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AIR HISTORICAL BRANCH

TRANSLATION NO. VII/VII

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A FORECAST OF
AIR DEVELOPMENTS
IN 1945.

A Study prepared by the German Air Historical Branch,
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TRANSLATED BY:-
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In the compilation of this study, expected developments on the side of the enemy, and our own limitations have been taken as a basis for comparison. Attempts have been made to draw suitable conclusions from the following factors, which may have a decisive influence on the course of the war in 1945.

Details of tactical methods, which must necessarily vary from time to time, have been purposely omitted. On the other hand, it has been necessary to take into consideration factors affecting the conduct of the entire war, because the military situation in particular, and also political and economic conditions have a decisive influence on the preparation and execution of air-warfare.

In Germany's present position, it is evident that, considering available means and forces, entirely new tactics cannot be employed. The only solution is to make our aims compatible with the strength of our forces, and to keep to the line of action formerly recognised as correct.

If we can succeed in gaining the necessary time to strengthen our war potential, by a successful defence of those vital fronts mentioned in the following pages, Germany's existence will be safeguarded; for many reasons, it is important for the enemy to end the war as quickly as possible.

In presenting the entire problem, we have attempted to exclude all bias from our statements. It should also be borne in mind that this Department is not conversant with the present official points of view on the conduct of the War.

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PART A.The situation on 1st September, 1944.

I. From the course of the war up to the end of 1940, the enemy learnt the decisive influence of the Luftwaffe on the conduct of a war, and has methodically created the preliminary conditions necessary for its successful prosecution. Of primary importance was an Air Force, whose first task was the protection of the vital sea-routes and industrial areas.

Apart from these defensive duties, the Air Force had also to be a powerful weapon of attack, capable of waging an effectual offensive air war. The first aim was necessarily the paralysing of the German armament industry, which could not be achieved without air supremacy. Military and Naval operations, which were becoming imperative as a means of winning sea and air bases, could also only be undertaken after air superiority had been established.

The enemy has based the conduct of the entire war on these principles and his success in the air since 1943 confirms their accuracy. In 1944 the enemy has had absolute air supremacy, which has enabled his armies to launch land attacks on the German fortress and has created the basis for the complete occupation of Germany.

Attacks on Reich territory brought increasingly favourable results for the enemy as the number of aircraft employed rose; not only did losses decrease, but the effect of the attacks was far greater. Modern methods of navigation, improved target data, and the increased range of fighter escorts, all favoured the enemy's attacks on the Reich.

Whereas the terror attacks on the civil population were not as successful as had been expected, the attacks on bottle-neck industries, (e.g. aircraft industry, chemical industry and fuel production), as well as on the communication network have been exceptionally successful.

As a result of this, it may be said that:

- (i) effective reinforcement of the German fighter defences over the Reich has not up to now been possible, and
- (ii) that the production of aviation fuel has decreased so much that an offensive air defence of the Reich cannot be contemplated, and it will even be difficult to maintain our defences at present strength.

The enemy can choose his targets without reference to the general war and political situation, to suit his aerial policy, and will adhere to existing targets and methods.

The enemy now has the following forces at his disposal, (situation as at August/September, 1944):-

(a) Western Powers.

(i)	In Great Britain and France	approx.	3,200 fighters
		"	4,100 fighter-bombers
		"	6,300 bombers.
(ii)	In the Mediterranean area (excluding Libya & Egypt)	"	800 fighters
		"	2,800 fighter-bombers
		"	1,700 bombers
		"	1,450 coastal aircraft
		"	350 aircraft of the Balkan Air Force.

(Source: OKL Operations Staff. Foreign Air Force. West. -
15.9.44).

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(b) Russia.

approx. 8,300 fighters
" 4,500 ground-strafer
" 5,700 bombers and recce.
aircraft.
" 1,400 long range bombers.

(Source: OKL., Operations Staff. Foreign Air Force. East -
1.9.44).

The output of the enemy's aircraft industry is not affected by any shortage of raw materials nor by the course of the war, and the operational strength of our opponents, which has steadily grown up to the present time, will continue to increase in the future.

Generally speaking, the performance of British and American aircraft is superior to that of our own. In particular, the reliability of his aero-engines enables the enemy to take full advantage of the flying equipment at his disposal. The Allies are far ahead of us in the field of H/F technique and are thus able to operate in all weather conditions; our own H/F operations have been quickly and effectively jammed by the enemy.

In Russia also, considerable progress is shown in the new aircraft series and prototypes. The performance of Russian fighters is equal to that of the German.

The enemy Air Forces are concentrating round the Reich, which now lies entirely within the effective range of escorted enemy long range bomber forces. By means of shuttle raids, the enemy is in a position to intensify his attacks, carry greater bomb-loads and provide added fighter escort forces. This concentration of forces offers him the additional advantage of being able to split the German defences by penetrating from three directions.

Depending on the development of the ground situation, the enemy will move his bases still closer to the borders of the Reich. Great flexibility and a ground organisation, equipped with practically unlimited technical aids, enable the enemy to establish many airfields in conquered territory and to supply his flying units. The air situation on all fronts and over the Reich in August 1944 is characterised by the enemy's unquestioned air supremacy, and the same is true of the Eastern front, which has been partly stripped of fighter forces in favour of the Reich defences.

At first, the enemy directed his attacks against naval bases in Germany, Italy, the Western occupied countries and Norway, and also against individual key-industries. The enemy later concentrated his forces, by day and night, on attacks that would ultimately give him air-supremacy (destruction of airfields and of Air Force units on the ground, devastation of the aircraft industry) and on attacks on communications and fuel installations.

Immediately before the beginning of the invasion, operations against traffic installations and transport movements were increased.

From May 1944 the enemy selected targets as follows:- About 65% of the total operations were directed against industry and communications, 25% were terror attacks and 10% were nuisance and saturation raids. Over 4/5 of the attacks on industry and communications were directed against flying equipment, fuel and communications.

Since the beginning of 1944, the bulk of enemy attacks have been made by American aircraft on daylight missions.

In 1943, of 51,000 aircraft sorties, 38,500 were flown by day and 12,350 by night.

In the first quarter of 1944, of 26,500 aircraft sorties, 12,900 were flown by day and 13,600 by night.

(Source:- O.K.L. Operations Staff. Most Secret documents. "Anglo-American air warfare against Germany" dated 25.4.44).

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In view of the growing incidence of daylight attacks a considerable increase in activity is to be expected. Daylight attacks will frequently follow the night operations, and will form a continuous raid lasting several days.

The main object is to weaken and deceive the German fighter defence. In contrast to the tactics employed early in 1944, when the enemy attacked a target by day with a large bomber-stream of about 500 aircraft, he now operates in echelon formation. Several bomber streams, constantly changing course, often fly deep into the Reich, small formations breaking off at intervals.

These tactics confuse the air situation and necessitate still greater dispersal of our defences. Under these circumstances, the task of our fighters is made exceptionally difficult, and can only be carried out when adequate situation reports are available.

As our forces are numerically inferior to the enemy, they must be brought to the battle at an opportune moment over great distances. Enemy fighters sometimes operate at a great distance from the bomber-stream, and taking advantage of our weak fighter defences carry out low-level attacks on airfields and traffic installations during and after the operations of the bomber formations. Fighter formations are also employed on independent missions against railways, airfields, river-shipping etc.

In a few cases, large enemy daylight attacks were carried out in bad weather, showing clearly the efficiency of the radar equipment and the high standard of training of the crews. On account of his highly efficient navigation and homing equipment, the enemy prefers in bad weather conditions to attack by night.

The bomber formations consist partly of four-engined aircraft and partly of fast twin-engined bombers (Mosquitoes), which are employed as markers and path-finders.

To confuse the air situation, the enemy makes use of forming feint attacks and camouflage devices including the dropping of metallic strips (WINDOW) to mislead our night fighters, Flak artillery, aircraft reporting and radar posts.

Nuisance raids are to an increasing extent being carried out by fast bombers, either simultaneously with, or independently of large scale attacks. Long range night fighters are also employed, to a lesser extent, with large formations, operating with great effect over the area between the bomber-stream and our night fighter bases.

In general, it may be said, that the capacity of the Allies to operate in all weather conditions is due to their masterly use of high-frequency technique, the use of scanning equipment including "Rotterdam" and "Meddo", which can be used for many purposes, illustrates this point.

The Russian long-range bomber force in the East, despite its strength of 1400 aircraft (Source: OKL. Operations Staff. Foreign Air Forces. East - 1.9.44.), plays no decisive part in the air war. With few exceptions, it is mainly employed in supporting the ground offensive and on attacks on front-line airfields and traffic installations. Since early 1943 however, successes have been scored during isolated attacks on targets far behind the front-line.

Russian development of high-frequency technique is still in its infancy. On the entire Russian front, only ground radar installations of English origin, or built on the lines of English equipment, have been found up to now. Although the existence of airborne radar equipment has not yet been confirmed, there are signs of fighter, (and night fighter) direction by this method.

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Even if its successes up to now are unimportant, it should be remembered, that the Soviet Air Force still possesses about 3,000 bombers apart from the 1,400 long-range bombers mentioned above. (Source: OKL. Operations Staff. Foreign Air Force. East - 1.9.44.) With the advance of their bases, the Russians are in a position to concentrate these formations and to strike heavy blows at towns and important targets near the Eastern frontier of Germany.

On all fronts the employment of close-support formations is a sign of air-superiority; these units operate with only a small or with no fighter escort. At the critical point of a battle, they operate as dive-bombers, and their task is the neutralisation of all targets on the battlefield with bombs, mortar bombs and machine guns. Attacks on roads and railways are also carried out. The bringing up of supplies to our troops and troop movements can therefore be made by day only at the cost of heavy losses. Night attacks on fortified positions and on communications have also recently been carried out by S.E. and T.E. ground strafers.

In the East, since the withdrawal of our fighter forces, the operating conditions for enemy ground-strafers formations are considerably easier. The Russians can, by employing small formations as dive-bombers, proceed to neutralise our troops permanently. Because of the efficiency of the Russian aircraft equipment industry, the present air situation and the low losses sustained, an increase in the number of Russian ground strafers can be expected in the future.

The decisive factor to be considered in judging the fighter-force of the enemy is its superiority in performance and numbers. The Western Allies can provide unbroken cover both for Great Britain and the activities of the ground forces.

The great production capacity of the Allied aircraft industry and the success of the air offensive against German armaments have made this possible. In addition their fighters are able to protect the bomber formations during attacks on targets in the Reich. Here too, high performance and numbers prevent the losses of the bomber formations from reaching an unbearable point.

The methods and organisation of the enemy night fighters are highly developed, and are continually being improved. More powerful German attacks have made such improvements necessary, and have also forced the enemy to employ S.E. fighters at night.

As in Germany, the British and Americans have effected a concentration of all parachute and airborne troops in one army. This policy has been followed until now in all landing operations in the Mediterranean and France and in the further land fighting in these areas. The present strength of this army is estimated at about 7 English and 3-4 American airborne divisions, excluding the Polish, French, Italian and other parachute formations. The Allies have also parachute and airborne troops at their disposal in the Far East and are at present creating new units on a scale that cannot yet be estimated. The enemy has developed these troops according to the German pattern, and knows how to use them to the best advantage. Their employment has been greatly facilitated by the overwhelming air superiority of the enemy.

In spite of the great strength of the present British fighter defences, an important role is played by the A.A. Units. The cutting off of an area by means of an anti-aircraft barrage is considered the best form of defence. The exceptional strength of British A.A. and the premature development and use of the rocket projectile, permit the execution of this policy.

The necessarily high expenditure of arms and ammunition presents no difficulties. The employment of barrage and rocket batteries permits the extensive use of home based anti-aircraft formations and personnel, who are not always fully trained. The concentration of forces in a few areas has been possible due to the limited number of German attacks.

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The western Allies have anti-aircraft guns of all calibres from 2-12.34 cms. at their disposal. The rocket guns are single, double and nine-barrelled, and the greatest calibre is probably 12 cm. According to our crews, an effective range of 7000 m. has been reached.

The extensive use of barrage and rocket projector formations has a marked influence on operational policy. The concentration of 60-80 guns to a mobile barrage, together with the limited laying possibilities and the appreciable loading time of rocket weapons, demand very closely linked sites if sufficient density of fire is to be achieved.

To favour the operation of night-fighters, much of the close co-operation between guns and searchlight batteries has been abandoned. According to night-fighters' requirements, searchlights are employed in the immediate vicinity of the objective. Numerous individual searchlights, lighting up the whole sky in this area, are situated between the Channel coast and London. Following the introduction of free-lance night-fighters, searchlights are employed for the formation of marker beacons.

British anti-aircraft fire is evenly distributed over the target area. A greater density of fire is achieved by means of "Flak-carpets" with about 30 simultaneous bursts, which are followed by further "Flak-carpets" at intervals of 3 minutes. Hits and density of fire have improved during the course of the war. In spite of our "window" operations in the last German attacks, good points of burst were established. This is due to faulty "windowing" on our part.

The development of Russian A.A. weapons has been based mainly on foreign ideas and methods. Our Eastern opponent has at his disposal, according to P.O.W. statements, guns of all calibres up to 15.2 cms. and also Flak projectiles. The heavy equipment has been copied from foreign types. Russian predictors can in no way emulate the performance of German models, and changes of course, speed and height are therefore often successful in confusing the Russian defences. Existing Soviet radar equipment is of English origin or has been copied. It is thought that the Red Army does not use its most modern equipment, in order to deceive us as to the stage of development that has been reached.

Russian A.A. is employed mainly at strategic points. A closely knit formation, close to the object, is favoured, and frequent transfers of forces, especially in the forward areas, are particularly characteristic of the Russian A.A. policy. In contrast to the Western Allies, the Russians favour destructive fire. Searchlights are only employed near important objectives requiring special protection. Value is evidently attached to the operation and effect of searchlights on landing strips and main traffic routes.

In Russia air protection for troops is energetically carried out. Weapons of all types are employed for this task and strengthen considerably Russian defences against low-level attacks.

II. Our own present position is well known, and it is therefore only necessary to point out the essential points in past operations, and the lessons that may be derived from them.

The development of the air war to date is characterised by the complete change over from the offensive to the defensive, brought about by the present situation. The uncontested German air supremacy in the years 1939/41 and our power to concentrate air forces in vital areas had a great influence on the outcome of the campaigns fought in those years. In the struggle for air supremacy, in the attacks on the enemy armament industry, in strategical and tactical co-operation with the Army and Navy and by independent missions, the Luftwaffe formerly played a decisive part in the conduct and course of the whole war.

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With the beginning of the war in the East, and the consequent simultaneous employment of the Luftwaffe in several theatres of operations, came the change in the conduct of the air war. Despite the knowledge of the unfavourable consequences that would ensue, the situation in the East demanded the divorce of the strategical Air Force from its proper tasks. The ever growing enemy air superiority completed the transition to a defensive strategy.

The fighting in the Mediterranean area and in the West definitely confirms the result of this development since 1941. The renunciation of all existing precedents of strategic warfare in favour of the policy of affording direct support for the Army and Navy, was accomplished under the pressure of the air supremacy of the enemy.

The following lessons for the future can be drawn from the progress of the air war to date.

1. The success of the German Air Force from 1939-1941 were due to:-
 - (a) The overpowering of the enemy Air Force, its ground organisation and armament industry.
 - (b) The harassing of enemy concentrations by means of attacks on supply and communication lines deep in enemy territory.
 - (c) Direct support of the Army by protecting the area above our troops; employment of reconnaissance, ground-strafer and fighter aircraft before the climax of an attack, and neutralisation of fortifications and centres of resistance by mass air attacks.
2. In spite of the severe weakening of the British Air Force and effective interference with the enemy armament industry, the air war against England failed to achieve the desired result, and supremacy could not be gained. This was due to the insufficient defensive armament of our bombers, the insufficient range of fighter escorts, the lessened efficiency of our sorties due to the large number of targets to be attacked; an additional cause was the inability of our supply organisation to bring up reserve supplies and enable us to maintain the strength of our attack.
3. In the war against Russia, the Luftwaffe is mainly employed in support of the Army. Weather conditions, supply difficulties and shortages of all kinds lead to a decrease in serviceability. In spite of the large number of aircraft shot down at the beginning of the campaign, the reconstruction of the Russian Air Force could not be hindered, because a strong strategical Air Force (4 engined aircraft) was not available to attack the Urals industrial area.
4. The reverses in the last years of the war were also due to qualitative and quantitative deficiencies in the Luftwaffe.

The present situation is characterised by the air supremacy of the Western Allies on all fronts and over the Reich. Thanks to this supremacy, which is twenty fold in some cases, the enemy can wage almost unhindered air warfare. Our operational strength has been drastically reduced, and the possibility of rebuilding the Luftwaffe jeopardized.

Apart from reducing our aircraft strength and the paralysing of German aircraft industry, the enemy has succeeded in reducing our monthly production of fuel to about 10% of the normal figure. Our planning, dependant on fuel supplies, has thus been disrupted, and only a fraction of existing units can be employed.

Apart from bottlenecks in fuel supplies, difficulties have arisen in the production of munitions owing to the shortage of nitrogen and nitric acid. Furthermore, it must be borne in mind that the enemy will direct his attacks against the few existing synthetic rubber factories, a reduction in whose output will also have a limiting effect on the serviceability of our aircraft.

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Owing to our material inferiority, air attacks can no longer be carried out over critical battle areas. The employment of fighter formations to relieve our troops is not on a large enough scale, and even with heavy losses, no very adequate results are to be obtained.

In spite of the numerical superiority of the enemy fighter force in the East, ground strafing is still possible under fighter cover. The Russians have not yet achieved material and tactical supremacy to the same extent as the Western Allies.

As regards night fighters, the models available at present are still an effective means of defence against four-engined bombers. Their efficiency is however limited by the short time that they can remain airborne, and in view of the increasing difficulties in the conduct of night fighting, this factor is a decided disadvantage.

German Flak has not, up to now, played a decisive role in aerial defence, their forces having been weakened by ground operations and valuable material and personnel having been lost.

In view of the ever increasing strength of enemy air defences, the employment of parachute or airborne troops in their traditional role would be possible at the cost of severe losses.

The petrol shortage rules out the possibility of supplying encircled troops from the air over long periods, a fact which must influence our strategy to a considerable extent.

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PART B.

Targets and operations in 1945.

I. Enemy intentions.

1. Policy
2. Economics
3. Conduct of air operations.

We shall assume as a basis for further military operations that by the end of 1944 the enemy forces are fighting on the German frontiers.

For details see part C, II.

1.

From the German point of view, the building of a new Greater Europe, which had such a fair beginning, disintegrated after the defeats suffered at the hands of a superior enemy.

Looking at the enemy, one at first gets the impression that the Allies form a solid political block. Behind this facade of strength, however, there are serious political conflicts, mainly due to the differences between Soviet Russia and the Western powers. These political difficulties arise out of the expansion of Russian influence in Rumania, Bulgaria and Finland and her further advances in the Southern and Western Balkans, especially towards the Dardanelles and the Mediterranean. German policy aims at taking advantage of these political difficulties so as to destroy the unity of the Allied powers.

Ultimately however, it is Germany's powers of military resistance that will determine the answer to the question of whether the Western powers, particularly the U.S.A. will consider it worth while to continue to put men and materials into an undertaking from which Soviet Russia will most probably emerge with the majority of the spoils.

There seems at present no possibility of the enemy's reducing the scale of their objectives. This applies at least to Soviet Russia as far as can be judged from our present estimations. Nevertheless the enemy is evidently attempting, in spite of his overwhelming strength, to finish the war quickly. The Americans will do everything in their power to maintain their export market, which they consider vital to their national life, at a profitable level and not to increase their domestic expenses, which are sorely taxed by war expenses, to unbearable heights.

In Eastern Asia Japan is fighting to build an Asiatic Empire, her chief enemies being the U.S.A. and Great Britain. Japan will try to avoid a conflict with Soviet Russia so as not to be forced to fight a war on two fronts, for the outcome of such a war against the combined strengths of Russia and America would be doubtful.

She is however interested in the continued existence of Germany, because should Germany surrender, strong Anglo-American forces could quickly be moved to the Eastern theatre of war. These are the most important factors relating to the policies and the war fronts of Germany and Japan.

2.

The American war potential for 1945 is in itself great enough to increase rather than lessen the onslaught of U.S. forces against Germany in her present position.

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Apart from the very favourable development of her chemical industry, America has become industrially far more self-sufficient, particularly in respect of specialised products such as optical, mechanical and wireless goods. Articles not produced by the U.S.A. are to a great extent imported from South America, a country which has been withdrawn from the sphere of British influence and forced to increase her industrial production.

In the British Isles, England has come up against certain difficulties, notably in the fuel industry, but the Empire supplies most of her requirements.

Australia has overcome her fuel difficulties by introducing legal controls in the coal mining industry. A surprisingly large number of men and women are serving in the forces and working in war industry. The co-ordination of industry and trade is progressing and war production is increasing.

South Africa is rapidly becoming industrialised. Her raw materials are supplied from the interior of the country. 50% of the entire population of the Union are engaged on war work.

Canada is particularly productive. She has delivered food, planes, tanks, ships, ammunition, armaments and other war materials to England, Soviet Russia, China, Australia and the "Maquisards" in France.

The Western powers on the whole are well off for raw materials. Oil in particular is available in large quantities.

By closing their frontiers for years past, the Soviets have succeeded in pulling a thick curtain over the true economic and military conditions in the Soviet Union. The war has given other countries an insight into the development of Russian armament. Her great reserves of manpower, her fruitful agricultural areas, and the vast quantities of raw materials are for all practical purposes and inexhaustible source of the Russian resistance.

The sources of raw materials and the location of production centres in the Urals, Central Asia and Siberia can even now only be guessed at. The loss of the Donetz basin, and of other industrial areas has doubtless meant a considerable loss to Soviet armament. A large part of the most important and mobile installations have however been transported farther East and therefore out of our range.

Most of the areas had been cleared before their occupation by the Germans, enabling the Russian war potential to rise in spite of all our precautions. This increase of potential had an effect on the population, and in particular on those fit for military service and war work, and on the food production areas. Large areas of land had been cultivated, and reserves of grain could not be destroyed. The same applies to trade; intensive destruction of factories and industrial installations and new machinery has not prevented the Russians from restarting their economic life in a very short space of time.

It is true that on account of the present war effort only the most necessary preparations for reconstruction could be made in the "scorched earth" areas. The population moreover has considerably decreased through war losses. On the whole we can however say that even in 1945, the Bolshevicks will be in a position to produce the materials needed for the continuation of the war against Germany. Her economic position has even improved since 1943/44.

3.

The ultimate aim of both our Eastern and Western opponents is to break through the present lines to annihilate the German fighting forces, and to occupy the whole of Germany. The main force of the attack in the West will probably fall on the North German plain.

In the East the Russians will probably try to cut off East Prussia, then to conquer the industrial regions of Upper Silesia and finally to advance on Berlin. Once the Balkans on both banks of the Danube are in Russian hands, the Bolshevicks will try to advance on Vienna.

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In the North the occupation of Finland by the Soviets has brought a threat to Northern Norway and possibly also to Sweden. In order to prevent the Russians from occupying Sweden, the Western powers may, as soon as their front in Western Europe has been consolidated, attempt a landing of their newly organised parachute troops in North West Germany and Denmark with a view to gaining a strong foothold in Sweden.

The Russian occupation of Finland is expected to be followed by intensified Soviet air attacks on our North Western flanks and our sea communications in the Baltic. A landing in Finland by the British and American troops which have been put into action against Norway and are engaged in mining operations in the Baltic, lies also within the realm of possibility.

Now that Germany is fighting in a smaller area, the enemy is in a position to provide fighter cover for bomber formations raiding any point of the Reich from the East, South and West. A reduced area, if the defendant has only small forces at his disposal, makes its defence easier, but does not help a defensive air war. The more space there is in which the industries and the air force ground organisation can be dispersed, the easier it becomes to reduce the efficacy of enemy air attacks. In a reduced area the enemy can batter ceaselessly at the more concentrated ground organisation and industrial plants.

In the present circumstances it is possible that in order to avoid further bloodshed, the Allies will not attempt to occupy Germany but will rather try to force her surrender by cutting her off from the outside world by a blockade and by subjecting her to intensified air attacks.

The enemy are now in a position to continue and to increase their attacks on German centres of production and communications without taking undue risks. Even if our armies hold their present frontline positions, the enemy air forces will be able to force a decision of the whole war unless we succeed in opposing them with strong enough forces.

In any case it is to be expected that the enemy will tend more and more to plan continuous night and day attacks lasting for several days as a unified air operation. During these attacks all possible measures and ruses will be used to weaken and mislead the German fighter opposition, especially the night fighters, in order to reduce the losses to a minimum even when very large bomber forces are involved.

Daylight raids carried out by very strong formations with varying tactics and with strong fighter escort will probably continue to be the most effective form of attack.

Night attacks will however gradually become more ruthless and effective and will continue to develop by taking advantage of favourable weather conditions and of such advantages as the shorter distance to our territory, improved direction finding and target location apparatus and methods, and the overcoming of bad weather conditions by the use of French bases for Boomerang and hyperbole flights. Night raids will become concentrated attacks in which the bombers fly at great heights with an escort of long range night fighters.

Whether the allies are attempting any formation flying by night, is at the moment not yet known. There are however signs of attempted night formation flying (Infrared formation flying apparatus), and the possibility of such attacks must be borne in mind. Should formation attacks by night take place, they would presumably be accompanied by intensified long range night fighter activity.

The war situation as a whole will always determine the selection of targets. The main force of the enemy attacks will in future still be directed against the aircraft armament industry (production of fighter aircraft), key industries and industrial bottlenecks, as well as against V-weapon factories and against our fuel supplies. The terror raids on towns can be kept up, especially when they can be combined with attacks against communications, fuel or industrial targets.

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In connection with the development of the land battles the enemy will carry out attacks on our communication system and rail centres. In the rear the enemy attacks will presumably be limited to bottlenecks and key points in the communications system, so as to hinder all movements of troops and supplies and other links between the Reich and the various theatres of operations.

The bombing of our petrol industry has paralysed our movements to a considerable degree. The Army, Navy and Air Force are severely affected and in addition the lack of petrol places an additional burden on the railways.

The electrical power and distribution stations might also become an important target. They will presumably receive more and more attention, as, with the destruction of our petrol installations completed, more forces become available for other targets.

In connection with the location of targets, it may be said that in the course of the war, German industrial centres have been greatly decentralised, and in particular have been removed from big towns. The targets for enemy air attacks have thus been distributed over practically the whole of Germany.

It remains doubtful if our Eastern enemy will introduce any radical alteration in the selection of his operational targets and increase the range of his air attacks. The possibility however exists that the Russians will use those bomber units which have so far been kept back, in concentrated form against targets in Germany; the success of these tactics will of course depend on the capacity of our defences. Night fighting units which up to now have been neglected will presumably also be strongly developed following the example of the Western powers.

Apart from the 7 British and 3-4 American airborne divisions which are in operational readiness at the present time, we must be prepared for attacks by numerous other divisions which are now being formed. The importance attached by the Allies to parachute troops is mentioned in a statement by General Eisenhower, in which he says that they will do much to shorten the war and help to bring about its early conclusion.

To prevent a deadlock the enemy will attempt parachute and airborne landings. Should the Allies therefore encounter difficulties on the Western front, they may attempt airborne landings behind our lines in an endeavour to break through from that direction; such a possibility must be borne in mind.

In connection with the above, the Alpine passes will acquire a special importance in 1945. Apart from the natural openings in difficult mountainous regions, the land forces will try to overrun the launching bases of our V-weapons, important traffic junctions and other key points.

In 1945 the airborne forces are expected to launch heavy and numerous attacks which the German defences will have some difficulty in repelling.

The British anti-aircraft defence system will probably be reinforced in the near future, in so far as this is considered necessary in view of the present position and strength of the German bomber force. Apart from this we may expect improvements in the range, effectiveness and guiding (by remote control) of rocket projectiles. The U.S.A. are also engaged on the large scale development and production of these projectiles.

On the tactical side it is worth noting that following our example, British mobile Flak units are undergoing intensive land fighting training, to enable them to be used in land battles when enemy air activity is slight.

The Soviet Union is still in the process of developing her Flak units, particularly with regard to the use of Radar equipment, and continued improvements in the Russian anti-aircraft defences are to be expected.

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Owing to the large size of the areas to be defended, the Russians will find it impossible to attain anything like the defensive strength of the Western allies in the near future. They can however set up individual and isolated Flak sites which can be most effective. The strength of the Soviet Union lies primarily in her light and medium Flak, including the FlaMG.

The above survey of the enemy's armament leads us to a number of conclusions. As the enemy's production figures surpass their losses, their operational strength will steadily increase.

The aircraft production figures for 1945 are estimated as follows:-

In Great Britain	10,000 Bombers
	4,600 Mosquitoes (for use as bombers and T.E. fighters)
	11,300 fighters
In the U.S.A.	20,000 Bombers
	18,000 Fighters.

The aircraft production of the Soviet Union is also increasing. At the Teheran conference Stalin gave the Russian aircraft production figure as 3,000 planes a month including 1,200 fighters. (The double of these figures is probably a more correct estimate). A survey showing the development of the British and American frontline aircraft up to the end of 1945 is given in Appendix 1.

Generally speaking no new types of bombers will be used operationally. We must however expect even larger numbers of bombers with greater maximum speeds and ceilings, heavier bomb loads and improved armament. The superfortresses B 29 and B 32 seem to be primarily intended for the Far East, but since the European theatre of war is still of first importance, they may also appear in Europe.

The introduction of more powerful engines in fighter aircraft will probably increase their maximum speed of 850 kms per hour. Jet propelled aircraft may also be used, but their use will for the time being probably be restricted to high altitude combat over the Anglo-American bases.

In view of the importance attached by the Allies to ground strafing forces, they will certainly increase the strength of these units. The conversion of fighter aircraft to ground strafers presents no great difficulties. This is very probable since, in view of the air situation, large numbers of fighters engaged in supporting the land forces are not being fully employed, fighter bombers are also far more useful for air support operations.

Aircraft engines will continue to improve. By the end of 1945 they may have achieved a maximum capacity of 4000 H.P. The B 29 can concentrate the fire of all its defensive armament on one target. Aircraft of this type are fitted out with a large number of guns which can be operated by remote control. Their effective shooting range might be raised to 1,000 metres by introducing a new type of gun sight with automatic deflection allowance and blind firing equipment aided by infra-red devices.

Bomb sights and target indicators for blind bombing will be improved. New navigational aids and methods will permit attacks to be carried out more easily in bad weather conditions. Path finders are also employed for the same purpose. Armour piercing bombs with their great depth of penetration may endanger even the underground German armament sites. New types of fuses, acoustic, electrical and mechanical and also remote-controlled torpedoes will doubtless be used by the enemy.

As Great Britain and the U.S.A. gradually decrease their aircraft deliveries to the Soviet Union, the latter will improve her own types of planes, specially her fighters. The bulk of the operations will fall on the fighters and ground strafers whose efficiency will bear comparison with that of the German models.

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II. Our own aims and potential.

The situation in the autumn of 1944, which provided us with a basis for the above estimates, showed the enemy to be in a superior position both economically and militarily. To challenge this superiority, to catch up on the enemy and to regain our former supremacy will be the tasks of the German High Command in 1945.

To stem the enemy advance and to stop him from crossing the frontiers of the Reich are the two basic conditions. If these are not fulfilled, the two opposing forces cannot be equalised, and a political and strategical foundation for future operations cannot be laid.

Thanks to Allied air supremacy, the Soviet air force which is rapidly being consolidated, dominates the air in Central, Southern and South-Eastern Europe. The selection of further strategical targets for 1945 will depend on the conditions prevailing in the event of Germany's regaining her air supremacy over the Reich and German occupied territories.

The need for reconstruction and increased production is closely related to the conditions for the reconquest of our air supremacy. Reconstruction work and higher output are particularly important now that extensive reserves of raw materials as well as factories have had to be abandoned to the enemy and that there is little hope of our reconquering them in 1945.

To meet the demands of the air war, the primary objective of our industrial reconstruction will be the expansion of the petrol and aircraft production industries. Next in importance are such vital matters as the production of ball-bearings and the development of High Frequency technique. Increases in both personnel and materials are essential if we are to pursue the war in the air.

Our most important manpower reserves for both industry and military service are to be found among men between the age groups of 18 and 60. Between 1914 and 1933, that is for 19 years, the German birth rate was so low that now in 1945, we lack men between the ages of 21 and 33. Even the call-up of boys of 17 and younger, and of women of all ages for war work, is barely sufficient to meet the demands for personnel in industry and the Armed Forces.

As not only the number but also the quality of workers is important, foreign workers can alleviate the shortage, but cannot entirely replace German workers, and the number of Germans thereby freed for other industries and for the front is negligible. It is intended to comb out non-essential workers from the armament industry and send them to the front in 1945.

The apparent shortage of materials can be remedied if all industries will use these economically, and if all those raw materials necessary for war production which are still in the hands of private owners, where they are either a luxury or lie completely idle, are seized. Many small objects of this nature when collected can make a valuable contribution to our industry.

After the Allied occupation of the French Atlantic coast, blockade runners could no longer get through, and raw materials in short supply could no longer be imported from Overseas. The enemy will therefore attach great importance to the remaining naval supply routes to and from Scandinavia and will attack them from the sea and from the air. In addition, there is also the possibility that the sources themselves of these raw materials may be more directly threatened from the air or an attempt made at occupying them, and an invasion of Denmark is very probable.

These sources of raw materials which are essential to German war production and the transports and routes over which they are imported will have to be safeguarded at least until sufficient reserves have been built up or other supply sources have been found.

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The lack of plating materials (chromium, nickel and tungsten) is making itself widely felt, and is affecting the production of equipment and instruments. Apart from this lack of certain metals, the very limited supply of nitrogen and saltpeter will cause a reduction in the production of explosives. Mass-produced goods are beginning to show imperfections which are probably due to foreign or insufficiently trained labour. The importance of all these shortages is however dwarfed by the severe damage caused to the carburant and lubricant production industries, which makes a further increase in the production of aircraft parts impossible.

It is most unlikely that the attacks on our power stations will cease, since the enemy considers their total destruction a decisive factor in the winning of the war. Consequently our hopes of slowly raising their output by planning the reconstruction of the industry, its decentralisation and by building some underground waterworks, have been dashed. The present output is probably most accurately to be estimated by taking an average between the figures given in the draft plans and those representing the present output reduced to a minimum by recent enemy attacks. Until such time as the new small waterworks (monthly output of 15,000 tons each) and those works which are being moved underground or elsewhere are ready, (middle of 1945), we can count on only a fraction of full production, estimated at a maximum of 30-40% of the present monthly output (approximately 200,000 tons).

The enemy offensive against the German aircraft industry and communications network is not for the time being expected to have any decisive results. A great part of the aircraft industry has been moved underground and is therefore far less exposed to enemy bombing. The communications system is so dense that there are at present sufficient branch lines, but an aggravation of the fuel position is expected to follow the attacks. They will also probably have a substantial effect on other vital industries, particularly the production of synthetic rubber and explosives.

The soldier, the consumer of these war materials, will have to be trained to use them with the most rigid economy. This applies mainly to air force personnel whose carelessness often causes loss or damage which can only be replaced with great difficulty.

The rebuilding of the German Air Force, especially of the fighter force, by strict adherence to the above rules regarding men and materials, is the primary condition for the battle for air supremacy in 1945, and German air supremacy is in turn the basic condition for a renewal of the air offensive. It is therefore the factor which will enable us either to destroy the enemy, or to batter him to such an extent that he will be willing to conclude a peace under conditions bearable for both sides.

Supported by an air force unchallenged in the air, the Army may also be able to launch attacks on a limited scale from their present positions, which must be held if the objectives planned for 1945 are to be achieved. In this task the army will take full advantage of all opportunities and tactics available against a numerically superior opponent, and will attempt to beat the enemy in those areas where military or geographical conditions are favourable. Briefly then, the Army must aim in 1945 at wearing the enemy out to such an extent that his losses in men and material will exceed his powers of replacement.

The German Navy will have to remember that Germany is fighting an Empire whose lifelines are on the seas. Its main task is to fight that Empire with every means at its disposal. In spite of the loss of the Western European bases, the German fleet in Norway will have to continue battering at the enemy supply routes in the Atlantic and safeguard our superiority in the Baltic. The enemy's long sea supply routes are very vulnerable and our fleet has thus an opportunity of checking the enemy's freedom of action on the Continent.

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The enemy's intentions of avenging the German use of V-weapons and of sapping the physical and moral strength of the German population will mean a continuation of his terror raids on our residential areas. We must therefore endeavour to strengthen the power of resistance of our nation by improving our A.R.P. system and by the dissemination of educational propaganda.

Unless the safeguarding and maintenance of our industries and communications are assured, our war potential, whether of supplies or personnel, cannot be maintained, and the solution of the above problems depends upon how far we succeed in building up a strong and active fighter force.

Our aircraft production and development programme aims therefore at a higher production of day and night fighters. In the near future more aircraft will be produced than can be flown with the present shortage of petrol, and we shall therefore have an opportunity of forming new fighter units.

In 1945 the main types of fighter aircraft at our disposal will be the Me 109 K, Fw 190 D and Ta 152. Types rendering a higher performance such as the Do 335, Ju 388, Me 163 and Me 262 will be available in larger quantities during the course of the year; only the latter aircraft will be able to put up an effective defence against the enemy air offensive. Appendix 2 gives a survey of the capacities of the present German fighter types and the potential capacities of the new types.

Internal combustion engines up to 2,500 H.P. and jet propulsion units having a thrust of 900 and 1200 kgs can be mass produced.

The old 7,9-13-15-20 and 30 m/m MG and MK guns will be used as aircraft armament; the 7,9 mm gun will be employed less frequently. As additional armament the HF 15 (high muzzle velocity) will be used for close range and will produce substantial after effects.

Non-recoiling guns such as the SG115 and SG116 with 3.0 or 7.5 ammunition have a perpendicular range of five above or below, and are valuable against aircraft at short range, but their effect must not be over estimated.

The ammunition used by all types of guns will have an increased fire and explosive effect but a reduced depth of penetration. New rocket guns, some having the effect of shrapnel, will be used, and will achieve good results if sufficient precision can be attained and range finding difficulties overcome.

The new gun sights "ZFR 5" and "EZ 42" are expected to produce a great degree of accuracy even at an increased range. This is particularly true of the EZ 42, which is equipped with an automatic deflection allowance. Blind firing equipment will be introduced in 1945.

Bombs will not alter very much; our production is limited to those of under 1,000 gs, and we still have adequate reserves of heavier bombs. Bomb-sights that will increase the chances of success of the ground strafers, and of aircraft bombing from great heights, will also be produced in 1945.

Among the special weapons we may also expect certain innovations. The recent use of the Fi 103 gives rise to hopes of success from the employment of these new weapons. During the 11 weeks of V-weapon attacks on London, considerable disruption and damage has been caused, and pressure exercised on the morale of the population. Substantial elements of the British defences have been pinned down over the target and along the path of the missiles. To a certain extent, operational units of the Allied air forces have also been used to attack the launching sites, the production centres and vehicles on which they were transported to the launching sites.

Nevertheless, although comparatively few missiles were shot down, the use of the Fi 103 cannot on the whole be said to have seriously damaged the enemy defence potential. The new weapons brought no direct advantage to

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the Luftwaffe because it proved impossible to aim at strategical targets dispersed all over Greater London, and we did not succeed in damaging the bases of the Allied air forces. On the other hand, both sides have learnt from experience that terror raids on the civilian population alone cannot have a decisive influence on the outcome of the war. An increase in the number of enemy attacks on the Reich during the period of the V-weapons proved that the enemy's freedom of action was not seriously impaired. A certain number of British and American terror raids were also made on German towns during this period as reprisals.

The production of the Fi 103's necessitated certain plants and materials which should have been used in the production of other war weapons. Furthermore each V-weapon had to be fitted out with complicated steering and compass equipment which were lost once the weapon had been fired. The transportation of the weapons and the manning of the launching sites required large forces. On the other hand the use of lower octane petrol was counter-balanced by the bottleneck in the German fuel production industry, and these weapons also represented a saving in flying and ground staff personnel.

The military situation does not justify the increase in the range of the Fi 103's to 400 kms planned for 1945 and which is to be achieved by reducing the explosive charge to 500 kgs. Only at one point in the Reich West of Duisburg is the distance to Greater London 400 kms, everywhere else it is far greater. The firing of Fi 103's from aircraft may prove initially successful, but is entirely dependent on the weather conditions and is also very vulnerable to enemy attack.

The same applies to the BV 246, with a range of only 200 kms when dropped from aircraft flying at a height of 7,000 metres. At such a height aircraft are easily picked up by enemy Radar and consequently can be intercepted with the utmost facility.

The new anti-aircraft weapons "X4", "Hs 298" and "Hs 117 H" are expected to prove particularly successful if the new fuse and navigation apparatus are ready according to schedule.

The ceiling, speed and invulnerability of the enemy's aircraft are to-day so great that our Flak has only limited chances of success. The majority of the enemy bombers now drop their bombs from 8,000 metres, the maximum altitude which the majority of our guns can reach with a reasonable possibility of success; above that height the field of effectiveness becomes so small that there is not enough time for an effective attack on the target, and this difficulty becomes still greater when the target moves at a greater speed.

The distance between the present and future positions of the target must be reckoned with because of the fuse time at these heights making it extremely difficult to follow flak predictions; the consequent dispersal of fire results in decreased accuracy.

The 8,8 cm Flak 41 and the 10,5 cm Flak 38 and 39 guns have a maximum target height of 10,000 metres, the 12,8 cm Flak 40 an altitude of 12,000 metres. Aircraft flying at over 12,000 metres can at the moment not even be touched by the German anti-aircraft guns, since the maximum range of the Kammandogerät 40 (Predictor 40) is 12,000 metres.

The invulnerability of modern aircraft demands that shells must burst at certain fixed distances from the target if they are to score an effective hit and bring down the aircraft. These distances must not exceed 7 metres for 8,8 Flak, 9 metres for 10,5 Flak, and 10 metres for 12,8 Flak. This factor places a limit on the efficacy of our A.A. batteries and necessitates a quite unattainable degree of precision.

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The majority of heavy Flak guns in use at present are 8,8 cm calibre. 7098 guns of this calibre are in operation in Reich territory as opposed to 1.489 10,5 cm calibre guns and 316 12,8 cm calibre guns. Our flak can therefore only be effective against enemy bombers up to a height of 3000 metres, although this range can in certain areas be raised to 10,000 or even 12,000 metres by a concentration of 8.8, 10.5 and 12.8 cm. calibre Flak:

The average ceiling of enemy bombers is as follows:-

Lancaster III	8,000 metres
Liberator	10,500 metres
Fortress II	11,000 metres
Mosquito IV	11,000 metres.

They can still escape our Flak by flying above these heights. Effective defence of our targets by Flak artillery is therefore technically impossible, and the occasional successes achieved by our Flak do not alter this fact.

Our attempts at raising the efficiency of our Flak artillery are directed at increasing its effective range and also the efficacy of the shells. The ballistic capacity of present day guns has reached a level which cannot be exceeded unless severe constructional difficulties are overcome, and substantially larger quantities of materials are produced. For this reason almost every country has changed over to rocket weapons. Since the latter are still in the development stage and since the necessary conversion in the armament industry takes a certain amount of time, we have tried to find a temporary solution by raising the performance of existing guns, installations and ammunition.

The 18, 36 and 37 8.8 cm Flak guns, which are the main weapons in operational use at present are to be converted as planned to achieve the same results as the 8.8 cm Flak gun. This will still not permit effective fire at over 10,000 metres.

The increased capacity of the 12.8 cm Flak 40 gun with a range of approximately 15,000 metres can not be effective as long as the Kommandogerät 40 (predictor 40) has a range of only 12,000 metres; the Kommandogerät 45 (auxiliary predictor 45) is not yet being produced in sufficient quantities. Only 20 predictors per month are to be produced in 1945, and we cannot therefore hope to attain during this year equipment with a range of more than about 10,000 metres. Above 10,000 metres there will be no effective Flak, but up to that height enemy raiders will in most areas meet a sustained barrage of concentrated fire.

The most extensive technical improvements have been introduced in our defences against low flying aircraft. The development of our medium calibre guns, and of the various types of small projectiles (Foehne) will cause the enemy to be more careful in his low flying raids, and will be of special importance for the defence of roads, troop concentrations, airfields, camps and other localized targets.

Projectils are used in anti-aircraft defence:

- (a) to put up a barrage of fire; the projectors are easily manned and both equipment and projectiles can be relatively easily produced in large quantities;
- (b) to achieve greater accuracy at greater heights and a more devastating explosive effect. The German weapons were developed along these lines, aiming at an improvement in quality. At present 4 types of projectiles are being developed. Their capacity is portrayed in Appendix 3.

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At close range blind spots appear and radio control becomes impossible. Remote control is carried out by visual and electrical plotting of the target and the projectiles. The fuse can either be set from the ground or it can be detonated by the proximity of the target (proximity fuse). No definite time limit need elapse between the firing of each successive projectile, but another guided projectile cannot be fired until its predecessor has reached its target and is freed from the radio control system.

In view of the many difficulties that must be surmounted in remote control operations, successes of the rocket batteries are small. The greater the number of projectiles fired from different batteries which converge on a given target at one time, the more difficult it is to pick up and control an individual projectile. Remote control is even more difficult than visual, because radar devices cannot separate one projectile from another when several are close together.

Our aim in projectile development is to obtain one direct hit in every two. (At the moment an average of 4,000 8,8 cm shells is needed to bring down one aircraft). Even assuming that such a high percentage of successes could be achieved, a single line of defence could never decimate an incoming wave consisting of several hundred aircraft flying in close formation. Several defence lines will therefore have to be set up behind each other.

Four such defence lines would require approximately 3,000 batteries of all types for the defence of approximately 70 towns with more than 100,000 inhabitants. These requirements would cover an approximate distance of 18,000 kms. If, instead of defending specific objectives, the whole Reich were surrounded by an anti-aircraft defence belt, approximately the same number of batteries would be needed.

The production plans (see Appendix 4) show that the introduction of projectiles in the anti-aircraft defence system in 1945 can no longer have a decisive effect. From the point of view of performance, the advantage to be gained by the introduction of anti-aircraft projectiles lies more in the increased chance of success in those altitudes which have already been considered, than in a marked extension of the effective range of our Flak.

It can be categorically asserted that the range of our ground defences will not in 1945 permit the destruction of modern bombers flying at great heights, and furthermore it is extremely improbable that any such result will be attained in the near future. This is already noticeable in the case of the B 29 which has a ceiling of approximately 15,000 metres, with a normal operational height of approximately 12,000 metres, a maximum speed of 600 kms per hour and a normal flying speed of 425 kms per hour.

Even within the maximum range of 12,500 metres, the proportion of direct hits so far achieved has been too low to enable us to describe our defences as completely efficient. Only ten rockets can be fired at a formation crossing a defence belt at a height of 12,500 metres. This means five successes, even assuming the fulfilment of the very optimistic reckoning of two rockets for one success. Even if rockets are used on a larger scale than has been planned for 1945, this will not radically alter the present position.

In conclusion it may be said that taking into account the improved performance of enemy aircraft, our ground defences will during 1945 achieve even less success than before in the heavy raids that will doubtless be carried out from great altitudes.

In this survey the new types of bombs used by the enemy (glider bombs and rocket bombs) have not been mentioned. The increased efficacy of these aircraft and bombs will, in the near future, most probably in 1945, enable the enemy to carry out large scale attacks on important objectives from an altitude altogether outside the range of our Flak artillery.

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PART C.

Deductions and requirements for the prosecution of the air-war in 1945.

I.

In spite of the present pressure exercised by the enemy's supremacy, we must achieve our objectives; this can be done by summoning all our forces and by employing them on priority missions. In planning operations it is most important to bear in mind the general outline of the campaign and not to let daily developments, which are only momentary, interfere with it.

In any appreciation of the further development of the German armament industry and of the air war, the fundamental question which always arises is that of the effect of enemy air attacks on our fuel production industry. With the extensive mechanization of the modern army, it is impossible to wage war without petrol. Enemy attacks on the fuel production industry if successful can seriously endanger or even defeat all branches of fighting forces. In May 1944 Germany had at her disposal a monthly output of 220,000 tons of aviation petrol, of which 10,000 tons were destined for Rumania. By August the enemy had reduced this production figure by 90% (25,000 tons in August) by his well planned and concentrated attacks on the German fuel depots. The total normal consumption of operational units and training units is approximately 250,000 tons a month.

The threat of destruction to the remaining production sites still remains, since the Allies have recognised the fact that the destruction of the fuel industry can prove decisive. By moving their bomber units to French bases, they have increased this threat. At this shorter range greater numbers of aircraft will be able to operate with increased bomb loads. Once those factories, which are still working at the moment are destroyed, our remaining reserves will be small. (268,544 tons on 1st August 1944). These reserves will enable the German fighting forces to operate only for a short time.

The production and building up of reserves of aviation fuel will, therefore, become the most vital factor in our war economy. The establishment of small decentralised factories, well camouflaged and reinforced or underground will have to be pushed on vigorously. Similar measures will have to be taken for the protection of the gunpowder and explosives industries in order to ensure the necessary minimum output. This includes also the manufacture of sulphuric acid for the production of acid smoke.

The disadvantage of this decentralization and division into small production centres lies in the fact that it requires a greater number of transport vehicles and that the whole process of production becomes less economical.

The above measures are, however, inevitable in the case of the most urgently needed materials, for the following reasons:

- (a) Active methods of defence alone cannot provide adequate protection.
- (b) Concentrated attacks with bombs of a great depth of penetration will again jeopardise the production in large concerns even those which have been reinforced or moved underground.

Furthermore, the ore supplies for German industry from Norway, supplemented by deliveries from Sweden, are of primary importance.

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The loss of other supply areas limits the production basis of steel and light metals even further. To make the fullest use of all such production concerns and to store any unused products in the Reich is a necessity as long as the possibility of the total loss of these concerns remains.

Other important industries need not be specially mentioned as they are all equally necessary for the production of aircraft parts and equipment.

Only three large concerns producing synthetic rubber are worth noting. So far they have been immune from enemy attacks but this is no guarantee that they will continue to be so in the future. Their production output must therefore exceed the present consumption so that reserves can be built up and the sites must be heavily protected by active and passive defence measures. The safeguarding of the synthetic rubber production is all the more important as it is most unlikely that blockade runners will succeed in importing any more natural rubber.

Passive defence measures must be increased in all branches of the air armament industry. This can be made easier by extensive use of home-workers, by camouflaging the sites and by making use of smoke screens. The disadvantages of a lower production output and of a greater use of transport vehicles caused by the decentralization can be compensated by increased manpower. The labour at our disposal is not at the moment being fully utilised in all branches of industry, because production has been held up through lack of materials. Subterfuges are often resorted to, in order to keep up the appearance of being busy - a state of affairs which can be remedied by efficient direction and supervision.

The question of foreign labour is more difficult to solve. Influenced by the events of the war and by propaganda rumours, they will be even more inclined to sabotage and may even become a real danger in the very heart of the Reich. We shall not have enough forces to keep the millions of foreign workers in order if the country is going to lose any more of its young men fit for military service. Stricter supervision by the recognised authorities is essential. Not only the military authorities but all concerns employing foreign labour are to take all necessary measures for the suppression of revolts.

II.

The situation on the ground has reached a point where any further deterioration would jeopardise the successful prosecution of the war. Nevertheless, the following eventualities must be borne in mind:

In the West the front line might possibly run along the Rhine between the Swiss and Dutch frontiers, North West of the Ruhr along and West of the German Dutch frontier.

In the North it is assumed that Denmark and at least South and Central Norway will remain in our hands till the spring of 1945.

In the East the line Wisloka or Dunajec-Vistula-Modlin-Rastenburg-Kurisches Haff may be held.

In the South-East, the valleys of the Save, Drina and Theiss rivers, together with Trieste, Agram, Belgrade and the Western Carpathians East of the Theiss constitute an area in which we must fight victoriously.

In the South we must hold the Alps.

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The fulfilment of the minimum requirements mentioned above represent the military and economic conditions essential for a continuation of the war as a whole and, in particular, of the war in the air. The need for an expansion of our economic sphere and our strategic bases is fully recognised, but this cannot be achieved with the forces and materials at our disposal in 1945.

New difficulties have also arisen for the air defence of the Reich through the development of the situation on the ground and through the shrinking of the forward areas. Having regard to the present state of our forces, it is hardly likely that the German High Command will, in 1945, aim at destroying or occupying the enemy air bases which form a concentrated ring around the Reich territory.

III.

Following the events of the summer of 1944, the defence of the Reich territory against enemy air attacks has acquired an importance for the final outcome of the war, greater than ever before during the entire course of the war. Through the loss of large and industrially important areas, which Germany had acquired at the outbreak of hostilities and adapted to her war industry and war economy, the German war potential itself has been reduced and even slight damage inflicted on it is a grave matter. It follows automatically that the opportunities for decentralization and dispersal of industry have become smaller and an unwelcome concentration of industries in certain areas has arisen (i.e. the Ruhr, Upper Silesia) which in turn increases the vulnerability of the German armament industry to air attack. Apart from this the enemy is establishing air bases nearer and nearer to the Reich territory in the West, East, South and possibly even in the North which will soon make heavy shuttle raids the general rule.

Again and again the enemy has shown that he has learnt to carry out his attacks in a concentrated form always on those targets which are of primary importance at any given phase of the war. He concentrates his attacks on the German tank or fighter industry, or he will direct them against water works and at the same time carry out "terror" raids on residential areas and communication-centres. Since our territory has been reduced and the enemy can concentrate his forces in a smaller area, he will be in a position to intensify and develop this system of attack.

Particularly during the present phase of the war everything depends on Germany being in a position to continue her war production unhindered, especially the production of certain all-important specialised weapons. It is the task of the anti-aircraft defences to safeguard the present and future production.

The problem of air defence can fundamentally be solved either by strict adherence to purely defensive measures or by certain offensive actions with an indirect effect on the defence. A country with an unlimited armament capacity will find the ideal solution in a combination of the two. Germany's present position with her shortage of means and materials, however, demands a clear and considered decision as to how the armament production should be fitted into the general scheme of air defence.

Should Germany, therefore, now wage an offensive or a defensive war in the air?

1) The offensive.

A defence which expresses itself in offensive operations could not

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only provide an opposition to enemy air forces and their ground organization and industry but also a means of attack against the shipping which brings up supplies for the Army.

Under the present circumstances it is, however, unlikely that an offensive against the enemy ground organization would prove successful, as we could not penetrate sufficiently deeply into enemy territory.

Attacks on enemy airfields would have to be carried out by great numbers of bombers with superior flying speeds or under strong fighter escort. As a sufficient number of fighters is not available for these missions, they could only be carried out by jet propelled bombers. In view of the small bomb-load of this type of aircraft, however, it would be possible only to a limited degree, to carry out concentrated attacks, using numerous light bombs, on large airfields and their dispersal points. The enemy's losses would be only slight. Even small numbers of long-range night fighters could, however, cause considerable interference to the enemy night raids.

The sinking of enemy shipping, especially tankers, would possibly be more effective. All the enemy's supply routes to Great Britain and France are on the seas. The sinking of a medium-sized transport vessel would mean a considerable loss to the enemy, since even a small amount of shipping space usually contains substantial quantities of valuable supplies.

Because of the heavy opposition, even attacks on shipping could only be carried out by jet-propelled aircraft with superiority in speed. Single-seater aircraft are, however, unsuitable for attacks over the Atlantic owing to the frequency of bad weather conditions. The enemy supply traffic in the Channel, on the other hand, lies well within the effective range of jet-propelled bombers. Should the enemy, however, suffer substantial shipping losses in the Channel, he could divert his supplies to the ports in Southern France, thus withdrawing them again out of range of our single-seater aircraft.

With the forces now at our disposal, an operational air offensive, such as our enemies are engaged in, seems to be out of the question, even though individual successes could be achieved. Here the use of airborne V-weapons will be unavoidable.

2) The defensive.

It is quite certain that the enemy is at present suffering only very slight losses at the hands of our fighters, and that this state of affairs will continue in 1945. At the same time, our day fighters are suffering comparatively high losses, and in spite of the high cost of their operations, are the chief users of the small remaining quantities of aircraft fuel. The cause of this obviously ineffective and uneconomical procedure is the great shortage of aircraft, which is unlikely to be remedied in the near future, even if the aircraft industry is still functioning, unless fuel production can keep pace with it.

In July approximately 25,000 enemy aircraft made daylight attacks on the Reich. Our day fighters achieved 347 victories, that is 1.4% of the total number of aircraft. As opposed to this, 2,575 of our own day fighters operated over enemy territory, losing 321 aircraft, or 12.5% of the total number.

If the enemy met no fighter opposition at all, he would intensify his attacks still further, throw his night bombers also into day light attacks and obtain improved results by dropping his bomb loads from more favourable heights. The losses among incoming and homing formations would decrease considerably the offensive spirit of crews would be boosted,

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The consequent increase in the efficacy of enemy air attacks would definitely hinder the rebuilding of our fuel and armament industries, increase our losses in personnel, and lower the morale of the civilian population.

In conclusion, it may be said that the present enemy air offensive can in no way be checked by the small numbers of bomber units at our disposal. On the other hand, long range night fighters used in offensive operations within the sphere of the fighter defence, promise a certain degree of success which must not be underestimated. Such operations lie altogether within our defensive scope.

Bomber operations, however, would be nothing but a waste of forces, and might even disrupt the whole plan of the campaign. In spite of the present weakness of our defences, it would be impossible to weaken still further the intensity of the fighter opposition by diverting fuel supplies and employing new types of fighters as escort in bomber operations to any great extent.

These weaknesses can be remedied in 1945 by other means but only if we summon all our resources. The German High Command will have to make it its aim to build up our defensive strategy with every means at its disposal.

Fighters, Flak artillery, air barrages and passive air raid protection must all aid in the task. The use of a smoke screen (over the entire Reich) will permit the transition from active to passive opposition.

Anti-aircraft guns, including rockets, will in 1945 still not be able to put up a barrage above 10,000 metres. But even below this level, and even if the rate of victories were doubled, it would only represent 2%. At the moment the enemy bomber formations operate in an average height of 6,000 metres, and thus take little advantage of the maximum altitudes of which they are technically capable. In spite of this, the Flak artillery achieves a very low rate of victories, which will decrease still further should the enemy take advantage of the higher altitudes.

As the bombers remain only a very short time over the target area, we must endeavour to break up the formations, and achieve our victories along their incoming and return routes. These problems and that of achieving supremacy at altitudes above 10,000 metres can only be solved by a strong fighter force. This still leaves a gap in the defences during bad weather conditions which will have to be removed by technical improvement of our fighters.

Between May and July 1944, the German day fighters shot down on an average 2% of the total of enemy aircraft which had entered the Reich. In day time the number of victories achieved by fighters was about double that achieved by anti-aircraft batteries. (8% were shot down during the same period by night fighters). Here it must be remembered that this result was achieved by an average of 150 fighters, who were often outnumbered by 5 or 6 to 1 by the enemy fighters alone.

Approximately 300 fighters were ready for operational use in the defence of the Reich. They were supplemented by about 9,000 heavy and 12,000 light anti-aircraft guns which shot down approximately 1% of the enemy aircraft. This low percentage is due to the fact that only a small fraction of the entire ground defences can actually operate in any single raid.

It is possible to estimate to what extent a stronger fighter defence could raise the percentage of victories. Apart from this, it should be stressed that any increase in our forces reduces our numerical inferiority and thereby increases the chances of success.

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Only with a strong fighter force can we break the enemy's air supremacy, and safeguard our fuel production. Only then can the further conditions necessary for the rebuilding and utilising of our bomber units, that is for a resumption of an offensive warfare prevail. As soon as fuel production has been safeguarded, the full mobility of all the fighting services will at long last be restored.

A basic output of petrol for the air defence will have to be maintained at all costs. This can be achieved by the following means:

- 1) By concentrating the day and night fighters in the defence of vital water works, at the cost of weakening our defences against attacks on other targets.
- 2) By concentrating the Flak artillery in the defence of fuel depots at the cost of diverting it from less important objectives. Small objectives can often be evacuated or rebuilt, a fact which reduces the urgency of their protection.

Active weapons of defence must be reserved for the protection of plants producing whatever aircraft parts are most vital at any given time, and whose protection by passive means is inadequate.

Quite apart from industrial production, the economic resources of the Reich as far as food stuffs, transport, raw materials or any other economic factor are concerned, have been greatly reduced, and such a heavy strain placed on them that any further encroachment may be disastrous. Nevertheless, a concentration of all the active weapons of defence round a few objectives, is preferable to their dispersal over many production sites.

Apart from these material factors, without unbroken morale and the spirit of resistance in the hearts of the German people, Germany could not continue the war. However wonderful the powers of endurance of the population have been up to now, it would be unwise to try them indefinitely. To be shown utterly helpless in the face of enemy air attacks would at the very least have a depressing effect. Considering the already considerable nervous strain imposed by the present phase of the war, it is essential to remember these factors, and our air defences must therefore also endeavour to reduce the scale of the terror raids or to prevent them altogether.

In strengthening the fighter forces destined for the defence of the Reich by the concentration of all available forces, we must also consider to what extent the land fronts can be deprived of fighter cover.

The army units cannot for long operate successfully without air support even when they are on the defensive. A strong concentration of Flak against the bulk of the attacking forces and passive precautionary and camouflage measures can however provide partial relief and reduce to a certain extent the effect of the attack.

These measures alone are however insufficient to bring about numerical equality of supremacy for our forces, and to provide the necessary conditions which would enable operational missions, troop movements and provisioning of our land forces to be carried out by our bomber formations.

The enemy has achieved his successes on all fronts because of his overwhelming material resources, and especially his air supremacy. This latter was instrumental in impeding our reconnaissance missions, smashing our spearheads and their bases, destroying all signals communications and interfering with every kind of traffic by day, both in the battle area and behind the front. The Flak units engaged in anti-aircraft defence were

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either put out of action on their sites by the enemy land artillery or the hostile aircraft soon after they had opened fire; or alternatively could not be fully used because of the shortage of ammunition due to enemy air attacks.

As the events in Normandy have proved, the withdrawal of all fighters from the front leads to its collapse. This means a territorial gain for the enemy without wear and tear on his forces, while once the fronts have collapsed, we the defenders face the danger of a threat to or loss of areas and supply lines which, although surrounded by every type of defence against air attacks, can be overrun by the Allied armies.

This knowledge forces us to decide whether and how many fighter units can and must be transferred from the defence of the Reich territory to support the armies. Owing to the weakness of our fighter forces there is no permanent solution to this problem. The division of existing forces to satisfy both demands will only lead to defeats on both fronts.

We must therefore aim at keeping the bulk of our fighter defences in the rear areas to meet a potential operational break through on the front, while at the same time summoning all other available forces for the protection of the Army.

The operations of the Army, whether offensive or defensive, require reconnaissance and ground strafers support. The numbers and operational readiness of such units must therefore be kept at their present level. Their maintenance has indirectly a bearing on the defence of the Reich and its production capacity.

The fighter units which are at the moment being used to escort the Ju 87 formations can be released as soon as the situation on the ground and the fuel supplies permit their conversion on to the Fw 190. They will then in the near future be able, and on the Eastern Front as well, to deliver their attacks without fighter escort. Not until the fighter units on all other fronts have been reinforced, will ground strafers be able to operate on the Eastern front to relieve and support the land forces there. The material and moral effect of our air operations on the fighting spirit of the German Army cannot be underestimated.

IV.

When the air war is being waged exclusively on defensive lines, the aircraft industry must concentrate all its forces on the production of day and night fighters.

Development and trials must be carried out on a broad basis, and extend to all promising new types of aircraft, weapons and instruments, even if they are not intended for immediate operational use. Any saving in personnel and raw materials achieved by false economy would be completely outweighed by the loss of precious time.

Production must be limited exclusively to the manufacture of aircraft and weapons for defence against day and night raids. Output must on no account be reduced even when the fuel supplies do not permit of immediate operational employment. The most effective weapons for the defence of the Reich are fighters converted to jet-propulsion aircraft, enabling them to operate successfully even in heavily defended areas. Such fighters are destined primarily for defence in medium and high altitudes; the lower altitudes will mainly be defended by Flak. Jet-propelled aircraft operate exclusively by day, and preferably in high and very high altitudes.

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According to enemy reports in our hands, it has been proved that the development of the enemy's jet-propelled fighters has reached approximately the same standard as our own. It is therefore important to equip units with this type of aircraft, so as to be the first in the field with sufficient numbers of this new weapon.

To adhere to this policy, all Me 262 and Do 335 must be used as fighter planes. These aircraft could be used as bombers or ground strafers on all fronts and would ease the land situation considerably, this would however entail the disposal of our forces and the weakening of the strategically vital defence of the Reich.

Comparing the standard reached in the development of jet-propelled fighters by both sides, our own aircraft may at first be expected to attain numerical supremacy over the Reich. Owing to its short range, the enemy will at first not be able to use this type of fighter on escort missions.

Our aircraft production programme plans an establishment of 3,000 fighters by the beginning of 1945, increasing to 4,000 later in the year. The quantity of aircraft fuel to be produced within the next few months, will permit fuel to be assigned to other types of aircraft only after the demands of the fighters have been met.

Day fighters must fulfil the following conditions:-

- 1) Their speed must exceed that of all hostile aircraft including the fighters. One type of aircraft alone cannot achieve this in all altitudes. High altitude fighters (over 12 kms) and types of aircraft with a maximum capacity of approximately 8 kms are required.
- 2) Our own fighters must have a greater climbing capacity than the enemy's.
- 3) Manoeuvrability takes second place to all other qualities.

The He 219 and Do 217 are no longer produced as night fighters; the former is a mere makeshift opponent for Mosquitoes. We thus possess no aircraft capable of opposing the Mosquito.

Night fighters must be further developed until they achieve record speeds, climbing capacities, ceilings, and a maximum flying time of at least 5 hours. The improved Ju 88's which are planned to be ready for operations by the beginning of 1945 will partly fulfil these requirements. The new night fighter type Ju 388 J, which should be ready by the middle of 1945, will also be successful against enemy planes taking evasive action into greater altitudes (between the heights of 11,000 and 14,000 metres it has a speed of approximately 600 km per hour.)

As it seems certain that the enemy will intensify his Mosquito attacks by night, the Do 335 which is at the moment being converted into a two-seater aircraft will be valuable even with its present speed (approximately 720 kms at 9000 metres). To enable these new types to achieve their deserved success, technical improvements in Radar, de-icing equipment, bombsights, front guns, lateral armament and blind flying instruments will be necessary.

As regards the ground strafers, the Fw.190 is already of no greater operational value in the West, than the Ju.87 in the East, and therefore requires a strong fighter escort which has to be provided out of the fighter forces engaged in air defence.

The General commanding the ground strafers units is therefore demanding Do 335's as new types of ground strafers aircraft. It is however to be expected that even this type will in the near future again be inferior to

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the newly developed enemy fighter types.

Steady development of ground strafers fighters seems to be impossible under present production conditions, and it therefore appears desirable to equip these aircraft exclusively for operations over the front affording them special protection from hostile fire. A strong fighter force will have to provide air supremacy in the areas in which ground strafers operate.

Generally speaking, it is best to develop aircraft for a specialised type of combat, and then to use all available resources in a co-ordinated attack. A multipurpose aircraft with varied operational possibilities will always be inferior to a specialised aircraft on its own ground.

All aircraft must be capable of taking off and landing even in unfavourable weather conditions, and must be fitted out with de-icing equipment.

Our air armament must concentrate on attaining accuracy at a range of 1,000 metres and over, and the 15,20 and 30 m/m guns which have proved themselves useful in the past will continue to be used. The results achieved by rocket projectiles are unreliable and decrease the aircraft carrying capacity, they require great precision as only a small number can be carried on board and travel at low speed.

In the case of the specialised fighter weapons X 4, Hs 298 and Hs 117 H, conditions are different. These will be fitted out with control devices and distance fuses, and are expected to achieve victories from the most varied firing positions and ranges. The conversion of all aircraft to armament of this type will be considered as soon as the control and fuse apparatus has been perfected. The bombs and special weapons for attacks on shipping and tanks can be kept back until there are aircraft available for this type of operation.

Like every other weapon, Radar, the essential factor in day and night fighting, can be countered by various means. Window operations and jamming are the principal countermeasures in use; the effectiveness of jamming depends on its intensity.

If ground D/F instruments are to be further developed to give a complete picture of the air situation, the following possibilities must be taken into account:-

1. Incoming formations flying at greater and very great altitudes,
2. Use of very fast and high flying aircraft (jet propelled) whereby the control (plotting station) may encounter difficulties. The development of the airborne Radar equipment must concentrate on the improvement and further development of airborne detection apparatus, homing beams and blind shooting instruments.

Single seater fighters require an immediate improvement in their control system and there is an urgent need for easily operated navigation and landing equipment. The following requirements must be met:

1. A Radar scanner with a range independent of the flying height.
2. Accurate homing beam in all weather conditions by day and by night.
3. Interference-free Transmission of orders.
4. Night flying instruments and instruments to keep aircraft flying in formation, to enable any number of following aircraft to fly behind the leader, and navigation by this beam until the target comes within visual range.

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Development in the field of navigational and flying accuracy must aim at introducing an aircraft navigational system which can be easily understood and operated by pilots of single seater aircraft. The further development of the automatic pilot for day and night fighters is equally essential. Radar will also prove a successful means of air defence, and its continued development on a centimeter basis is therefore necessary.

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PART D

Conclusions and future prospects.

England is an example of how a strong opposition can force the attacker to reduce the scale of his attacks or even to stop them altogether; this is only possible when he is unable to send up reinforcements and when his losses in personnel and materials exceed his supplies. A strong fighter force which could shoot down 20% of each attacking bomber formation, would have such a decisive influence that even our Western enemy would no longer consider it worth while to sacrifice his most valuable attacking weapon in such a risky enterprise.

In the present phase of the war we must endeavour to achieve what England achieved in 1940.

The capacity of our aircraft and fuel industries having been reduced by enemy action and by dispersal, it is now essential that we throw all our resources into the defence against enemy air attacks over the Reich and into the support of the land troops who are engaged in bitter fighting. A certain concession in this respect is only to be made in favour of the reconnaissance and ground attack units, which, in the present critical phase of the land battles, have to remain in action at all cost. The petrol needed for these operations is relatively little.

So long as defensive fighting alone cannot be expected to wear down the enemy forces sufficiently to force him to surrender, the war can only be brought to a satisfactory conclusion if we take the offensive. This applies especially to the war in the air, which fundamentally always puts the defence at a disadvantage. The present air situation however demands that all our resources be thrown into the defence against the enemy air offensive.

To wage an offensive war against the enemy air force or against his supply routes on the seas, does not, at the moment, appear to be the most promising or the most practicable solution. The aircraft most suited to such an offensive are not available in sufficient numbers. The higher rate of losses in personnel and materials as well as an increased fuel consumption, both of which would be inevitable, would be too heavy for our present resources.

Should we succeed, by summoning all the resources at our disposal, in reestablishing our air supremacy over our own territory, and in raising the total output of our industries, especially the fuel production industry, we should then have fulfilled the primary conditions, which would permit a new operational air offensive. In order to be prepared for such an eventuality, it is essential to keep up skeleton bomber units and to continue the further development of bomber aircraft in the light of the experience gained from previous operations. This will provide the necessary means in personnel, materials and tactics for a later air offensive which will decide the outcome of the war. The enemy's complete dependence on his overseas supply routes will continue to be the starting point for our air offensive. The dislocation of sea traffic will then be the exclusive aim of our U-boats and air force. Their aim will be to sink all enemy merchant vessels, in particular, tankers, in order to paralyse the enemy air forces.

It will be necessary, therefore even during the period of strategic defence, to set up and train strong combat forces, and to improve their equipment in preparation for the battle against enemy merchant shippings. The need for a suitable base (the French Atlantic coast) must be considered in the light of the conduct of the war as a whole.

The preparation of all other means which will enable the air force to fight a battle for a considerable length of time without its strength diminishing, and the establishment of some organization which will provide the fullest opportunities for combined operations of the navy and the air force, are essential conditions for the successful conduct of such operations.

Experience has shown that this battle cannot be left to the Navy alone. There are periods when a reinforcement in the enemy defences makes U-boat
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attacks no longer worth while. Only the use of the air arm at sea, can again give the U-boats opportunities for effective action in the Atlantic. Given sufficient and suitable forces at her disposal, it is, above all, the air force which is in a position to deliver the fatal blow to the very roots of the enemy's power of resistance. The results, which also apply indirectly to the air defence of the Reich, are obvious:-

1. The enemy must divert large units of his air and sea forces to counter our offensive.
2. The production capacity of the enemy's armament industry is considerably reduced by the loss of shipping.
3. The enemy's war economy, as well as supplies for Great Britain, become disrupted,
4. The enemy's operational air and invasion bases will be cut off from all supplies.

Both the enemy's and our own experiences prove that a land offensive can be undertaken only when the basic conditions for air warfare are fulfilled, so that reconnaissance aircraft, ground attack, fighter and bomber units can all give the Army strong support.

Our momentary numerical inferiority can be balanced by the introduction of new types of effective weapons. We must not, however, overlook the fact that even with weapons of a superior quality the defeat of a numerically superior enemy requires a certain length of time during which the enemy has again ample opportunity to prepare effective counter measures or to produce similar weapons. The moment at which such new types of weapons are to be used for the first time must therefore be carefully planned by the High Command, due regard being had to the initially slow rise in the production of such weapons.

In 1945 special attention will be paid to the development of the following new measures:

- (a) Jet or rocket-propelled fighters,
- (b) Bomb sights, gunnery and attacking methods which will increase the effective range of fighter aircraft against air targets, particularly bombers,
- (c) self-propelled projectiles (rockets) and remote control instruments, automatic target detectors or proximity fuses for use against air targets by fighters and Flak,
- (d) ammunition with an increased fire efficacy or depth of penetration,
- (e) all instruments and methods for the non-visual detecting, locating and shooting-down of air targets.

None of these new instruments must be used operationally until a certain minimum output has been reached and their further production has been assured. They must also have reached a stage in their technical development where they function perfectly. To bring out a new weapon before it has been produced in sufficient quantities or before it is perfected, is always an error, which must not be made even in the face of marked enemy superiority. Numerous examples during the past years have shown that such a course of action not only does not achieve success, but it also causes disadvantages.

These new types of weapon may possibly be used operationally as a substitute for attacks by aircraft. The potentialities of such attacks depend on the range, accuracy and efficacy of the weapon.

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To bring about a decisive change in the present war situation, especially in the air, by the use of long range weapons, it is essential to maintain their present explosive capacity while at the same time increasing their range and accuracy; we must also succeed in using the weapons in a concentrated and continuous effort. Only then could such a weapon alleviate the heavy tasks of the operational units of the G.A.F. in their battle against the British Isles or in similar theatres of war.

It must, however, be pointed out that as far as the V-weapon activities have been planned for 1945, they will not bring about a change in the air situation or in the war situation as a whole. Even assuming that they can be kept up during the coming year, they will only pin down a small number of enemy aircraft, which are in any case unsuitable for strategic warfare, without breaking the enemy resistance. In other theatres of war it is equally unlikely that the various types of V-weapons will have a decisive effect.

With regard to the scope of the technical development of long range projectiles, the question arises whether in 1945 air attacks will still be carried out on the Reich territory with present day methods. It is quite probable that the enemy will be able to use new types of weapons himself, thereby confronting our air defences with entirely new problems.

We must count on the probability that the enemy is in a position to develop similar projectiles out of the parts of the V-weapons which have fallen into his hands, to improve these from his previous experience and, supported by his industrial superiority, to put them into operation in a concentrated form.

The German defence will have to adapt itself to meet such an eventuality.

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APPENDIX 1

Development of British and American aircraft during 1945.

From the point of view of engine development, 1945 will it is expected be marked by the introduction of the 36 litre Griffon engine, which can raise the maximum speed of the Spitfire XIV to 720 km. per hour at a height of $8\frac{1}{2}$ km., and the service ceiling to over 13 km.

With this engine, the Mustang can achieve a maximum speed of about 470 km. per hour at 8 - 9 km. and a service ceiling of 13 km. The performance of an improved aircraft of the Thunderbolt type should attain a normal range of speed of about 700 km. per hour with a more powerful engine.

Although we are unable to give further details, the highest performances are to be expected with the Sabre VI engine. The Tempest should achieve a maximum speed of 760 - 780 km. per hour and a service ceiling of $12\frac{1}{2}$ km. with an armament of two 4 cm. and two 2 cm. guns.

The use of single jet-fighters, whose speeds are assessed at 850 km. per hour, can be reckoned with towards the end of this year.

Concerning the development of single seat fighters, it can be said that:

- (1) A further specialisation in types of fighters, ground strafers and fighter-bombers for different altitudes is very probable.
- (2) Maximum speeds of fighters are assessed at up to 760 km. per hour at altitudes of approximately 9 km. With jet-fighters, a speed of 850 km. per hour will be attained.
- (3) Service ceiling will be approximately 13 km.
- (4) The maximum speed of ground strafers must be assessed at about 600 km. per hour when flying at low level.
- (5) Even if the main armament continues to be the heavy machine gun and 20 mm. cannon, the occasional use of cannons up to 40 mm. must be reckoned with.
- (6) The increased introduction of gyroscopic controlled gun-sights is likely, raising the effective range of fire to approximately 500 m.
- (7) Additional bomb loads of about three 450 kg. bombs will be carried for distances up to 400 km., and up to 450 kg. for distances of about 700 km.
- (8) An increase in the range of escort fighters is not considered possible.
- (9) Pressurecabins may come into operational use.
- (10) With the introduction of the automatic pilot, the use of special navigation and W/T equipment is not considered likely.

Developments in bomber aircraft up to the end of 1945 will produce the following results:-

(a) Maximum speeds:

British aircraft:- up to 500 km. per hour at an altitude of 7 km.
American aircraft:- up to 600 km. per hour at an altitude of 9 km.

(b) Operational heights:

British aircraft:- 7 - 8 km.
American aircraft:- 10 - 12 km. (with Pressure-cabins)

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APPENDIX 2.

Performance of German fighter aircraft.

Type	Speed at Altitude (km. per hr.) (km.)	Service ceiling (km.)
(a) Modified types:		
Me. 109H (High altitude fighter)	710 at 8.	14
Fw. 190 D-9 (Low and medium altitudes)	650 at 6.	10
Fw. 190 D-11 (Medium altitudes)	660 at 6. 700 at 10.	13
(b) New types:		
Ta. 152C (Medium altitudes)	-	-
Ta. 152H (High altitude fighter)	690 at 10.	13
Do. 335	800 at 9.	12
Me. 262	Jet fighter	
Me. 163	Jet fighter	
Ju. 388 J-2	520 at 8. 610 at 14.	14

See Appendix I for comparison with performance of enemy bomber and fighter aircraft.

(c) Service ceilings:

British aircraft:- 10 km.
 American aircraft:- 15 km.

(d) Likely additional bomb loads:-

British aircraft:- 7 tons (metric)
 American aircraft:- 9 tons (")

(e) Armament:-

British aircraft:- transition to heavy machine guns, 2 cm. cannons (unlikely).
 American aircraft:- heavy machine guns, 2-4 cm. cannons already in use. Introduction of gyroscopic controlled gun-sights.

(f) Take-off weights:-

British aircraft:- 30 - 35 tons (metric)
 American aircraft:- 45 - 50 tons (")

As regards new bomber aircraft, only the use of the B.29 and the B.32 is to be expected up to the end of 1945. Jet-bombers are not being built.

The following improvements in enemy bombers are to be expected in 1945:-

- (1) Strengthened escort protection by day and night.
- (2) Intensified attacks in bad weather conditions.
- (3) Increased operational heights.
- (4) Increased cruising speed.
- (5) Improved and heavier armament.
- (6) Improved warning devices.

The numerous possible uses of the Mosquito as a long-range fighter, long-range fighter-bomber, night-fighter, sea reconnaissance aircraft, photo-reconnaissance, training and communications aircraft justify a special consideration of this type. The maximum speed of the Mosquito is expected to reach about 700 km. per hour at an altitude of $8\frac{1}{2}$ km. with the installation of Griffon engines.

Of the estimated total output of aircraft of the British Empire, the total of fighters will not exceed 1,600 aircraft per month. To this should be added a total of approximately 1,200 bombers monthly.

As regards British S.E. aircraft, it is calculated that the Albacore will become obsolete in 1945. Of the T.E. bombers, the Blenheim is expected to become obsolete in 1945, and also the Stirling (4-engined).

Of the estimated total output of American aircraft for 1945 a total of at the most 3,500 bombers monthly is to be expected. To this must be added a further total of approximately 2,000 aircraft to include fighters, transport, communication and training aircraft.

An increase in the production of B.32 bombers is considered probable. The output of the P.60, P.72, P.52 and Aerocomet is expected to rise, and that of the P.47 and P.70 to decrease.

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APPENDIX 3

Performance of German Flak projectiles

Type	Calibre	Explosive charge	Speed at Target	Burning time of propellant	Effective range with height
WASSERFALL	880 mm.	100 kg.	400 m. per sec.	45 secs.	12,500 m. without E. A. 23,000 m. with E. A. 14,700 m.
ENZIAN	850 mm.	550 kg.	250 m. per sec. (app.)	70 secs. (approx.)	12,500 m. without E. A. 10,000 m. with E. A. 16,000 m.
SCHMETTERLING	350 mm.	23 kg.	210 m. per sec.	50 secs. (approx.)	10,000 m. without E. A. 7,500 m. with E. A. 6,600 m.
RHEINTOCHTER	550 mm.	100-150 kg.	270 m. per sec. (app.)	30 secs. (approx.)	7,500 m. without E. A. 5,600 m. with E. A. 3,400 m.

N.B. E.A. = evasive action.

Number of Hits

Type	Target height	Without E. A.		With E. A.	
		Approaching Target	Passing Target	Approaching Target	Passing Target
WASSERFALL	12,500 m.	6	5	4	3
ENZIAN	Figures not yet established; correspond approximately to those for Wasserfall.				
SCHMETTERLING	5,000 m. (7,500 m.)	5 (4)	5 (-)	5 (4)	4 (-)
RHEINTOCHTER	5,000 m. (7,500 m.)	4 (2)	- (-)	4 (2)	- (-)

The maximum vertical ranges of the Flak projectiles are as follows:-

- WASSERFALL 18,000 m.
- ENZIAN 13,400 m.
- SCHMETTERLING 10,500 m.
- RHEINTOCHTER 9,000 m.

TRANSLATOR'S NOTE

The above figures appear to be inaccurate according to research, but they are given exactly as in the German text.

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APPENDIX 4.

Estimated output figures of Flak projectiles in 1945.

The introduction of the "Schmetterling" projectile during the course of 1945 is considered certain, and that of the "Wasserfall" towards the middle of the year is considered probable. Plans for the formation of rocket batteries provide for 70 "Schmetterling" and 20 "Wasserfall" batteries up to the end of December, 1945. From April 1945; the production of "Schmetterling" projectiles should be 100 per month at first, and from July 1945, that of "Wasserfall" projectiles should be 50 per month at first, by December 1945, a production of 2,050 "Schmetterling" and 900 "Wasserfall" projectiles per month should be achieved.

Only the "Wasserfall" projectile can be employed for heights over 10,000 m; according to present plans, one battery should be available in July, 1945, and 20 in December, 1945.