possible, to seize the vital bridges over the Maas at Grave, the Waal at Nijmegen, and the Lower Rhine at Arnhem (Operation Market) making use of airborne forces for this purpose. In all cases the bridges and surrounding areas had to be held until the Guards Armoured Division could effect a junction and thrust Northwards across the rivers as far as the Zuider Zee, after which the role of the airborne troops would be to consolidate and protect the sides of this very narrow and vulnerable corridor that had been opened by this operation (Garden).

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- (1) Leigh-Mallory Despatch.
 - (2) A considerable part of the 1st S.S. Panzer, 2nd S.S. Panzer, 9th S.S. Panzer and 116th Panzer Divisions managed to get away, though with the loss of much of their equipment: but trapped within the pocket were the 326th, 363rd, 271st, 276th, 277th, 89th and part of the 331st Infantry Divisions, with some of the 10th S.S. Panzer and 21st Panzer Divisions.

The two operations were complementary and would not only give the Allies the opportunity to turn the German flank in the North, but would also have the added advantage of cutting off enemy troops still in North-Western Holland. The plan was a bold one and fraught with risks which, as will be seen, proved too much for the successful accomplishment of the operation. Nevertheless the stakes were high and, had the carrying out of the plan met with the good fortune it deserved, the record of battles that followed would have been materially different.

Market-Garden. 17 September 1944

At midnight on 12 September it was announced that the Guards Armoured Divisions was over the Dutch frontier in strength and was making towards Eindhoven, while 11th Armoured Division had crossed the Albert Canal. American reconnaissance units had also reached Eupen and Malmedy, and others were pushing North-east from Luxembourg. The plan now envisaged the laying of an "airborne carpet" from Eindhoven to Arnhem across which the armour could continue its rapid advance. Eight days were available for all preparations to be completed before "D" Day, 17 September. A repercussion brought about by the grounding of the supply and troop carrier aircraft to prepare for the operation was that the absence of their invaluable co-operation with the rapidly advancing armies and air forces who relied on their support, slowed down the pace of their advance and forced them to operate from bases much too far to the rear. For the same reason it was not possible to forecast precisely how much effective support would be possible from 2nd T.A.F. whose ground resources had been badly strained by the succession of leap frog moves with which the tactical squadrons had had to contend during the previous fortnight in order to keep up with the battle.

Of several difficult questions to be answered one was whether the operation should be undertaken by day or by night. There were two major considerations; whether the relatively intact G.A.F. night fighter force could inflict heavier casualties than the much more accurate flak by day. First Allied Airborne Army, in control of the operation, considered that proper employment of the supporting air forces could successfully neutralise the flak positions, and that a daylight operation was therefore preferable. As the operation was going to involve more than one flight it was decided to make use of two routes. The necessity of making one flight on "D" Day and another on D+1 was due to the fact that whereas the R.A.F. Groups were trained and prepared to take off at night, the American component was not. This, it will be seen, was a vital factor and meant that at Arnhem the airborne force would have to be delivered in two lifts on two successive days, involving the supposition that the forces of the first lift would achieve and hold their objectives until the second lift was delivered. Furthermore it was an essential requirement that weather conditions on the second day should be good enough for the next lift to take place. Another factor bearing closely on the problem of re-supply on subsequent days was the ability to have up to date information on the tactical situation which the reconnaissance squadrons of 2nd T.A.F. could have well supplied. However, the assault, mounted as it was from an outside theatre, was quite deliberately kept outside the control of 2nd T.A.F. and the battle at Arnhem was already lost before this situation was rectified. Planning was in fact controlled by Command Post, Eastcote, which housed the First Allied Airborne Army who were responsible for submitting any plans for the use of airborne forces. This system had not so far been put to any severe test. After Arnhem, by the Spring of 1945, the theatre Air Commander had become the superior authority on the air side.

One of the first contributory causes of the failure of the Arnhem operation was the fact that the planners were misinformed about the suitability of the terrain and the expected strength of the enemy resistance. Landing and dropping zones were chosen some distance from the objective, the furthest D.Z. being some eight miles as the crow flies from the bridge over the river. Such a choice increased still further the risks already imposed by the two-day drop, as half the forces were now committed to holding a long front until the second lift arrived. During this vital period the element of surprise would evaporate and enemy resistance could be expected to stiffen. Market was to prove that if a sufficient force could not be concentrated within a reasonably short space of time in a defended area, then the whole operation became a gamble. The bitter lesson learned in this operation was put to good use later in the campaign. (1)

Morning fog covered most of the British and American airfields on "D" Day, 17 September, but all were fit by 09.00 hours. (2) With the expectation of these conditions, the take off had been set at 09.45 hours, which meant that the leaders of the main force would come over their dropping zones simultaneously at 13.00 hours. A mighty armada was airborne on that day, there being no fewer than 1,240 fighters and 1,113 bombers in support of the 1,534 transport aircraft and 500 gliders. It is tragically significant that all but 122 of these fighters and bombers were based in the United Kingdom, the theatre air commanders still being excluded from the operation. 2nd T.A.F., in fact, was not called upon to provide support until D+7, when the tactical situation had got out of hand.

In the three sectors some 16,500 parachute troops dropped from the air in addition to 3,500 glider-borne troops brought into Arnhem, where just over 6,000 men assembled by the afternoon of "D" Day. From the start enemy resistance in all three sectors was stronger than had been anticipated. The advance by XXX Corps at Eindhoven had been foreseen by the Germans, who had blown gaps in the road, with the result that the Guards Division was checked three times. By dawn on D plus 1 the advance on the ground was already behind schedule and the Arnhem component was still awaiting the second lift. There the situation had rapidly become serious for the troops who had captured the bridge quickly lost contact with the main body of the Division and never properly re-established it. Still, the second lift was expected at 10.00 hours on D plus 1, and the small force held on gallantly. Fog, however, in the United Kingdom delayed the take-off until after 11.00 hours, with the result that the reinforcements did not arrive till 15.00 hours.

In England the deterioration of the situation at Arnhem was unknown as no communications had been established with the airborne troops. In the South the Guards, who by D plus 2 should have been somewhere between Nijmegen and Arnhem, had only reached the Grave bridge by 09.00 hours, and the bridge at Nijmegen was not only still in enemy hands, but was not even threatened. It was not until D plus 4 that a combined assault effected the capture of the bridge, and by then all hope of reaching the Zuider Zee had to be abandoned and contact with the troops at Arnhem became the primary objective. Apart from these various set-backs, the lack of any information regarding what was

(1) See Operation Varsity pp. 152 et seq.

(2) II S/76.

actually taking place at Arnhem made the task of the supporting air force one of great difficulty. For this reason operations could only be continued on the lines of the pre-arranged plan and it was impossible to brief crews with up to the minute information regarding the positions of the Allied and enemy forces, nor was it possible to adjust loads on the re-supply missions to cater for the altered requirements brought about by the miscarriage of the original plan. (1) For instance, it was not even known in England whether the chosen zones were still in Allied hands, and when they had been lost to the enemy or were too dangerous for employment and new zones had been chosen it was almost impossible to make the crews of the re-supply aircraft realise that changes had been made. Batteries for "Eureka" beacons soon ran low, marker strips were immediately mortared by the enemy and the personnel putting them out were constantly sniped at. Furthermore, strong attacks were put in by the enemy when he realised an area was being marked off in anticipation of a re-supply mission, and dummy or misleading signals were made to the aircraft to confuse their crews.

The third re-supply mission resulted in further tragedy for the third and fourth waves of aircraft had been given no fighter protection and the Typhoons of 2nd T.A.F. which could have done so much to assist both the aircraft and the hard pressed ground forces were still under orders to keep clear of the target area. German fighters arrived in strength and the later waves were badly mauled. In the third wave, for example, ten Fw,190's shot down seven out of ten of one squadron. (2) More than 50% of the re-supply aircraft were lost or damaged on this mission. As a result, and then only after a personal visit by the A.O.C. 46 Group to the Continent, No. 575 Squadron was ordered to Brussels to undertake re-supply under the orders of the A.O.C. 83 Group. Such an arrangement immediately brought about the following advantages:-

- (a) Crews could be given the latest information on the tactical situation;
- (b) Better and closer support could be given by 2nd T.A.F. and its fighters and fighter-bombers.
- (c) The number of sorties could be stepped up due to the shorter length of flight to the target area and,
- (d) It would be easier to effect rapid changes in the contents of the panniers or of the points at which they were to be dropped.

The situation was deteriorating rapidly, however, and though Polish parachute troops were landed South of the river and men of the Dorsets had come up by the 25 September the day was lost as far as Arnhem was concerned, and the operation had now become an effort to keep the beleaguered men supplied until they could be extricated from their predicament. The intervention of 2nd T.A.F. had begun to make itself felt, and casualties amongst the supply dropping aircraft showed a marked decrease. On D plus 6, for instance, no Dakota of the re-supply mission was lost and only four damaged. (3)

(1) II S/76.

(2) II S/76 p.81.

(3) II S/76 p.83.

At 21.40 hours on D plus 8 the evacuation began and was completed as far as possible by 06.00 hours on 26 September, although some 6,400 men did not return. The failure of the operation was not due to the inadequacy of the support provided by the transport aircraft; in all Nos. 46 and 38 Groups had made some 1,340 sorties and lost 55 aircraft. The reasons for the failure may be summarised as follows:- (1)

- (a) Due to poor intelligence the most suitable dropping and landing zones were not chosen, with the result that the airborne troops were landed too far from their objective, (2)
- (b) The necessity for two drops on successive days was forced upon the planners due to technical reasons, but this called for the supposition that:-
 - (i) The first lift could hold out on an extended front until the arrival of the second lift and,
 - (ii) The weather would be sufficiently good for the second lift to be delivered on time.
- (c) The plan called for the ground forces to work to a pre-arranged time-table of relief for their airborne comrades which, due to stronger enemy resistance and the excellent defensive positions he occupied, was thrown badly out of schedule and over taxed the resources of the lightly armed parachute troops,
- (d) The failure of the signals organisation, due partly to lack of time in which to train the personnel and partly due to the mixed British and American equipment used together with the planning of the attack from a base remote from the theatre of operations which left the planners in complete ignorance of how the situation was developing. (3)
- (e) The absence of any plan of interdiction or close support from 2nd T.A.F., who were in an excellent position to supply it, allowed strong enemy opposition to be brought to bear very quickly by the Germans.
- (f) The exclusion of 2nd T.A.F. from the operation made it impossible to brief crews with the latest tactical reports and resulted in large numbers of re-supply missions being abortive due to the panniers dropping outside the perimeter of the airborne forces.

Nevertheless it cannot be said that the operation was a complete failure. It had not achieved the objective of driving right through to the Zuider Zee. In a short space of time the British Second Army, however, had leapt forward nearly sixty miles and had dashed German hopes of making a winter stand along the Maas, Waal and Neder Rijn to the ground. Two vital bridges had been secured and a firm base established for future operations against Germany. In these respects material advantages

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- (1) Leigh Mallory Despatch.
 - (2) II S/76.
 - (3) Effectiveness of Third Phase Tactical Air Ops. in the European Theatre.

had accrued to the Allies. In another respect too, the whole operation had marked another step forward in the lessons that had to be learned in the use of airborne forces, albeit the lesson had been a costly one. The smoothness with which Operation Varsity was subsequently executed owed much to the re-organisation and improved planning brought about as a result of the Arnhem operation.

Walcheren Island - October/November 1944.

The forward thrust of the Allied Armies had made it imperative that the long Lines of Communication should be shortened by opening up the Port of Antwerp for their use, (1) The Northern Group of Armies was instructed to undertake the operation as a matter of first priority. The mouth of the Scheldt, however, was guarded by an enemy force of some 10,000 troops including AA and at least eighteen Coast Defence batteries, garrisoned on the island of Walcheren at the Northern entrance to the estuary. The continued existence of such a force could deny the use of Antwerp to the Allies and, as winter approached, the reduction of the garrison became a matter of urgency.

The first preliminary was the isolation of the island by air bombing, and the second was the neutralisation of the Coast Defence batteries to allow naval vessels to sweep the approaches clear of mines, (2) It was felt that the task could be greatly simplified if it were possible to breach the dykes in order to allow the sea to flood the island, much of which was below sea level. It was hoped that this would:-

- (a) Force the enemy to concentrate his forces, making them easier to attack.
- (b) Impose serious administrative difficulties on the enemy.
- (c) Immobilise the enemy reserves.
- (d) Create an entry for amphibious vehicles.
- (e) Put a proportion of the defences out of action.

On 1 September S.H.A.E.F. gave approval for the flooding plan and, as the task called for an effort by heavy bombers beyond the capacity of 2nd T.A.F., discussions were immediately begun with Headquarters, Bomber Command. (3) The Dutch were warned by broadcast and leaflets of the impending operation, and on the next day, 3 October, a force of 259 heavies attacking in waves, dropped 1,432 tons of explosives on the dyke. Within an hour a breach was effected in the sea wall which was approximately 250 ft. thick at its base and 60 ft. wide at its top, (4) The immediate effect was to inundate four gun emplacements and surround seven other batteries with water. Two further attacks were made on 7 October to the West and East of Flushing with 390 and 430 tons of bombs respectively, with the result that additional breaches were made in the sea wall. Sixty-three

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- (1) II SL/13 (A). 4A.
 - (2) II SL/13 (A). 12A.
 - (3) II SL/13 (A). 11A.
 - (4) Report on Air Operations, 1 October 1944 to 9 May 1945.

heavies made another attack on 11 October, dropping 419 tons of bombs, and a final attack was made on 17 October. This effort was effective in flooding all the low-lying parts of the island, and the heavy bombers then turned to the task of attacking the gun batteries and strong points. (1) Between 11 October and 31 October, 941 sorties were made and 4,871 tons of bombs were dropped on these targets.

Meanwhile 2nd T.A.F. had been dealing with its own targets. 654 Spitfire and 150 Typhoon sorties were flown between 28 October and 31st against pre-arranged targets such as gun positions, flak positions and radar sites. The final assault took place at first light on 1 November, and was in two simultaneous operations known as Infatuate I and Infatuate II; the former being the attack on Westkapelle and the latter that on Flushing.

An important point is that the Army Commander had decided he was definitely going to assault Flushing whether air support could be given or not; (2) and the Army and Navy Commanders responsible for Infatuate I also decided to make the assault on Westkapelle, although at the time it was certain that weather would be unfit for air action. The weather, in actual fact, on the night immediately prior to the operation, was as bad as could be expected. Cloud was 7/10 to 10/10 at 800 ft, and rain and drizzle reduced the visibility at times to less than 1,000 yards. Nevertheless both operations proceeded from the Breskens area as planned.

Flushing was subjected to attacks in thirty-seven sorties by Mosquitos from last light on "D" minus 1 Day to 05.30 hours on "D" Day. Here the plan was that there should be no air support until the land forces were established ashore and air support could be called for in the normal manner through the A.S.S.U. Owing to weather conditions at base this did not materialise until 11.00 hours, but subsequently nearly two hundred sorties were flown during the day in extremely bad weather against various targets in the area. A heavy bomber programme against the dock area at Flushing, scheduled to take place shortly before the attack, was cancelled due to bad weather.

The plan for the assault on Westkapelle, unlike that on Flushing, had taken into account the provision that air support would be provided but, although the A.O.C. No. 84 Group recommended that the operation be suspended for twenty-four hours due to the flying conditions that were expected, the Navy and Army Commanders on the spot decided to press forward with the assault knowing full well that air support was unlikely until mid-day at the earliest. The importance of the operation, however, justified the risk even without this assistance as, after that date, the operation would have been impossible from a naval point of view.

Although cloud was down to a base of 100 to 1,000 feet and visibility at the most was 3,000 yards, the low level of the target area enabled aircraft to make a timely appearance at a critical stage when the naval support force was making its approach and it seemed that the enemy batteries would turn their fire on the slow-moving L.C.T.'s. It was then that R.P. Typhoons (delayed by weather) appeared and requested permission to attack.

(1) II 51/13B, 53A.

(2) II 51/13B, 54A.

Beach defence targets in the assault area were attacked first, the emphasis shifting to targets away from the beach assault area as the Commandos advanced. These attacks, together with the way in which the naval support force drew the fire of the shore batteries, were completely successful in preventing the enemy switching his fire on to the assault craft and the Commandos in the period immediately before and after the touch-down.

During this phase the Headquarters Ship requested No. 84 G.C.C. to scramble all available fighters for close support. (1) This was done and fighter-bombers and R.P. Typhoons on turn round provided the maximum close support possible in the prevailing weather conditions.

Information about the suitability of targets and the position of forward troops was passed to the Group Control Centre (G.C.C.) either through the fighter aircraft or naval inter-ship communications direct to the Forward Control Post (F.C.P.). This information was used to brief crews for subsequent attacks until the Air Support Signals Unit (A.S.S.U.) began to function. Fighter-bombers were kept on "Cabrank" under F.C.P. with instructions to search for suitable targets outside certain pre-determined bomb-lines. These were supplementary to precise targets given by F.C.P.

It had also been planned to screen the assault force from the Domburg batteries during the touch-down by smoke laid by Bostons, but weather at base prevented this operation. Similar conditions prevented the Spitfires from taking off from their United Kingdom bases for spotting duties, though bases in Belgium, from which spotting aircraft could have operated, were clear. (2) Air O.P's had been arranged at short notice as an alternative, but due to poor communications the results were "most disappointing" and the naval bombardment was carried out by observation. This absence of F/R spotting aircraft during the forenoon of "D" Day very severely reduced the efficiency of the heavy ship bombardment. When the aircraft did eventually arrive all the ships were able to give effective support.

Too much reliance had been placed by the surface forces on the effect of the heavy bomber attack on the coastal batteries and the naval support force was subjected to heavier attack than they had anticipated. The absence of spotting aircraft for the heavy ships' guns or close support aircraft at the time of the assault enabled these batteries to inflict severe punishment on the attackers. This situation was materially relieved when the weather improved and aircraft were able to become airborne.

In the event four separate items of air support were either not forthcoming or delayed due to bad weather:-

- (a) Smoke laying by Bostons. (Cancelled).
- (b) F/R Spotting by Spitfires. (Delayed).
- (c) Close Support by R.P. Typhoons. (Delayed).
- (d) Attacks by heavies on Flushing Docks. (Cancelled).

(1) II 51/1 Sect. 6.

(2) II 51/13/(c) Sect. 4. Para. 28.

It is for remark that no alternative arrangements were made other than the hasty provision of A.O.P's (which were not a success) and the suggestion on the part of the A.O.C. No. 84 Group that the operation should be postponed for twenty-four hours, although it was known that no other suitable date for the operation would have presented itself for some days. (1) Although the C-in-C 2nd T.A.F. expressed the opinion that the operations by No. 2 Group on "D" minus 1 Day, and by No. 84 Group on "D" Day "gave one of the most effective examples of air support under the existing conditions which had occurred since "D" Day of Operation Overlord," the R.A.F. operations were criticised by the Navy whose fire was rendered ineffective for a vital part of the operation, and by the Army in whose opinion it was "obvious that the bombing effort placed on the various batteries covering the approaches to Westkapelle failed to achieve the expected and desired result." (2) Again the Army failed to appreciate that it was impossible to guarantee completely the total destruction of a number of heavily protected gun emplacements.

Although the clearing of Walcheren, which was completed by 9 November - netting some 10,000 prisoners - had opened the Port of Antwerp for the use of the Allies, the long line of the attacking troops who had raced across France at an unprecedented speed offered a tempting opportunity to the enemy. If he could be successful in driving a wedge between the Allied armies and striking right through to the coast, he could cut his attackers in two and deny them the use of their newly acquired port. It will be remembered that the Germans had attempted a similar drive in France in an effort to cut General Patton's lines of communication by driving a spearhead through to Avranches. That attempt had ended in the disastrous Falaise pocket.

The Ardennes Offensive - 16 December 1944

Like the previous attack in France just referred to, a drive through the Ardennes towards Antwerp had been anticipated by the Allies as a possibility, but the probability of such an attack through the difficult terrain in the winter months had, as before, been dismissed. (3) In order to provide troops for attack elsewhere, and because of this premise, this portion of the battle front was very thinly held by the Americans. A clue to the attack had been provided by the gradual assembly by Field Marshal Von Runstedt of six infantry divisions in this quiet sector. This was a larger number than was required for reasonable security, but use had been made over many months of this area for the preliminary seasoning of new troops. In spite of this concentration it was still felt that no offensive operations in this area were likely and, in any case, could be dealt with effectively so that the outcome would not be advantageous to the Germans. Nevertheless the attack was launched and did achieve some initial success, although it failed in its objective of reaching Antwerp.

Planning began in the beginning of November to develop an attack which had Antwerp as its final objective, the main effort being with the Sixth S.S. Panzer Army thrusting towards the port from

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- (1). II 51/13/(B). 5A.
 - (2) II 51/13/(C).
 - (3) Report by S.C.A.E.F.

the area Monshau/Losheim via Liege. (1) The German Army Commanders considered the plan too ambitious for the forces earmarked for the attack and, in the event, even those were not all available. Objections, however, were over-ruled by Hitler himself, and the German Commanders were committed to an offensive which they were not confident of being successful. To balance their weakness in strength it was decided to make the utmost use of surprise. The most elaborate security precautions were taken which, although they considerably hampered the planning of the operation, achieved the desired result. For this reason the assault was timed for 05,30 hours on the morning of 16 December, and bad weather prior to the attack materially assisted the Germans, as even routine reconnaissance had been impossible for Allied aircraft.

The enemy thrust provided for two Panzer Armies, the Fifth and Sixth S.S., comprising eight Panzer Divisions and ten infantry Divisions representing approximately 40% of all the available field force on the Western Front. (2) Approximately 500 tanks were employed in addition to 350 assault guns and 1,300 artillery pieces; one third of those on the entire front. The G.A.F. had been carefully conserving its resources. Small reserves of fuel were thus built up at its bases and the number of aircraft available was thereby increased. In spite of the congestion caused, the Luftwaffe decided to use forward airfields which were vulnerable to Allied attack as a further measure to conserve fuel and give maximum ground support.

The assault was preceded by a short artillery preparation and a powerful attack was launched against the Allied line between Monschau and Trier. Parachutists were dropped behind the Allied line to disrupt communications and hamper the movement of reinforcements. Information that penetrations of the American line had been made by enemy tank formations was passed to General Bradley, who happened to be at a conference with General Eisenhower at the time. (3) The latter felt that this was something more than a minor local attack and immediate steps were taken to re-deploy the Allied forces. The initial breakthrough was followed up by units equipped with American tanks and uniforms whose task it was to seize key points such as bridges and road junctions. Behind these followed the armoured spearheads of the Fifth and Sixth Panzer Armies. In the early stages Allied ground resistance was weak and the enemy moved so swiftly that no definite plan of counter-attack was evolved. The situation from the Allied point of view became fluid and confused; communications were disrupted and commands split. Rapid deployment of the forces available, a plan calling for the holding of certain vital areas and a number of changes in the operational control of both the ground and air forces were necessary.

The initial rate of movement of the enemy was of the order of about twenty kilometres a day, which was maintained until 23 December. (4) On the 24th it was evidently slowed down, and on Christmas Day it ceased altogether. It is significant

(1) Enemy Documents.

(2) Effectiveness of Third Phase Tactical Air Ops. in the European Theatre.

(3) Report by S.C.A.E.F. 2nd T.A.F.

(4) O.R.S. No. 19.

that there was no sudden change in resistance on the ground to account for this abrupt halt to the advance, whereas the timing of the air effort fits the sequence of events perfectly. Evidence shows that the indirect air support was a decisive factor, whereas the close support was of much less importance. For instance, detailed examination immediately after the offensive showed that the destruction of enemy armour was insignificant, whereas the advance ceased two days after really heavy bombing in the rear areas, and one day after fighter-bombers had resumed their activity on the lines of communication nearer the front. At the beginning of the attack the Allied air effort had to be diverted to combating the attacks of the G.A.F. which flew some six to seven hundred sorties on 17 December, (1) On that day the U.S. IXth Air Force put up more than 1,100 fighters and fighter-bombers and claimed to have destroyed ninety-six out of some three hundred enemy aircraft attacked. 2nd T.A.F. made a claim for eleven out of one hundred intercepted.

Bad weather still hampered air operations, but on the night of 17/18 December Bomber Command attacked four centres (2) important to the enemy's communications. On the 18th the U.S. Eighth Air Force put nearly 500 bombers on to marshalling yards and the Tactical Air Forces flew 1,400 fighter and fighter-bomber sorties. (3)

The following four days saw a period of fog or near fog both at the bases and over the battle area, and plans for further attacks on communications had to be cancelled, only 1,500 sorties of all types being flown on 19 December and twenty on 20 December. On 21 December 284 were flown, of which 112 were flown by Bomber Command.

To centralise direction of the Allied forces engaged in the battle elements of the U.S. Ninth Army were placed under the operational control of the British 21st Army Group, and in conformity the IXth and XXIX Tac. Air Commands of the U.S. Ninth Air Force were temporarily placed under the operational control of the 2nd T.A.F., Royal Air Force.

On the night of 21/22 December, Bomber Command attacked Bonn and Cologne with over 200 aircraft and, during the day of the 22 December 2nd T.A.F. were able to operate 256 sorties. (4) Plans to fly supplies to the Allied forces isolated in the Bastogne area had to be cancelled due to the prevailing bad weather conditions. On the 23rd however, conditions improved and there were 929 heavy bomber sorties and 837 sorties by medium bombers. More than three thousand tons of bombs were dropped on the enemy's lines of communication. Sorties by fighters and fighter-bombers rose to 2,700, whilst no less than 1,150 enemy sightings were reported during the day. It became evident from such a show of strength on the part of the G.A.F. that, in order that the Allied air forces could give the defending ground troops the maximum support, it was essential to restrict the activities of the G.A.F., even if this meant temporarily drawing off aircraft. Accordingly, on 24 December,

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- (1) Report on Air Operations, 1 October 1944 to 9 May 1945.
 - (2) These were:- Ulm, Duisburg, Munich, Hanau. (D.S.C./TS.100/9 Air Commanders Meetings. 18 December 1944).
 - (3) Effectiveness of Third Phase Tactical Air Operations in the European Theatre.
 - (4) Report on Air Operations.

2,400 heavy bombers attacked airfields and air force control stations, dropping more than 4,200 tons of bombs on these targets. A further 738 sorties by medium bombers increased the tonnage by another 2,600 tons. Fighters and fighter-bombers flew more than 4,000 sorties destroying 125 enemy aircraft and dropping 500 tons of bombs. Transport aircraft were also enabled to fly in supplies to the Bastogne area where the U.S. forces were still encircled. In all, over 7,500 offensive sorties were flown on 24 December.

By Christmas Day the farthest spearhead to the West, that of the 2nd Panzer Division, was caught at Celles, immobilised through lack of petrol, and here it was decisively smashed. (1) The support given by the air arm had effectively cut the life blood from the advancing Germans, and the attack petered out through sheer lack of supplies which it was impossible to bring up in the face of the devastating bombardment and strafing from the air. This day saw the end of the enemy offensive and his failure to obtain his hoped for objective of dividing the Allied armies.

In general it may be stated that the offensive failed due to the following reasons:- (2)

- (a) The rapid counter-measures taken by the Allies, who had ample supplies and greater freedom of movement.
- (b) The superiority of the Allied air forces which made movements of men and supplies virtually impossible.
- (c) The inadequacy of the forces deployed for the offensive.
- (d) The inadequacy of the fuel supply, which rendered immobile both armoured units and artillery. The activities of the Allied air forces must take a great share in the denying to the Germans the supplies of fuel they so urgently needed to maintain the pace of the advance, and the slowing down of the enemy columns as the weight of effort on his lines of communication was stepped up is ample proof of the effectiveness of this form of support in stemming an attack.

The three months preceding this desperate bid by the enemy to drive through the Ardennes had seen much progress towards the ultimate object of meeting him within his own frontiers. (3) During October Twenty-first Army Group had pushed Eastwards from Nijmegen with the assistance of heavy bomber attacks on the key points of Cleve and Emmerich. Twelfth Army Group had captured Aachen, but continued to meet heavy resistance in the Metz and Nancy areas. Sixth Army Group made progress in the Vosges country. During November and early December Twenty-first Army Group had cleared the last pocket on the West bank of the Maas, but was insufficiently strong to attempt an advance on the Rhine. Twelfth Army Group reached the Roer River on the Aachen front with the assistance of heavy bomber attacks on Duren, Julich, Eschweiler and Heinsberg, and broke through in the Metz-Thionville

(1) 2nd T.A.F. O.R.S. Report No. 19.

(2) Enemy Documents.

(3) Report by S.C.A.E.F.

sector and established bridgeheads across the River Saar near Saarlautern. The Sixth Army Group reached the Rhone through the Belfort Gap and penetrated well into the Siegfried defences Northeast of Wissembourg, but the enemy forces from the Vosges managed to maintain a bridgehead West of the Rhine in the Colmar pocket. Then came the interruption caused by the offensive in the Ardennes, which for a short time threw the Allies on the defensive; though the successful defeat of the enemy did much to weaken his resources for the battles that were to follow when the Allies could once more take up the offensive. The Ninth U.S. Army remained under Twenty-first Army Group for the next stage of the campaign aimed at the destruction of the enemy forces west of the Rhine prior to the seizure of bridgeheads, the destruction of the remaining enemy East of the Rhine, and an advance into the heart of Germany. The First French Army eliminated the Colmar Pocket and all enemy resistance West of the Rhine in that zone in late January. In the first week of that month an attack by the enemy on the Canadian front was anticipated but photographs taken of the ferry at Groninghen confirmed civilian reports that the Germans were moving north. (1) This information, which was acted upon within an hour and a half of the photographs being taken enabled a fresh deployment of the ground forces to be made and bombing of the area to be put in hand.

Operations West of the Rhine were now to be developed in three distinct phases, of which the first consisted of the operations referred to under the code names Veritable and Grenade.

Veritable and Grenade - February 1945

These operations embraced the advances of the Canadian Army and the U.S. Ninth Army to the Rhine below Dusseldorf. (2) In addition, the U.S. First Army was to seize the line of the Erft West and Northwest of Cologne. The target date for Veritable was set at 8 February in anticipation of hard, possibly frost-bound, terrain which would enable a swift and violent offensive to be launched by the Allied armoured columns, thus enabling them to penetrate deep into the enemy's rear areas. When the attack was launched, however, conditions were far from what had been hoped for, as the melting of the January snows had made the ground soft and waterlogged and had given rise to many floods. Difficulties imposed on the ground troops were immense, such that the men often had to fight waist deep in water and the advance soon developed into a slow and bitter struggle to push the enemy back.

Planning for the operation had started in December prior, in fact, to the Ardennes offensive which, although it had absorbed all the Allied effort for a period, nevertheless was not allowed to interfere with the preparation of arrangements for pushing into Germany. (3) For the operation the Canadian Army had the support of Nos. 83 and 84 Groups and No. 2 Group medium bombers, whilst the U.S. Ninth Army continued to be supported by the XXIXth T.A.C. In preparatory air attacks for the forward thrusts of the ground forces and on units withdrawing hurriedly to the Rhine the Allied air forces played a notable part.

(1) 2nd T.A.F. O.R.S. Report No. 33.

(2) Report by S.C.A.E.F.

(3) II S1/26/1. Operation Veritable. Report on Air Ops. by A.O.C. No. 84 Group.

The effort to disrupt the enemy communications which had done so much to halt the attack in the Ardennes was continued. The three marshalling yards in the Saarbrücken area, at that time only fifteen miles from the Allied front line and very active, were attacked on 13 and 14 January with a weight of over 2,000 tons of bombs in the twenty-four hours. The attack from Nijmegen was preceded and supported by intense Allied air activity. On the night of 7/8 February R.A.F. Bomber Command attacked the towns of Cleve and Goch, dropping more than 2,000 tons of bombs. Light bombers of 2nd T.A.F. harassed the enemy night movements on the roads and railways leading to the assault area. On the 8th the U.S. IXth Air Force and 2nd T.A.F. medium bombers and No. 38 Group heavies, all operating under 2nd T.A.F., attacked a number of defended towns and villages in the path of the advancing troops and communication centres immediately in the rear of the area. The targets received a total weight of more than 1,200 tons during the day. 1,400 sorties were flown by the fighters and fighter-bombers of the Allied Air units in support of the ground forces, who were making headway across the difficult country.

It is probable that stiffer resistance would have been met from the enemy were it not for the fact that the relentless hammering of all his forms of transport received from the air made regrouping and the movements of troops to the assaulted area a matter of great difficulty. He had lost a prodigious number of motor vehicles, locomotives and rolling stock. In addition, the roads and tracks over which the remainder had to travel had been subjected to systematic and sustained attack. Supplies of petrol were running low, a further complication to the problem of movement for the defence. This support of the armies was maintained on 9 and 10 February and through the intervening hours of darkness; bombs and rocket projectiles being aimed against all forms of communication and enemy strong points.

There was no air battle. Therefore, the whole of the Typhoon and Spitfire force was available for use in a ground support role. Flexibility, however, was somewhat impaired due to the fact that the armament carried by the two types of aircraft differed considerably, (e.g. the Spitfire could not carry thousand pound bombs or R.P.). (1) Experience in this operation therefore pointed to the value of having a fighter-bomber force capable of carrying all the various types of armament used in ground attack in order that the maximum advantage can be taken in circumstances when there is complete air superiority and the entire force can be diverted to a ground attack role. Such a state of affairs would overcome the tendency to specialise duties by types, as was the case for Veritable.

Some of the effects of ground "strafing" were lost due to the inability of the ground forces to take immediate advantage of the air attack. Despite the comparative slowness of the Allied progress, however, Operation Veritable achieved its strategic objectives. A footing had been established on the West bank of the Rhine in readiness for the crossing which was to be launched at a later date. The enemy had suffered heavy losses West of the river and had had to draw considerably on his diminishing reserves.

(1) Report on Air Operations - Veritable by No. 84 Group.
II SI/26/1.

On 22 February a wholly air operation under the code name Clarion was undertaken. Although results were difficult to assess and many of the targets were remote from the scene of the battles in progress, mention should be made of it here. On that day between 8,000 and 9,000 Allied aircraft were airborne and dropped approximately 8,500 tons of explosives on over 200 specific stationary targets. Over 500 locomotives and 3,000 rail trucks were destroyed or damaged, (1) It was hoped that this attack would saturate the repair organisations with overwhelming demands simultaneously made on their resources, and thus seriously interfere with enemy supplies. Against this formidable air attack the G.A.F. put up, in all, about 360 aircraft, of which at least sixty-five were destroyed, compared with the Allied loss of less than 1% of the aircraft employed.

On 23 February, Operation Grenade, which had been repeatedly postponed due to the ground conditions, was initiated. Difficulties had been brought about because the enemy, by opening the sluices in the dam of Schwammernanel, had caused the Roer River to rise about four feet, (2) The attack, therefore, had to be delayed until the river could be crossed successfully.

It is not surprising that the intensity of the Allied attacks increased even more than previously. On the ground the enemy forces were retreating East with the result that anti-aircraft fire, which had been intense at the start of the operations, began to fall. The opposition from the G.A.F. was negligible and it now became for the Allies merely a question of how many aircraft were available to put into the air. The brief reference to Operation Clarion shows what could be achieved by making a maximum effort, and how ineffective was the enemy's reply. As a further example, some 2,400 sorties were flown on 23 February and over 3,650 on the following day. The effectiveness of close air co-operation became difficult to assess because the need for it had largely disappeared. Air power was now being employed, in the main, to prevent the retreating German Armies from crossing the Rhine and to isolate the Ruhr area. Although the advancing Allied troops left a number of poorly defined pockets of resistance, they were not profitable targets, and it was only a matter of time before they could be disposed of. The overwhelming air superiority of the Allies therefore tends to give a distorted picture of the part that air support plays, because enemy opposition had now become so ineffective that many of the early problems with which this particular use of aircraft had been connected were no longer applicable.

By 23 February, the Canadians, making slow progress, had reached the Rhine opposite Emmerich, having captured Cleve and Goch. At the same time the First Army, having captured the Roer dams struck Eastwards across the Roer and closed in upon the Rhine, whilst Third Army closed from the Southwest, having first eliminated resistance in the Saar-Moselle triangle. On 15 March, after having gained their objectives along the Rhine, North of Moselle, the Allies opening their major offensive South of the Moselle. (3) Third U.S. Army struck South Eastwards across the Moselle in conjunction with a

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- (1) Effectiveness of Third Phase Tactical Air Ops. in the European Theatre.
 - (2) Report by S.C.A.E.F.
 - (3) Report by S.C.A.E.F.

Seventh U.S. Army thrust Northwards through the Siegfried Line and, by the end of the month all organised resistance West of the river had come to an end. In addition to achieving the object of destroying the enemy and closing to the Rhine, two sizeable bridgeheads at Remagen (First U.S. Army) and near Mainz (Third U.S. Army) had been obtained.

Plunder and Varsity. 23 and 24 March 1945

The operation of crossing the Rhine by the land forces during the latter half of March was known by the code name of Plunder, whilst the airborne operation which supported the crossing was referred to as Varsity. (1) As the two operations are complementary it is proposed to deal with them generally as a whole rather than attempt to separate them one from another.

The enemy at this time was in an unenviable position. He had, as the Allies had hoped, elected to stand and fight West of the Rhine, and the result had been disastrous to him. His losses in battle had been crippling, morale was low, and the front his troops held was too long for his shrunken numbers, facing as they were almost four million Allied soldiers. The fundamental feature of the campaign now was the launching of the main attack to the North of the Ruhr, supported by strong secondary thrusts from bridgeheads in the Frankfurt area. The plan of Operation Plunder, the great assault across the Rhine which was to constitute the main effort, involved the use of three Armies. Under the command of Field Marshal Montgomery the U.S. Ninth Army on the right and the British Second Army on the left were to attack on the river between Rheinberg and Rees. They were to capture the communications centre of Wesel and then to expand their lodgement area on the east bank South and North. The Ninth Army's assault was to be launched south of Wesel with its main bridging area at Rheinberg; and its principal initial task was to be the protection of the Army Group's right flank. (2) The Second Army was to assault North of Wesel and to concentrate first on the capture of that town in order that the Ninth Army might commence bridging there. The Second Army was also to bridge the river at Xanten and Rees.

To assist the advance of the Second Army, the First Allied Airborne Army was to drop XVII Airborne Corps (comprising the U.S. 17th and the British 6th Airborne Divisions) North and Northwest of Wesel to seize the key terrain in that area. (3) This airborne operation - known by the code name Varsity - was timed to follow the commencement of the ground assault, it being hoped thereby to achieve an additional element of surprise.

From the nature of these operations it will be seen that the cutting of communications from the Ruhr was a matter of first importance in facilitating the establishment of a bridgehead on the East bank of the Rhine, North of the industrial area. In accomplishing this the Allied air forces were to play a big part. The plan entailed that the North-western area of Germany should be cut off from the central and Southern regions by the drawing of a line of interdiction running in a rough curve Southward from Bremen to the Rhine at Coblenz. This embraced eighteen

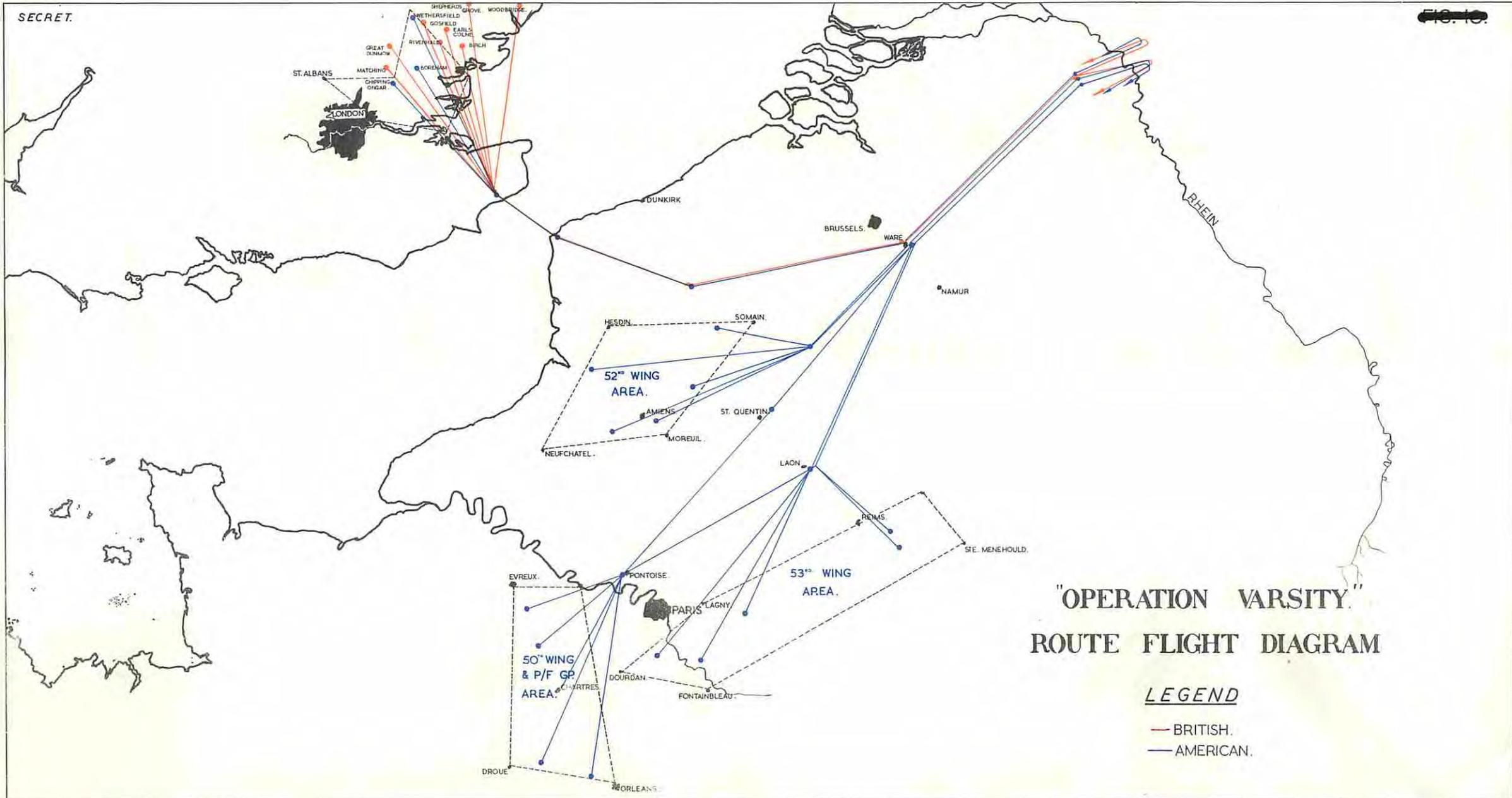
(1) Report by S.C.A.E.F. and II S/54.

(2) II S/76.

(3) 38G/S.10/94/Air.

SECRET.

FIG. 10.



"OPERATION VARSITY"
ROUTE FLIGHT DIAGRAM

FIGURE 17.

rail bridges and rail viaducts, the destruction of which it was considered would cut every main railway line leading out of the Ruhr to the West of Germany. There were three lines of paramount importance, namely those running through Bielfeld, Altenbeken and Ansberg, whose traffic, it was calculated, amounted to about half that to and from the Ruhr. Previous damage to a number of these targets had been energetically repaired by the enemy; for their importance had increased due to the successful attacks upon the waterways connecting the Ruhr and the increased traffic they now had to carry since the Silesian coalfields and industrial centres had been lost to the advancing Russians. The isolation of this area and the disruption of its rail centres would not only assist the assault crossing of the armies of Field Marshal Montgomery by hampering the ability of the enemy to deploy his ground forces in his rear areas, but would also deny much of its war production to the remainder of the enemy forces resisting the Allied pressure on other fronts.

On 21 February a series of attacks was initiated against these eighteen rail bridges and viaducts. During this period forty-two attacks by medium and heavy bombers were made on these bridges and viaducts by aircraft of the U.S. IXth and VIIIth Air Force and by R.A.F. Bomber Command. A summary of the effort made and the losses involved against what were frequently heavily defended targets is tabled below:-

	<u>No. of Attacks</u>	<u>Effective Sorties</u>	<u>Tons of Bombs Dropped (1)</u>	<u>Aircraft Lost</u>
R.A.F. Bomber Cmd.	14	308	2,270	6
U.S. VIIIth	8	702	2,023	-
U.S. IXth	20	875	1,530	31
Total	42	1,885	5,823	37

By 24 March, ten had been destroyed, one partly destroyed, and three were so damaged as to be impassable. A further two were suspended from air attack as by that time they were within range of the artillery of the Remagen bridgehead area. Therefore only two remained as possibly passable, and their importance had been lessened by other cuts along the lines which served them. During March, within the area and Westward to the battle line, a tremendous onslaught was made against every nodal point on the rail system,....some 158 heavy attacks being carried out in the first three weeks of the month. These attacks were designed to paralyse rail communications within that area and seal it off prior to the assault crossing and the airborne operation across the Rhine.

The more immediate preparation for this took place on the three days previous to the opening of the battle. Both heavy and medium bomber forces took part in these operations, forty-three separate attacks being made during which 3,471 effective sorties were flown and more than 8,500 tons of bombs dropped.

(1) In these attacks the R.A.F. for the first time made use of bombs of 22,000 lbs., with considerable success.

Fighter-bombers also intensified their attacks on enemy movements in the seventy-two hour period preceeding the assault. More than 3,000 sorties were flown by day and night against targets in the area, and claims were made that included 318 M.T. vehicles, eighty locomotives and 2,385 railroad cars destroyed and 215 railcuts made. Not only was it essential to disrupt the communications and movements of the enemy in the area, but it was also imperative to subject his defences to a series of attacks in order to facilitate the assault of ground troops and to minimise the interference from A.A. and fighters to the airborne operations. Accordingly, in the three days prior to the crossing no less than fifty-six attacks were made on defence, artillery and flak positions, and more than 6,600 tons of bombs were dropped upon them. Rocket firing aircraft were especially successful in several attacks on buildings believed to house Headquarters Staffs, G.A.F. bases, particularly those from which jet fighters operated, were heavily and successfully attacked in order to neutralise these fields during the vital period of the assault.

It can be seen from the preceeding paragraphs that the Allied air forces, over a period of some weeks, did a great deal of preparatory work before the operation actually took place, and it may well be said that the attack was made against an area that had been successfully isolated from the rest of the battlefield, and in which communications, defences and troops had been subjected to a series of heavy and intensifying bombardments. The land offensive (Operation Plunder) was heralded at 20.00 hours on 23 March by a great artillery barrage of an hour's duration directed against the East bank of the Rhine and extending through the zone where the airborne forces were to be dropped and landed the next day. (1) At 21.00 hours the barrage lifted and the British 1st Commando Brigade began the assault on Wesel. So accurate and heavy had been the bombing of Bomber Command that the town fell with a loss of only thirty-six casualties. During the night the main attacks went in. The initial crossings, thanks to the weight of the preparatory artillery fire and bombing were generally effected against only slight opposition and firm footholds were gained on the far bank of the river. The airborne landings, (Operation Varsity) began just before 10.00 hours on 24 March. The plan provided for the paradrop and glider-tug aircraft operating from the United Kingdom to set off shortly before 08.00 hours, and for the train, which was an hour long, to converge with the train from the French bases. This latter train of aircraft and gliders was to be two and a half hours long. From a turning point near Brussels the two trains were to fly parallel courses to Weeze, whence they were to turn into four dropping and six landing zones.

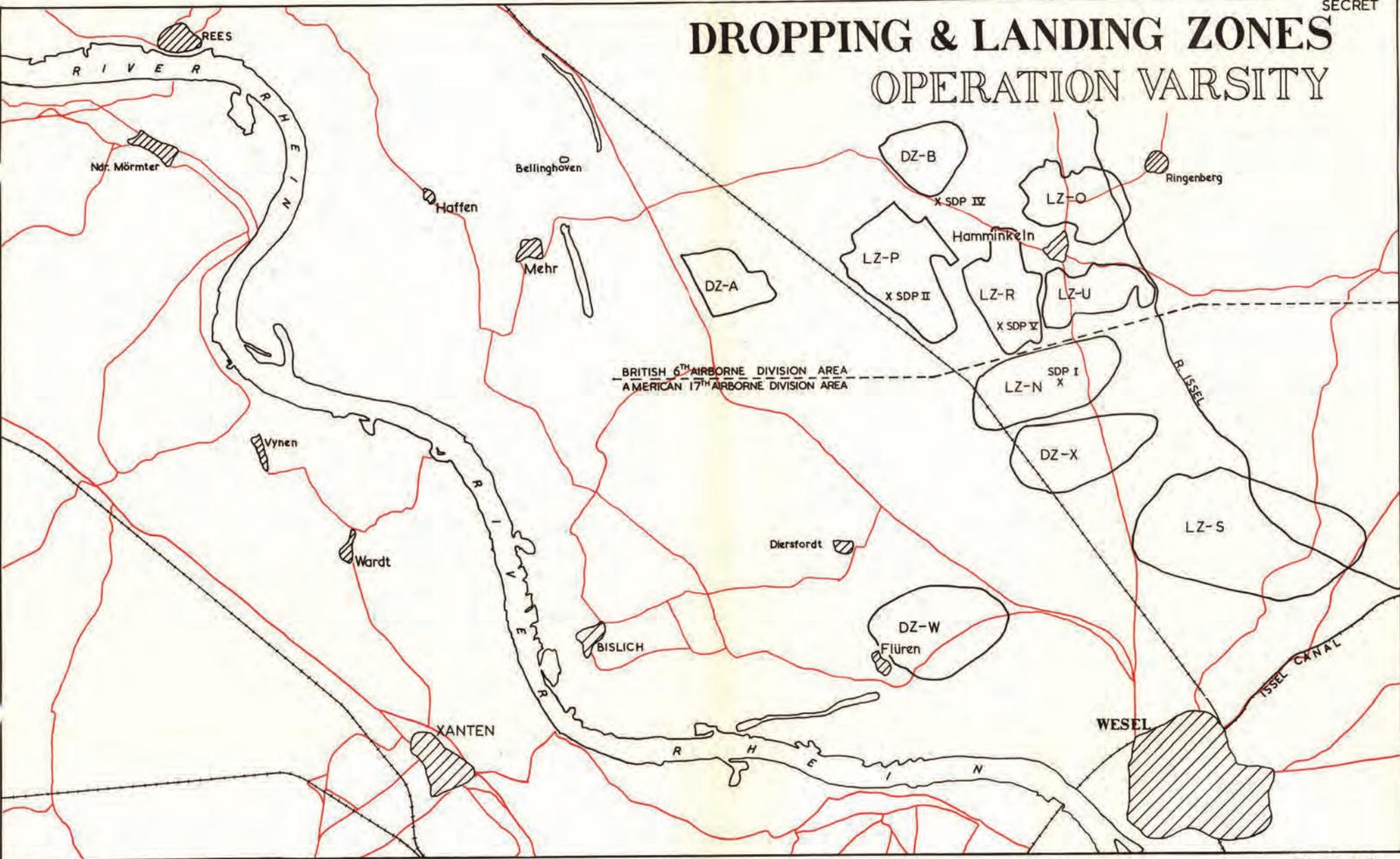
The whole operation was carried through almost exactly as planned. The parachute forces led both the American and the British trains. The British forces were carried in the 243 aircraft of the U.S. IXth Troop Carrier Command, operating from the United Kingdom, with No. 38 Group R.A.F. All of these forces and the U.S. glider forces flew at 1,500 feet M.S.L. decreasing height to 600 feet above ground level at the dropping and landing zones. The British glider forces flew at 2,500 feet M.S.L. for the whole outward journey. At the completion of the drop the British 6th Airborne Division turned left about and the U.S. 17th Airborne Division turned right about.

(1) II S/76.

FIGURE 18.

SECRET

DROPPING & LANDING ZONES OPERATION VARSITY



Summary of Loads carried in the Initial Drop

Troops	14,365
Ammunition and Explosives	109 Tons
Vehicles	695
Artillery Weapons	113
Equipment and Supplies	765 pieces

U.S. VIIIth Air Force Liberators carried 582 tons of equipment and supplies.

The smoothness with which the whole operation went through was an indication of the progress made in this aspect of warfare since the initial landings of "D" Day. Such success is even more a matter for congratulation since the forces and aircraft taking part were both American and British. The fighter escorts also were made up by 213 R.A.F. and 676 U.S.A.A.F. aircraft on the approach flights, by 900 fighters of 2nd T.A.F. over the target area, and by 1,253 U.S.A.A.F. fighters establishing a screen east of the Rhine. Operation Varsity was "an Allied operation in the fullest sense, and the victory won represented yet another triumph in the annals of Anglo-American co-operation in the common fight." (1)

(1) General Eisenhower.

THE CONTROL OF AIR SUPPORT

The results of the trials held in Northern Ireland during the autumn of 1940 are set out below.

Support

Two forms of bombing were to be used to give direct assistance to Armies in the field, and were defined as follows:-(1)

- (a) Direct Support. The isolation of the battlefield by air forces.
- (b) Close Support. The intervention of air forces in the battlefield itself - no distinction was drawn between action in the battlefield as applied to the "defence" and action off the battlefield but within the zone of active operations as applied to the "attack and pursuit".

It was foreseen that in practice there might be no clear dividing line between the two types of support, and that both would probably have to be provided by the same force of bomber aircraft. The broad distinction, however, existed that direct support could be planned before the battle and applied as the result of reconnaissance behind the enemy's lines, whereas targets for close support would probably have to be indicated by forward troops who alone would often know what should be attacked from the air. The forward elements, therefore, had to have a means of indicating targets and the air forces had to be so organised as to be able to respond quickly and effectively.

The right applications of close support therefore required a clear understanding of the characteristics of bombers, which were described as follows:-

- (a) Flexibility. It was possible for the whole bomber effort to be concentrated at short notice on a particular portion of the front. To make the best use of this flexibility some form of centralised control was desirable.
- (b) Form of attack. As had been demonstrated repeatedly in attacks employing dive-bombers against objectives within a strong and well organised fighter and ground defence system, the attacker had suffered heavy casualties owing to the inherent vulnerability of the dive-bombers. For this reason it was unlikely that steep dive-bombing tactics would always be the best method for close support. The shallow dive or level attack might prove to be more effective and the type of aircraft envisaged for the close support role would therefore be capable of carrying out either type of attack. It was also to be suitable for medium distance bombing which, as a corollary, indicated that squadrons employed in medium distance bombing (or direct support) could give close support if necessary.

(1) The extensive use of front gun fighters was not yet feasible and rocket projectiles were as yet unknown.

- (c) Range. The support from aircraft would need to be generally reserved for employment on targets which could not be effectively engaged by artillery, For this reason close support was to be mainly in support of armoured and mobile Divisions, combined operations and highly mobile operations.
- (d) Accuracy. The accuracy was less sure than that of artillery, neither did it increase as the bombardment proceeded.
- (e) Vulnerability. Aircraft, being more vulnerable and less easily replaced than artillery, economy in their use against well-defended positions had to be exercised. This did not mean economy in numbers applied to the objective, but economy by application to the right targets at the right time.
- (f) Element of doubt, Support ordered could not always be guaranteed as it could be interrupted by weather and a number of other factors.
- (g) State of readiness, It was uneconomical, as well as impracticable, to keep all aircraft constantly in a state of readiness to take off. It was estimated that not more than an average of one third of bombing aircraft could be immediately ready to take off, except for a pre-arranged initial effort. In order to reduce the time spent in bombing up it was recommended that only one, and not more than two, normal bomb loads be used for other than pre-arranged operations.
- (h) Fluctuating effort. The bomber effort would decrease as casualties occurred, and vary according to the interval which elapsed between the engagement of one target and the time aircraft became available to engage the next. Although, therefore, the bomber support available could be assessed with some accuracy on the basis of the first sortie of each aircraft, the support available from further sorties would be initially an unknown factor.
- (i) Protection. The organisation had to provide a means for getting protection at short notice for bombers carrying out close support roles.
- (j) Uncertainty as to Time, Unlike artillery there could be no absolute certainty of the time when aircraft support would be given. Various factors might cause delays. On the other hand it was most undesirable that aircraft should circle over a target waiting for "zero hour", and it followed that close support had to be given within admissable time limits.
- (k) Weight of attack. Unlike artillery in which volume can be obtained largely by ammunition expenditure, the weight of a bombing attack depended upon the number of aircraft employed. Centralised control was therefore essential in order to develop an adequate weight of attack to overcome the more serious obstacles.

- (1) Effect of bombardment. It was desirable that commanders should have some "yardstick" whereby the effect of air bombardment might be measured in artillery terms. This would come as a result of experience and could not be laid down precisely. Again, weather, strength of defence, type of bomb, target and bomb load were influencing factors. As a very rough guide, subject to revision, it was reasonable to assume in the case of aircraft carrying a bomb load of 16-40 lb bombs, that the effort of one attack by a single aircraft might be equivalent to four salvos from an eight gun battery of 25 pdrs., and that attacks from a flight and a squadron might be the equivalent of battery concentrations of five and ten minutes respectively. The effect on morale of consistent bombing attacks was known to be great, particularly if the enemy had already been shaken, or if the attack was closely followed by other forms of attack. Similarly the effect on morale of the attacker was increased by the knowledge that air assistance could be obtained rapidly and surely.

The characteristics of the weapon being thus described, it was next necessary to consider the basic requirements of the Army which the system should aim to satisfy. These were as follows:-

- (a) The interval between calling for and obtaining support had to be reduced to a minimum.
- (b) The local commander calling for support had to know as soon as possible if and when it would be forthcoming.
- (c) It was desirable that the local commander should know in advance whether his demands were likely to be met.
- (d) As local commanders would always want the maximum support available and could not know the general air situation, the scheme had to ensure that, as far as possible, demands were limited to the minimum vital need.
- (e) When support was given the concentration had to be adequate.
- (f) It was unlikely that any headquarters in rear of Brigades would be in a position to detail actual targets to be engaged at short notice, and the scheme therefore had to be designed primarily to deal with the requirements of lower formations.

The simple solution to direct allotment of specific squadrons to forward Brigades was clearly unacceptable and some form of centralised bomber control between forward units and airfields was therefore essential for the control and allocation of tasks to the squadrons involved. It was proposed to meet these requirements as follows:-

- (a) The close support aircraft would probably be placed under a Close Support Group Headquarters. (This later became the Tactical Group embodying fighters, fighter-bombers and reconnaissance aircraft).

- (b) The Group Headquarters was to have the means of sending forward mobile equipment and personnel for one or more mobile advanced combined headquarters known as "Close Support Bomber Control" (to become later a distinct R.A.F. control unit known as the Group Control Centre). Later developments were off-shoots of the Control such as Forward Director Posts and Mobile Radar Control Posts.
- (c) In the initial plan it would therefore be necessary to decide whether to:-
- (i) Keep the Close Support Control adjacent to the higher headquarters, allotting the bomber effort in weight of support rather than by squadrons.
 - (ii) Allot the whole effort to a subordinate formation in which case the control would be established adjacent to the headquarters of that formation.
 - (iii) Divide the bomber effort by squadrons and to establish two such controls.
 - (iv) Allot the bomber effort by weight of support as in (i), but to establish a single control adjacent to the subordinate formation most effected.
- (d) Signals communications were to be provided as follows:-
- (i) By the R.A.F. Direct wireless links between the Control and each airfield with which it dealt, on the basis of one set at Control for each three airfields controlled.
 - (ii) By the Army. One set with each forward formation to which, for an operation, it was decided to sub-allot authority to call for air support. These forward sets were to be known as "tentacles" and the Control was to have one set for every three tentacles. It was decided that when an Army formation was in direct touch with an airfield it would provide both ends of the signals link.
- (e) At each Control there was to be an Army Staff Officer who would, in emergency, represent the Army Commander at Control when direct touch was lost with his headquarters.
- (f) Tentacles were to be sub-allotted in bulk to lower formations for a given operation and could be further sub-allotted as necessary. This sub-allotment was not normally to be below Brigades of infantry or Regiments of the Royal Armoured Corps.
- (g) It was not expected that one Control could handle more than nine tentacles and six airfields.

The essence of the problem was clearly a matter of speed and certainty in the provision of close support. Certain factors, such as visibility, enemy defences and recognition could be more readily appreciated than countered, but nevertheless it was possible to devise a workable system providing adequate communications, airfields, and aircraft were available.

Basing aircraft close behind the front line would reduce the distance between forward and rearward links and thus make communications less difficult. The Wann-Woodhall report suggested a minimum range of 50 miles for the tentacle wireless and 75 miles for the airfield wireless. All W/T equipment was to be fully mobile and it was recommended that airfields should be provided with a minimum of two channels of communication. Line communications were to be provided wherever possible from Control to Group H.Q. and to the military commander fighting the battle. This was later simplified by siting the Group and Army Headquarters alongside. The intention was to introduce V.H.F. R/T communication between Control and close support aircraft as soon as the equipment became available.

The siting of airfields well forward would also reduce the time taken in flying to the chosen targets, and from the wireless ranges contemplated it may be assumed that the maximum distance considered was in the order of 100 miles. Trials had disclosed that at this range the time lapse between the time of origin of a request for assistance and the time of arrival of the aircraft would be in the order of an hour and a half. Another advantage of keeping the airfield well forward would be that aircrew would be well aware of the operations in progress and could thus be expected to locate and identify targets more easily.

In these circumstances, however, operational bases were often likely to be hastily prepared grounds of limited size where the facilities for maintenance and handling aircraft would be somewhat rudimentary. Aircraft would therefore need to be such that they could be operated in these conditions without difficulty.

The application of this system incorporated simplicity and variability to meet particular requirements. The first responsibility was naturally that of the higher commander in deciding the allotment of bomber effort to any particular sphere of operations and the subsequent re-adjustment of this allocation as necessary. The provision of fighter cover was to be a function of the Group Headquarters Staff, but a need was foreseen for the final executive order to be issued from the Control direct to the fighter airfields, (1)

The lower formations to which tentacles were allotted were to indicate their requirements to control by brief signals including the following information:-

- (a) Estimate of sorties required. This required knowledge of the type of aircraft and the weight and type of bomb load.
- (b) Target. Brief description and map reference.
- (c) Time. A period of time was normally to be stated within which support was needed and after which aircraft were not to bomb.
- (d) Bomb line.

(1) Simplified later by the inclusion of both fighters and fighter-bombers in the Tactical Group of which the precursor was the Composite Group combining fighters, bombers and reconnaissance aircraft.

As a general rule the only targets selected were to be those on which bombing would have a definite effect on the battle and which could not be adequately engaged by other means. Concentrated and relatively stationary targets were most suitable and dispersed or rapidly moving columns were not. The recognition of targets had to be easy from either high or low level under the prevailing conditions of visibility and enemy defences, and a margin for the security of our own troops had to be allowed in fixing a "bomb line" behind which bombing was not to take place. A suggested system for trial was the placing of white cloth arrows fifteen feet in length with bars each indicating 500 yards to point out targets and indicate our own positions.

A first requirement of the Control was that it should make certain that, as far as possible, tentacles were not left in doubt as to the availability and extent of support on which they might call. Furthermore, discretion would have to be exercised on occasion in responding to or rejecting demands, and it was for this reason that the Control was given a combined Staff and was best located adjacent to the headquarters of the Army formation most concerned with the battle. In either case, a request from a tentacle was to be answered at once as to whether or not support would be sent. The acceptance of a request was to be followed by the issue of executive orders to the airfields selected for the task and the remainder of the responsibility then rested with the airfield concerned except for any amendment to the order and the provision of fighters. Any tendency to regard the Control as an Air Intelligence centre was to be deprecated and drastically discouraged, for the Staff and communications system would be fully engaged with the receipt and issue of requests and orders. Consequently air intelligence from airfields was to be passed direct to Group H.Q. from whence it would be passed to Control when the line facilities allowed.

At airfields, briefing was best carried out in the operations room close to which the aircrews were at readiness in their rest room. Maps most suitable were those of the same scale and marked with the same grid as those in use by the Army formations. It was considered that R/T or telephone briefing to dispersal points was considered unsatisfactory owing to the delay and misunderstanding which might arise.

This system was clearly adaptable to several other methods of supplying air support which could be brought into force to meet special circumstances such as might occur if ground formations were experiencing difficulty in defining centres of opposition or when special assistance was needed for the operation of armoured formations. These variations were foreseen as follows:-

- (a) Bombing by judgement. This form of bomber support might afford timely and valuable assistance, but it carried the risk of misapplication and therefore had to be based on a directive from higher headquarters. The Control would indicate to airfields the aim to be achieved, the target area, and the period of attack and the objectives would then be found by bombers and attacked.
- (b) Bombing as a result of air reconnaissance. Air reconnaissance ahead of leading columns was to be provided whenever possible and the results were to be passed by normal means (or perhaps by wireless) from the air to forward formations. The leading formations to which tentacles were allotted would therefore be able to make full use of this information and could make it the basis of requests for air support.

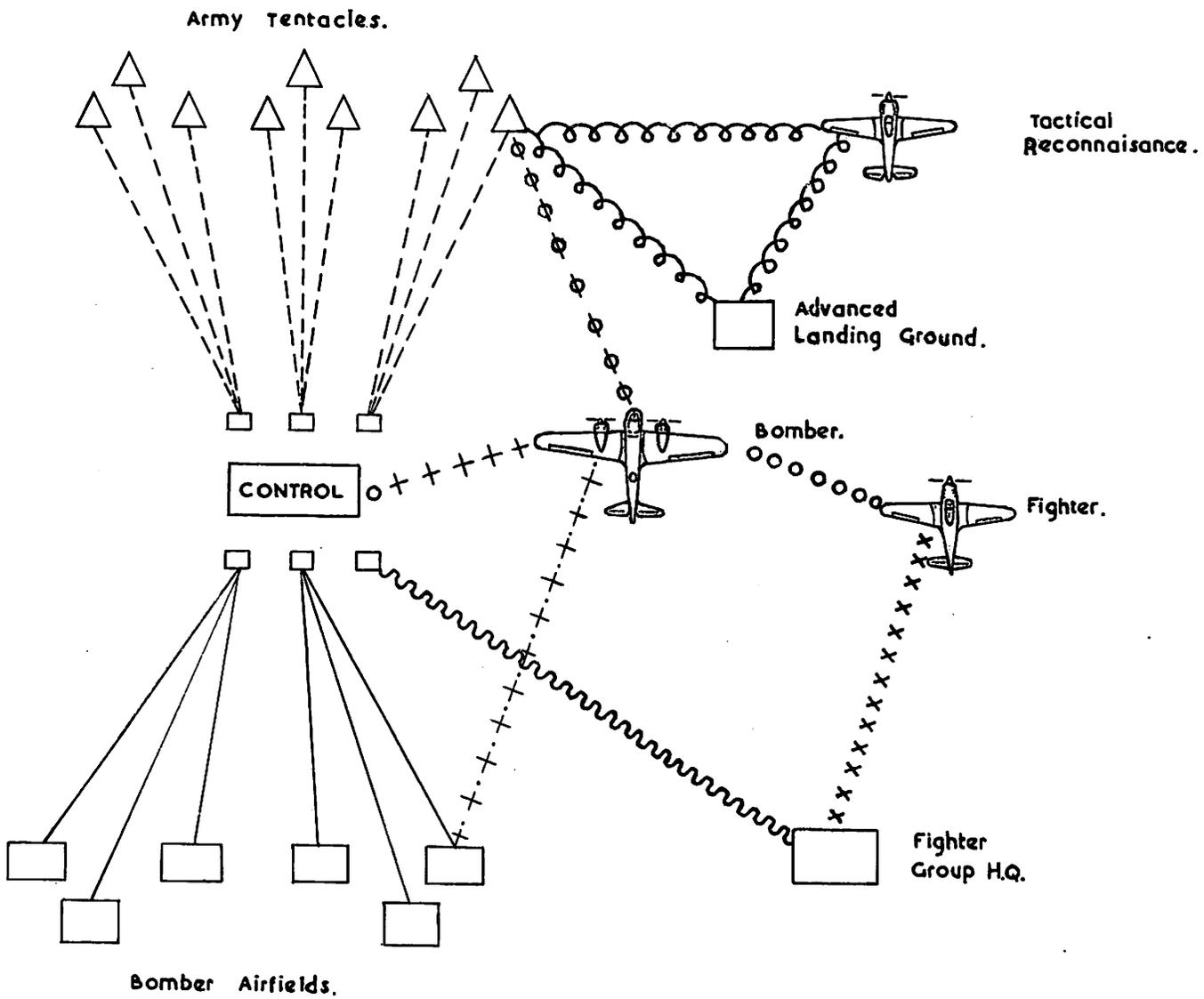
If the information available should prove insufficient on which to direct bombing it was suggested that the Control might then arrange for additional reconnaissance and order close support bombing as a result of the further information obtained.

- (c) Bombing as a result of R/T instructions received in the air. This system had to await the provision of V.H.F. R/T, but it was foreseen that aircraft might then be ordered off the ground to rendez-vous by pre-arrangement in anticipation of precise orders being transmitted from either the tentacles or the Control. (1)

A further variation of the organisation was proposed for the special support of armoured formations in which a composite force of bombers, fighters and reconnaissance aircraft was to be employed. Control was to be exercised from a small mobile operations room, the equivalent of the Close Support Bomber Control, which was to move forward with the commander of the armoured Division conducting the battle, but would incorporate in its normal tasks the close co-ordination of fighter, bomber and reconnaissance aircraft. (2)

-
- (1) Later developments included a mobile Visual Control Post for this purpose.
- (2) Later developed as a Forward Director Post, a forward auxiliary of the Group Control Centre.

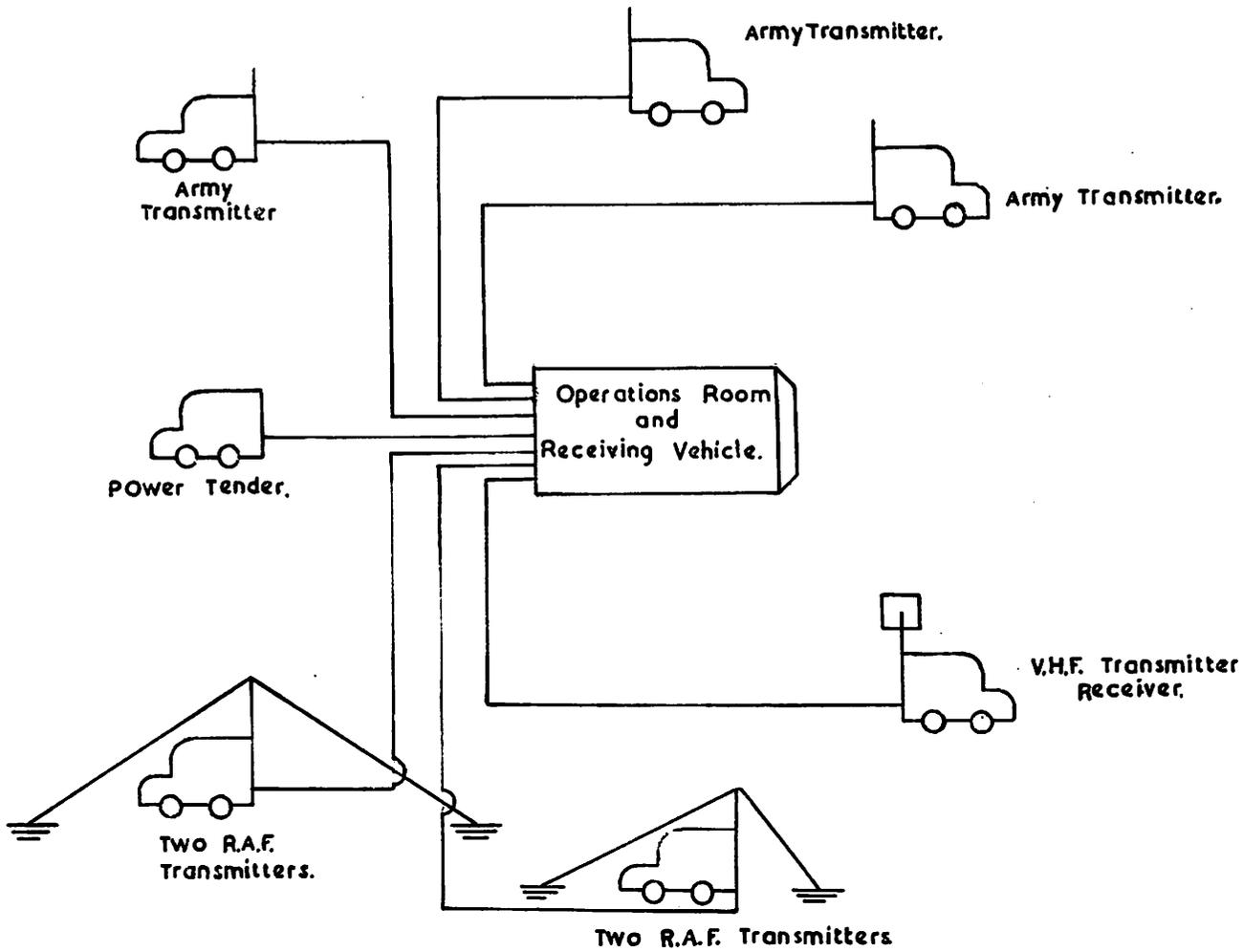
DIAGRAMMATIC PLAN OF COMMUNICATION FOR CLOSE SUPPORT.



LEGEND.

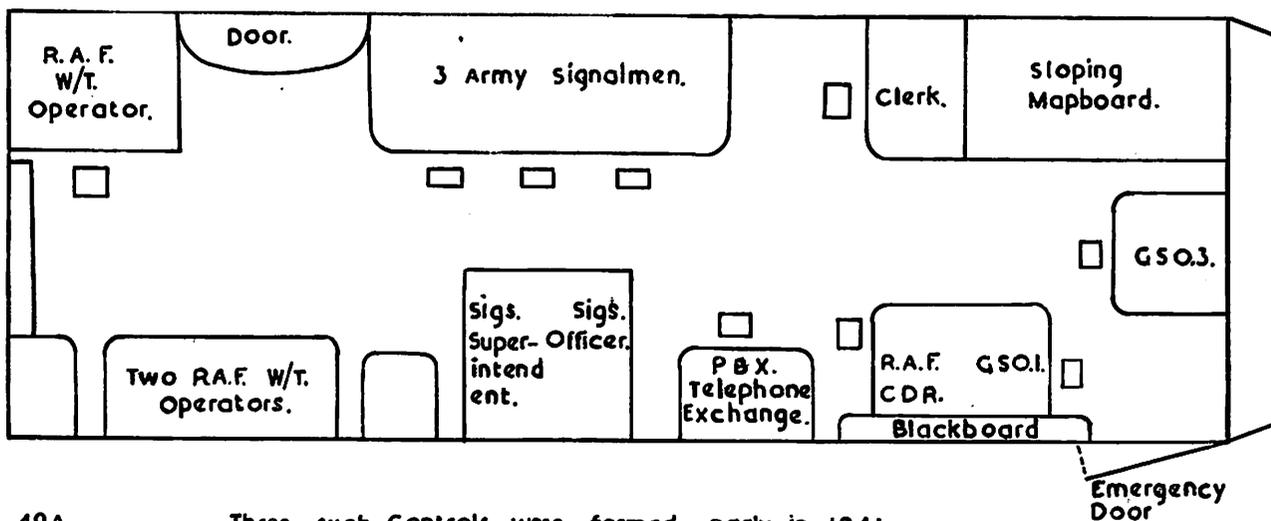
- (a) Point to Point W/T.
- Army tentacles. -----
 - RA.F. to airfield. =====
 - RA.F. to Fighter H.Q. ~~~~~
- (b) Aircraft Communications V.H.F. R/T. (proposed)
- Airfield to bomber. + + + + +
 - Control to bomber. + + + + +
 - Army Forward H.Q. to bomber. ⊕ ⊕ ⊕ ⊕ ⊕
 - Fighter to bomber. ○ ○ ○ ○ ○
 - Fighter Group to Fighter. X X X X X X X

DIAGRAMMATIC SIGNALS LAYOUT OF THE CLOSE SUPPORT BOMBER CONTROL. 1941.



All vehicles 400 yds. from operations room.

THE OPERATIONS AND RECEIVING COACH LAYOUT.



Enc. 49A.
File CS.5943.
Enc. 64A.
File 56512.

Three such Controls were formed early in 1941. Two were for use in England and the third was in Northern Ireland, and later in the year a further two were provided.

ARMY TRAINING INSTRUCTION No. 6

This instruction, issued on 31 October 1941, set out the methods and organisation for air support that had been developed and agreed to that date. The forms of air support were categorised in the following order:-

- (a) General air superiority was vital as it provided the conditions essential to free observation of the enemy, secrecy in our own preparations, and the prevention of enemy air forces from taking action which would adversely effect the course of a land operation.
- (b) Provision of information whose value was in proportion to the speed with which it could be delivered to the military commander concerned.
- (c) Attacks by bomber and fighter aircraft against strategical targets having a long-term effect on the campaign as a whole, and against tactical targets more closely connected with land operations, in addition to attacks on targets in pursuance of the policy of obtaining air superiority. These air support targets included the following:-
 - (i) Strategical: Docks, shipping, base installations, factories, and distant communications,
 - (ii) Tactical: Troops, vehicles, war materials, defiles, defended localities, headquarters, and communications; all of which might be engaged either on a deliberate plan or in quick response to the requirements at any one time.
- (d) Fighter cover for special operations when air superiority was not absolute.
- (e) Airborne operations with gliders and transport aircraft for the carriage of troops, equipment and stores, and for the dropping of troops and/or supplies.

The responsibility of the R.A.F. was visualised as including the provision of assistance by means of air formations placed under the Army and of formations operating under R.A.F. control. The force under Army control was to be known as an Army Co-operation Force which was normally expected to consist of aircraft of the fighter reconnaissance or bomber reconnaissance type. Thus provision was made for the Army to be supported by an air force under command which could provide reconnaissance together with army air support, local fighter cover in an emergency, and assistance to the air forces not under army control when not needed for military operations. A number of squadrons with their commanding officers acting as advisers, were likely to be allotted to Corps and armoured Divisions for tactical and artillery reconnaissance, while the remainder were expected to be organised into Wings or Groups to provide army air support.

The squadrons provided by the R.A.F. outside the Army Co-operation Force were not necessarily to be expected to have practised attacks on fleeting targets near our own troops or to have trained with the Army, but would usually have been trained to operate on more deliberate methods involving the use of a

carefully organised communications system, which inferred that their use against close tactical targets would need to be closely regulated. In addition to operations undertaken to further the campaign as a whole, it was to be expected, however, that these forces would be employed to assist the Army in the following ways:-

- (a) By fighting for general air superiority in the theatre of military operations.
- (b) By the attack of strategical targets prior to the battle.
- (c) By the attack of permanent targets during the battle regardless of their location in accordance with a general joint army/air plan for a particular operation.
- (d) By the provision in emergency of reinforcements for the Army Co-operation Force: in which case they would be placed under the operational control of the Military commander concerned - the operational communications being the responsibility of the Army Co-operation Force.

In any active theatre of war the Army contribution towards assisting the air forces in the performance of their tasks included the provision of secure bases from which to operate, information regarding the progress of the land battle, and all land lines and certain W/T communications between military headquarters and the R.A.F. Stations.

Visual and photographic reconnaissance by day and night were all possible requirements within the three main categories of reconnaissance.

- (a) Strategical reconnaissance under the control of G.H.Q. or Army Headquarters was normally to be carried out by long range fighters equipped with cameras in clear weather and by bomber types at night or under cover of cloud.
- (b) Tactical reconnaissance under the control of Corps or armoured Divisions would, if the enemy opposition were strong, be restricted to short mission flights to obtain one or two definite items of information.
- (c) Artillery reconnaissance was to be undertaken by Air Observation Posts as far as this was practicable. That which was beyond their powers was to be undertaken by the reconnaissance squadrons allotted to Corps and armoured Divisions.

Targets fell into three main categories, although no clear-cut distinction could be made and no comprehensive list could be given. Those of a "strategical nature" were not necessarily to be expected to affect the military operations immediately, and were normally to be engaged by the main air force on the orders of the A.O.C.-in-C in accordance with the strategical plan of campaign. "Tactical targets of a permanent nature" either on or off the battlefield were to be attacked deliberately according to a pre-arranged military/air force plan, normally by the main air force but also by squadrons of the Army Co-operation Force if this could be done without prejudice

to the engagement of opportunity targets. The military situations thought likely to benefit from the attack of permanent tactical targets were as follows:-

- (a) In the initial stages of a deliberate attack when adequate close support could be provided by the artillery, the air effort was to be used to isolate the battlefield by the attack of such targets as head-quarters, reserves and concentrations beyond artillery range.
- (b) In defence, to cut the enemy off from further reinforcements and to attack ammunition dumps and stores in order to delay and hinder his offensive,
- (c) During an orderly withdrawal in order to prevent the repair of engineer demolition.

The third category was the opportunity target which was intimately connected with the operations in progress and was to be attacked by aircraft of the Army Co-operation force, or by squadrons of the main air force detailed to provide army air support and was to be selected during the course of the battle at the A.A.S.C. The types of military situation thought likely to require this form of assistance were as follows:-

- (a) An attack against hastily organised defences when the effect on enemy morale might be decisive and when A.A. opposition might not be serious.
- (b) During the break through, after an initial land attack, when artillery fire was outdistanced by the advancing troops and air support would be invaluable. Reserves were to be kept for this purpose.
- (c) During a pursuit, against defiles, villages (to block roads), and enemy columns especially where they were congested owing to road blocks.
- (d) During an enemy break-through or a hasty withdrawal of our own troops when it might become advisable to intervene within close proximity of our own troops in order to provide material and morale assistance, rather than to concentrate upon the wider and normally more effective task of attacking more distant targets.

The headquarters of the Army Co-operation Force was to be adjacent to G.H.Q. and provided with land lines to subordinate formations during static operations. For mobile operations one or more A.A.S.C.'s were to be available to accompany the headquarters of the formation to which squadrons were allotted. It was the duty of the A.A.S.C. to implement the decisions of the military formation commander in respect of the frontage covered, the sector's requiring a concentration of air effort, the allocation of air effort to a sector, and the phasing of the air action. Air attacks ordered by the A.A.S.C. against suitable targets revealed by special reconnaissance, normal reconnaissance, military sources, or tentacles, were to be as heavy as reserves would permit and were to be repeated and sustained, if necessary, until the desired effect was achieved. The decision to use fighters or bombers depended upon the nature of the target as, for instance, in the case of troops dug in or in buildings which were more likely to be vulnerable to bombs than machine guns, troops or M.T. on the road which were

generally more vulnerable to attack by fighters, and deployed A.F.V.'s which could only be expected to succumb to cannon fire.

The use of special reconnaissance and normal reconnaissance as a means of selecting opportunity targets depended upon the quick receipt by the A.A.S.C. of the information obtained, and for this purpose a listening set at the A.A.S.C. and line communications through Corps to the reconnaissance control set were to be provided. By means of suitable wireless communications between air support aircraft and the A.A.S.C. or tentacles it was also thought possible to brief pilots in flight, amend or confirm orders and thus reduce time-lag.

Considerable agreement had also been reached on the nature of targets which could usefully be attacked either on or off the battlefield. Those on the battlefield were now tabulated as follows:-

- (a) Headquarters and signals offices.
- (b) Defended points such as villages and woods.
- (c) Crossing points of obstacles, bridges, bottlenecks.
- (d) Concentrations of transport and A.F.V.'s, especially at bottlenecks where diversion was difficult.
- (e) Movements of reserves.
- (f) Artillery positions.

The attack of more distant targets with the object of isolating the battlefield included all forms of communications and had to be co-ordinated and based on the enemy's system of supply, so far as it was known. Some considerations on the vulnerable points in communications were shown as follows:-

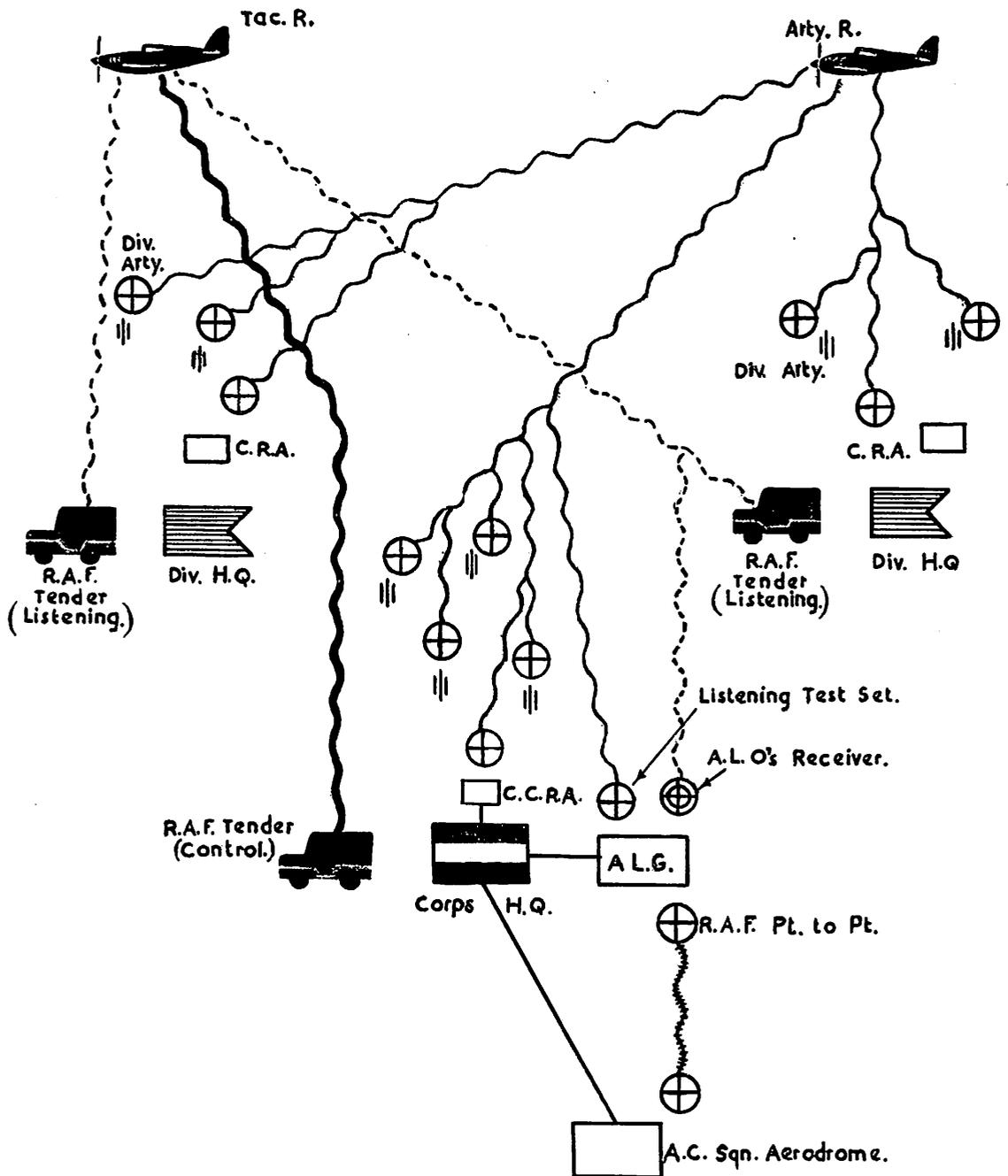
- (a) Headquarters and signal communications. To obtain useful results it is necessary to attack the centres of communications. Effective attack on both distant and near headquarters may paralyse the enemy's activity and, if co-ordinated with the land attack, may have decisive results on the operations.
- (b) Rail communications. The greatest dislocation is secured by attacking vital junctions every few days. Railways are not an easy target and attacks must be made in sufficient strength to ensure that damage is inflicted. This is applicable to the period prior to active operations, provided the targets attacked do not disclose the area in which the offensive is being prepared.
- (c) Road communications. Generally speaking these are not good targets being hard to hit and diversions can be made. When travelling at a low density M.T. offers a poor target to the bomber. Low flying fighters may prove effective, but their employment on this role must be weighed against other demands they may have to meet. The point selected for attack should be a stretch of road where repair is difficult and detour facilities poor. Bridges are the most favourable targets from this point of view, but it must be expected that enemy anti-aircraft defence will be at its most effective at such vulnerable places. When

all main routes in an area are filled to capacity the attack on roads in towns which form bottlenecks will be the best means of dislocating road movement. Hits on houses bordering the road will cause rubble to obstruct the road and delay traffic without the necessity of obtaining a direct hit on the road. The plan should aim at causing a number of blocks simultaneously so that diverted traffic becomes congested on the routes that remain open. Attacks may then be made on the traffic itself and, if the air situation permits, machine-gun attacks by fighters can prove most effective.

- (d) Water communications. Air action against water transport, whether by sea or land, is most effectively directed against docks and other points of transshipment. These targets are well suited to night attack.
- (e) Air Communications. The main responsibility for harassing air communications rests with fighter aircraft which can attack transport in the air and on the ground. Bomber attack on aerodromes which form the terminus of an air transport system is usually unprofitable unless there are no alternative landing grounds. If the enemy is limited to a few aerodromes it may be possible to render them temporarily unserviceable and to damage aircraft without undue bomber effort, but usually the effort will be more usefully employed against other targets. Machine gun and cannon fire are more effective against dispersed aircraft than bombing.

The transfer of tentacles between formations during battle was rarely desirable and consequently the initial allotment either had to allow for a reserve or had to be on a basis that would not require re-adjustment. This allotment was normally on a scale of one tentacle to a Brigade of infantry, and, in the case of armoured Divisions which had better internal W/T communications, on the basis of one "active" tentacle at Divisional Headquarters. When not being used for their primary tasks tentacles could be used for passing information provided no message exceeded five minutes, as otherwise a demand for air support from one of the other tentacles on the same frequency might be delayed unduly.

A.T.I.6. DIAGRAM TO ILLUSTRATE RECONNAISSANCE CHANNELS OF INTERCOMMUNICATION BETWEEN CORPS AND RA.F.

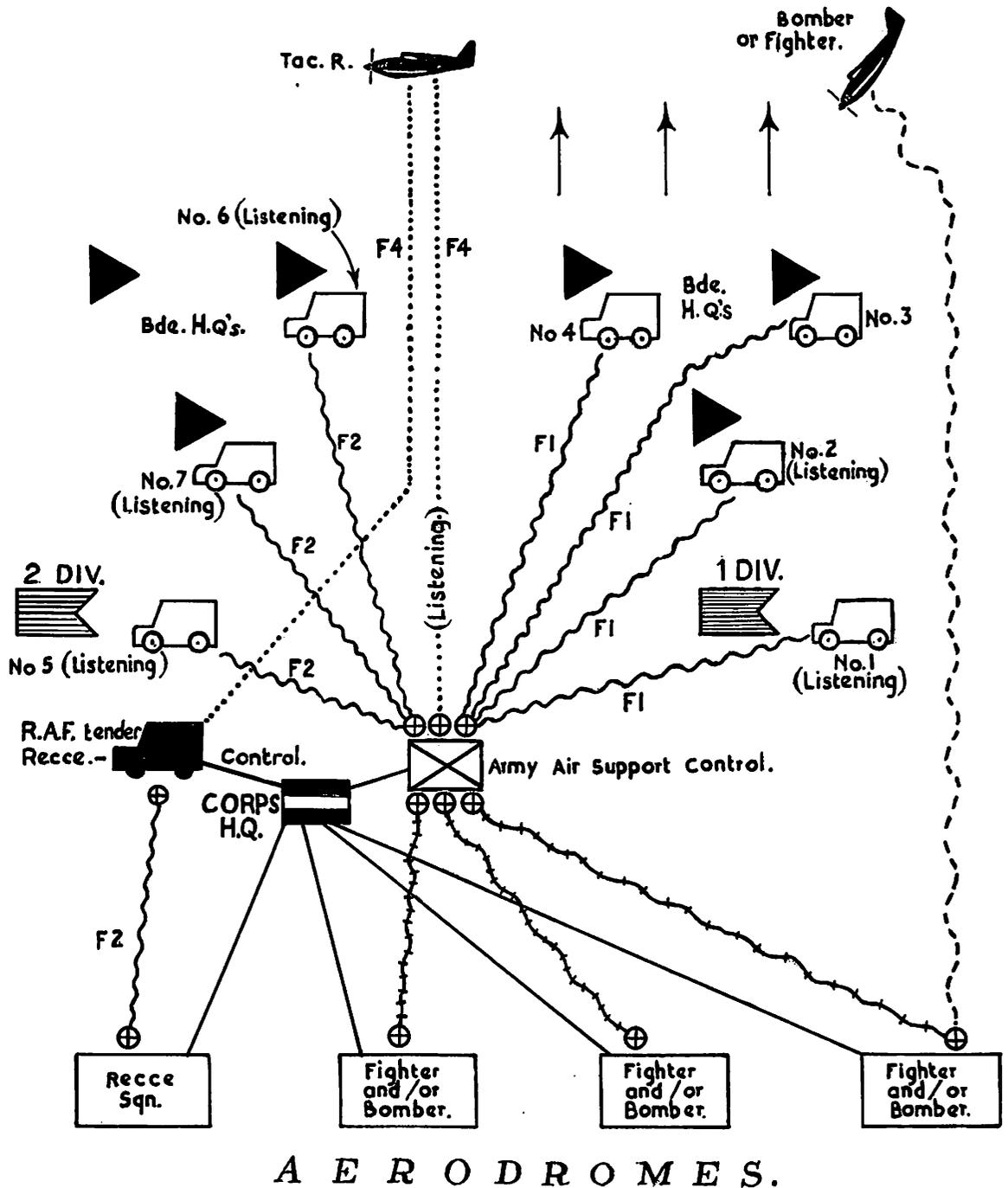


LEGEND.

- Two way R/T.
- One way R/T.
- Aircraft to listening sets.
- One way W/T.
- Aircraft to Bty Ground Stas.
- R.A.F. Pt to Pt W/T. or R/T.
- Line (usually laid by Corps Sigs)

- Notes: 1. Listening tenders are not necessarily allotted to Divs.
 2. Only Arty. detailed to answer air calls (by fire) will be listening to Arty. R.
 3. A.L.G. established only if Aerodrome too far from Corps H.Q. for rapid intercomn. and visits.

A.T.I.6. DIAGRAM TO ILLUSTRATE ARMY AIR SUPPORT CONTROL CHANNELS OF INTERCOMMUNICATION.



LEGEND.

Two way R/T or W/T Army. ~~~~~ Frequency F1, F2 etc.
 Tac. R. aircraft to ground. Line (Army Sigs)
 Bomber or Fighter air to ground. - - - - - Tentacle Tender  No.1 etc.
 Two way R/T or W/T R.A.F. ~~~~~

- Notes:
1. Seven tentacles shown.
 2. Main air attack allotted on 1 Div. front, and only Nds 3 and 4 tentacles are "active."
 3. Normal Army comns. and Tac.R. R.A.F. tenders (listening) are not shown.
 4. Future equipment may allow for R/T from Bomber or Fighter aircraft to A.A.S.C.

TACTICAL AND ARTILLERY RECONNAISSANCE

The unsuitability and vulnerability of the Lysander made it an essential for a replacement aircraft to be found. As an interim measure it was proposed to supplement Lysander squadrons with fighter types for areas where Lysanders would be too vulnerable, but directly after 1940 there was little prospect of obtaining fighter types in sufficient numbers for the purpose. Consequently it was decided to re-equip the Army Co-operation squadrons with the American Vengeance and Bermuda dive bomber type aircraft which were no longer required as support bombers. (1) It soon transpired, however, that these types could not be obtained in early 1941 owing to low production in the U.S.A, and attention was switched to a quantity of Tomahawks which had originally been ordered to serve as fighters. Re-equipment with Tomahawks was therefore begun in 1941 and as an essential measure of economy the number of squadrons in the U.K, was provisionally limited to fourteen, mainly with an aircraft establishment of twelve and a proportionally reduced pilot strength. The basis of allotment was retained at one squadron per Corps or Armoured Division and the role of bombing, and later ground attack, remained as a secondary task to the primary function of tactical reconnaissance. By July 1943 the Tomahawk was completely superseded in all theatres and the Mustang at home and the Hurribomber abroad became the established aircraft. The Spitfire became the next tactical reconnaissance aircraft, and for the remainder of the war operated alongside the Mustang in the Metropolitan Air Force (including 2nd T.A.F.) and replaced the Hurricane in the Middle East. No change was made from the Hurricane in South East Asia.

It is noteworthy that the number of tactical reconnaissance squadrons reached a peak of some thirty squadrons in 1942 and 1943, of which some eighteen were in the Metropolitan Air Force and that thereafter the number decreased to seventeen and less, of which only eight and later five were at home or in 2nd T.A.F. This change of policy was a reflection of the increased amount of information that was at this time obtainable as a result of the increasing scale of fighter and bomber operations, and of the adoption of centralised control for reconnaissance units. The pooling of specialised tactical reconnaissance resources into Wings was then found to be a satisfactory organisation for providing the remainder of the required information and, with the development of the Air Observation Post the amount of artillery reconnaissance flown was likewise limited.

Artillery reconnaissance remained, as previously, a function of army co-operation or tactical reconnaissance squadrons, the main difference being in the replacement of the Lysander by faster aircraft, the introduction of air observation by artillery methods on 15 July 1941 whereby the pilot corrected the fire with reference to the line between the battery and the target instead of plotting the fall of the shot by the old clock code method and, finally, by the subsequent introduction of two-way R/T. (2) The Royal Artillery concept

(1) A.M. letter to A.C.Cmd. S.6162 Encl. 68A. 22 February 1941 and Minutes of C.A.S. V.C.I.G.S. Meeting 19 February 1941. S.6162 Encl. 71B and S.7736 Encl. 4A and W.O. letter S.6162 Encl. 81A. 17 March 1941. C.A.S. Meeting S.7736 Encl. 6A.

(2) A.A.C./S.82/Air.

of the flying Observation Post was that of a light aircraft provided by the Royal Air Force but manned by the Royal Artillery on a probable basis of one to each artillery Regiment. The light aircraft was intended to operate at a low height over our own and not over enemy territory, and to supplement the functions of the normal Regimental Observation Post on the ground in observing the enemy's disposition and directing fire. Security was to be obtained against enemy fighters by its low speed, low height and its manoeuvrability and in its short time in the air at irregular intervals. This latter factor was of some concern to the Royal Air Force as all trials had been carried out in peaceful conditions and it was doubted whether the A.O.P. could operate effectively in the face of the enemy. Additionally there was the problem of providing the equipment and personnel to form and maintain the units required and there existed the risk that the Air O.P. aircraft on forward landing grounds might have to be abandoned to the enemy in the event of a sudden tactical move being undertaken by night or in bad weather. On the whole, therefore, the case against the Air Observation Post from the Air Force point of view seemed practically conclusive, but no satisfactory alternative existed and trials were continued.

A.O.P. squadrons were not regarded as substitutes for the orthodox direction of fire by aircraft flying deep into the enemy zone, but were intended to provide aircraft to supplement eyes on the ground limited for want of height. They would also to some extent reduce the tasks which had to be given to normal air observation, but their essential quality was to increase artillery power and not to reduce calls on the air. They began to form in the United Kingdom in the latter half of 1941. By July 1944 there was a total of $12\frac{1}{2}$ Auster squadrons, this having been found the most suitable aircraft. Of these squadrons four and a half were in the Mediterranean Allied Air Forces and one in South East Asia, and by May of the following year the total had been increased to sixteen and a half squadrons.

COMMAND IN THE MEDITERRANEAN THEATRE

Although outside the scope of this monograph a brief description of the administrative arrangements and changes that took place during the North African and Italian campaigns is included in this Appendix.

On 10 June 1940, Headquarters No.202 Group moved from Heliopolis to Maaten Bagush, absorbing Headquarters No.253 Wing, which until then had been in charge of Air Operations in the Western Desert. (1) During the first advance through Cyrenaica the Group moved as far forward as Benghazi, to return subsequently to the Delta where it eventually resumed the pre-war title of Air Headquarters, Egypt.

Responsibilities in the Desert were handed over on 25 February 1941 to Air Headquarters Cyrenaica which formed at Barce, where the Governor General and the Army had Headquarters. The retreat from Cyrenaica however, (2) removed the purpose of this new Headquarters and consequently on 12 April 1941 Headquarters No. 204 Group was formed at Maaten Bagush from personnel of No.202 Group and Air Headquarters, Cyrenaica. In June 1941, Rear Headquarters were established at Burg EL Arab whilst the Advanced Headquarters remained at Maaten Bagush. This Advanced Headquarters was moved alongside the Army and the Sea on 9 August 1941, and was combined with the Rear Headquarters two months later to form Air Headquarters, Western Desert. The new Commander (A.V.M. Coningham) had immediately appreciated the need for the A.O.C. and the G.O.C. to work and live together, and consequently the Advanced Headquarters was reformed on a mobile basis on 2 November 1941 and thereafter the Army Battle and the Advanced Air Headquarters moved in consort. A further development was effected in the middle of the same month by which Headquarters No.253 Wing joined with Advanced Air Headquarters to form a Direct Support Section. (3) The A.O.C. was thus enabled personally to control the whole of his force. The Wing had been reformed in May as an "Air Component Wing" charged with the task of providing close support and tactical reconnaissance for the Army, but was not properly established until July, when exercises and operations were begun. Eventually, in October when the new Air Support Control Organisation was introduced it became momentarily a purely Army Co-operation Wing before being absorbed by Advanced Air Headquarters.

During the preparatory period from mid-October to mid-November 1941 the Western Desert Air Force took shape for the battle to come. (4) Fighter, Army Co-operation and light bomber reinforcements were obtained by depleting Egypt and adjacent territories. These considerable additions necessitated some expansion of the organisation for control and administration so, accordingly, the number of fighter wing headquarters was increased from one to three (one defensive and two mobile), two light bomber wing headquarters were formed, and all transport aircraft were concentrated under an Air Transport Wing Headquarters which for want of staff was operated as a nucleus with Air Headquarters at Maaten Bagush.

(1) Collishaw Report. II J6/3.

(2) Longmore Despatch.

(3) O.R.B. No. 253 Wing.

(4) Wg. Cdr. Geddes Report.

The Advanced Air Headquarters was established near Fort Maddalena on a mobile basis, leaving the static remainder at Maaten Bagush under the Air Officer i/c Administration, and with No.262 Wing operating all the offensive squadrons from the Bir Khamsa area, No.258 Wing Headquarters was freed of operational responsibilities during a preparatory move to the Maddalena area. This, then, inaugurated the principle of movement by means of two limbs: thereafter the two fighter Wings virtually formed two sections of a Group, either of which could retain control while the other moved, and squadrons, working on the same system, had a divisible ground staff for maintenance.

Such an organisation for the first time made the R.A.F. in the Middle East fully mobile and, during Crusader the Advance Headquarters move forwards from near Fort Maddalena to the Tobruk area and to Tmimi; then during the subsequent retreat it moved back again via a number of sites to Burg El Arab. During November and December 1942 it moved forward once more in eight stages to Las Lanuf (Marble Arch) and, in January 1943, in three further stages to the Tripoli area, where it was joined by its Rear Headquarters.

Simultaneously with its advance westwards the forces of General Eisenhower's Allied Expeditionary Force had effected a landing in North Africa and begun their march on Tunis from the West (Operation Torch). (1) Arrangements were soon begun to co-ordinate the operations of the two converging Allied forces. It was evident, however, that when the armies of Von Arnim and Rommel were joined the two theatres would be fused into one and a unified command of land, sea, and air forces would be required to supercede the triumvirate of Commanders that had held sway previously. This was achieved under General Eisenhower on 19/20 February, 1943. From this unifying process emerged the North West Tactical Air Force as the selected organisation for the command and control of all formations directly concerned with the provision of air support for the 18th and, later, 15th Army Groups. Advance Headquarters (Western) Desert Air Forces which, up to this time, had been in sole charge of operations in support of the Eighth Army retained its status vis-a-vis that formation under the direction of the A-O-C, Tactical Air Force, but from time to time had to adjust its operations to meet the requirements of other sectors. During the assault on Sicily, for instance it was subordinated to Air Headquarters, Malta. In Tunisia Tactical Air Force was comprised of the Western Desert Air Force, XII (U.S.) Air Support Command and No.242 Group - which provided support for the Eighth Army, II U.S. Corps and First Army, and the Tactical Bomber Force.

The purpose of the Tactical Bomber Force, which had been formed at about the same time (20 March 1943) as the Tactical Air Force and included American aircraft, was to concentrate the full weight of tactical bombers against support targets that were either too close to the front line or some distance behind, and it was not until the adequate attack of the more distant targets was assured by the build-up of a substantial medium bomber force (B.25s and B.26s) that the Desert Air Force and XII (U.S.) Air Support Command could be reinforced permanently by the transfer of light bomber squadrons: thus simplifying the provision of intimate support and the arrangements of fighter

(1) Draft Tedder Despatch,
Eisenhower Despatch.

escort. Previous to this transfer of forces, however, Tactical Bomber Force was placed at the disposal of the tactical fighter formations fighting the battle as necessary from time to time.

At the end of 1943 the light bombers were divided between Desert Air Force and XII (U.S.) Air Support Command and, in February 1944, when the Tactical Bomber Force was disbanded, the U.S. Medium Bombardment Wings were taken under the direct control of Tactical Air Force which had, on 10 December 1943, become the Mediterranean Tactical Air Force, maintaining its Headquarters alongside the Army Group, from where it directed the operations of fighter, bomber and reconnaissance formations. It was the Air Force which was to be directly responsible for the support of all major land and assault operations through Tunisia, Sicily, Italy and later in the invasion of Southern France. From now onwards, therefore, the Eighth and Fifth Armies were supported by two truly composite formations and medium bomber formations, all under Headquarters Tactical Air Force. The Desert Air Force continued to operate in Italy throughout the campaign, but XII Air Support Command (renamed XII Tactical Air Command), was diverted to the support of operations against Southern France and was eventually replaced in Tactical Air Force by XXII Tactical Air Command.

Throughout the whole of this period, operations were directed from the main or advanced headquarters of Tactical Air Force, but local control was invariably vested in the tactical formation supporting the immediate battle. Thus as occasion demanded the tactical direction of a part or the whole of the force was passed to H.Q. 242 Group, H.Q. Desert Air Force or H.Q. XII (U.S.) Air Support Command.

AGREED STATEMENT SUBMITTED TO THE PRIME MINISTER BY
THE SECRETARY OF STATE FOR WAR ON 14 NOVEMBER 1942

Organisation of Air Support for the Army in Continental
Operations

The organisation of the R.A.F. Western Desert (A.V.M. Coningham's force) is as follows:-

- (a) When a land battle is in prospect or in progress, the sole responsibility of the A.O.C., R.A.F. Western Desert is the support of the Eighth Army. The air defence of the Nile Delta is the responsibility of the A.O.C.-in-C.
- (b) The organisation is capable of expansion. Medium bombers are allotted by the A.O.C.-in-C., Middle East, to the A.O.C. Western Desert; the numbers vary with the requirements of the situation; they may even include Fleet Air Arm aircraft. On the 31 August 1942, for example, the A.O.C.-in-C., Middle East, placed the whole of the medium bombers at the disposal of the A.O.C., Western Desert.
- (c) Mobility. In the Western Desert Air Force all operational units, including A.H.Q. Group and Wing H.Q., are fully mobile.
- (d) It is a composite force of fighters, light bombers and reconnaissance formations, whose Headquarters and units are trained in Army Air Support.
- (e) The A.O.C. is permanently in personal touch with the Commander, Eighth Army, and his organisation and training has been evolved so as to facilitate his control over all the air forces which are operating in direct support of the land forces.
- (f) The operational control of light bombers and the fighter groups, and also of such medium bombers as are allotted to the A.O.C., is centralised. They are disposed for their tasks on the following day as a result of a personal conference between the Army and R.A.F. Commanders.
- (g) The control of air support is exercised from a joint Advanced Army and Air Headquarters.

The arrangements described below are those in use in the Western Desert, with the modifications necessary to meet the different conditions of major operations against the Continent of Europe. These different conditions are:-

- (a) The fact that the operations envisaged will be a joint Anglo-American operation in which virtually the whole of the Metropolitan Air Force and the U.S. Air Forces in U.K. will be engaged.
- (b) The existence of a Supreme Commander over all the Allied Air, Land and Sea forces engaged, having under him a single A.O.C.-in-C., one of whose principal tasks will be the control, under the direction of

the Supreme Commander, of the strategic air reserve represented by the Heavy and Medium Bombers of the British and 8th U.S. Bomber Commands.

NOTE:- If the operation were entirely British, neither (a) nor (b) above would arise and the difference from the Western Desert would be merely one of scale.

Assuming that (a) and (b) above are applicable there would be in Europe a higher level, represented by the Supreme Commander and the A.O.C.-in-C., which does not exist in the Western Desert. But both on this level, and on the lower level represented by the G.O.C.-in-C., British Army and the A.O.C. Eastern Air Force on the one hand, and the Commanding Generals U.S. Field Army and 8th Air Force on the other, the governing principle is exactly the same as in the Western Desert. This is that the whole Air Force available in the theatre will afford the Army all possible support irrespective of other targets, the tasks and objectives being indicated by the Army Commander (or the Supreme Commander as the case may be) and dealt with by the Air Force Commander (or the A.O.C.-in-C) with his maximum force in the manner most effective.

Thus when the Army is established in France and the necessary aerodromes and other air facilities are available,

- (a) The Supreme Commander and the A.O.C.-in-C., of the Combined Air Force will be established in immediate contact, either in the U.K. or in France. For reasons of aerodrome accommodation, administration and supply, the bulk of both British and U.S. Bomber Commands must continue (until a stage later than it is necessary to consider in this Paper) to operate from bases in the U.K., as must the fighter Squadrons employed in the protection of the U.K. and the Line of Communications across the Channel. It seems unlikely that the main H.Q. of the Supreme Commander and the A.O.C.-in-C., will transfer to France until an advanced stage of the invasion of the Continent. But adequate communications will be provided between the A.O.C.-in-C. and the H.Q. of the two Air Forces in the Field.
- (b) The G.O.C.-in-C., British Army and the A.O.C. Eastern Air Force will be established in immediate contact at a H.Q. in the Field.
- (c) Mobile composite groups, each containing fighter, light bomber, army support and reconnaissance wings, and each corresponding exactly to the organisation in the Western Desert, will have their respective H.Q.s in immediate contact with the H.Q.s of the Armies in the Field. They will be under the command of the A.O.C. in the Field, subject of course, to the general operational control of the A.O.C.-in-C. They will be flexible formations of no fixed strength, and one or more can be reinforced at the expense of others by the A.O.C. in the Field, in consultation with the G.O.C.-in-C., according to the situation on any army front. Their basic organisation will thus be such as to be capable not only of controlling the formations permanently under command, but also those which are allotted. Close support operations and reconnaissance by all classes of aircraft will be controlled, as in the Western Desert, by a specially trained Army Support Commander through the Army Air Support Control Organisation at Group Headquarters.

AIR SUPPORT CONTROL ORGANISATION DURING CRUSADER UP TO TIME OF DECENTRALISATION OF CONTROL FOR BOMBERS ON 25 DEC. 41. (GIVING WINGS AND FREQUENCIES)

