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A STUDY OF BRITISH AIR DEFENCES

RESTRICTED

TRANSLATED BY
AIR MINISTRY, A.H.B.6.
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What were the reasons for Britain's being in a position to repel the German air-raids at first by day, and later by night?

Introduction

After the victorious conclusion on June 25, 1940 of the campaign against France, it was the intention of the German General Staff to force a swift defeat on the British by a landing on the mainland of Britain.

Despite the fact that, because of England's insular position, the operations that followed met with greater difficulties than on the Continent, the strategic setting of targets was the same as in the previous campaigns. In their attack, the aim of the Luftwaffe was above all to crush the Royal Air Force.

As long as Britain, protected by her Navy, was able to supplement and even to reinforce her power from overseas, the geo-political principle of the protective power of an insular position remained valid; as a sea-power, Britain could only be defeated at sea.

But to do this, the German naval forces were inadequate. In the first World War Germany possessed a strong fleet in a bad geo-political position, but now the German High Command had a favourable strategical position, but without the fleet.

Thus, the only possibility open was to get the British bases into German hands.

In these circumstances, the German High Command had to decide to attack the British mainland; for this purpose, they had first to achieve air superiority. At the time, the Luftwaffe was superior to the Royal Air Force, and its striking-power had been proved in three campaigns.

I.

Survey of the Operations

Concentrated for the air offensive planned against Britain were :

In Norway and Denmark	: Luftflotte 5 with Fliegerkorps X.
In Holland, Belgium, and Northern France	: Luftflotte 2 with Fliegerkorps I and II, the 9th. Fliegerdivision, Jagdführer 2, and the Night fighter Division.
In other parts of France	: Luftflotte 3 with Fliegerkorps IV, V, and VIII, and Jagdführer 3.

According to the order dated August 2, 1940, preparations were to be concluded by August 5, so that from August 6 the attacking Luftflotten 2 and 3 could deal a strong initial blow. The order to attack was to be given by the key-word, "Eagle Day".

The landing was planned for four weeks after the beginning of the air war. According to the plans evolved for this operation (cover-name "Sealion"), the 6th and 9th Armies were to cross to various positions on the south and south-east coast of England, with their main attack between Dover and the Isle of Wight.

To carry out the preliminary air operations, Reichsmarschall Goering had assigned to Luftflotten 2 and 3 the task of gaining air superiority in the southern area of England by combat against:

- 1.) The Royal Air Force, in particular fighters in the air and on the ground,

- 2.) The airfield bases and supply installations of the Royal Air Force, particularly those of the night fighter formations.

Luftflotte 5 was to begin its attack on the Royal Air Force and the aircraft industry in the Newcastle area on the afternoon of "Eagle Day +1".

The German Command hoped to be able to defeat the enemy fighter defence in the southern area in four days. Then, the air offensive was to be brought forward over the line from King's Lynn - Leicester into the North of England.

When on August 12, an improvement in the weather was expected because of the advance of a belt of high pressure from the Azores, the Commander-in-Chief of the Luftwaffe announced the key-word "Eagle Day" for about August 13.

The first large-scale attack (1) extended to about 30 airfields and some industrial installations.

Up to August 17, the Luftwaffe's attacks had taken in a total of 44 airfields, of which 11 had been permanently destroyed (2), 12 severely (3), and 21 partly (4) damaged.

In the area south of the line from London-Gloucester, some 40 airfields which seemed suitable as fighter bases were at the disposal of the Royal Air Force. Of these 40 airfields, some 15 were destroyed or severely damaged.

Thus a breach was driven into the ground organisation of the British fighters. The remaining airfields might for a time suffice for British fighter operations, but their position probably hindered their operational potentiality.

In the meantime, the battle against the British fighters became ever more violent, without any decisive result.

When on August 26, 1940 Berlin had had its first British air-raid, in which residential areas of the capital had borne the main brunt of the attack, the Fuehrer in his speech of September 4, announced imminent reprisals. A few days later, on September 7, the large-scale attacks on London began.

At the same time, the struggle for air superiority switched to the armament industry, which was mainly concentrated in the English capital.

In all, the Luftwaffe carried out 22 large-scale attacks on London in the month of September. In October, and on into November, the war of attrition increased considerably in intensity.

When the advancing season brought worse weather conditions, the German High

/Command

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- (1) Strength of the attacking forces
(2) Eastchurch(J,K), Gosport(J,N), Lee-on-the-Solent(J), Lympne(J), Manston(J,K,S), Tangmere(J), Hawkinge, Portsmouth, Rochester, Driffild(K), Martlesham Heath(J).
(3) Andover(K,S), Benson(K), Biggin Hill(J,K), Cardiff P.M.(J), Detling(J,K), Kenley(J,N), Netheravon(S), Odiham(J), Redhill(J,S), Gravesend, Maidstone, Sealand(S,N)
(4) Abingdon(K), Boscombe Down(K), Farnborough(S,N), Hullavington(S,N), Old Sarum(J,S), Blandford, Bristol-Whitchurch, Canterbury, Filton, Halton, Hamble, Middle Wallop, Reading-Hodey, Wilmington, Worthy Down, Yeovil, Kinloss, Linton-upon-Ouse, Montrose, Penrhos, Wick.

J = Fighter Formations.
K = Bomber Formations.

S = Flying School
N = Supply Store.

Command resolved to postpone further the landing on the mainland of England. During the winter months, objectives in the South of England, important to the war economy, were the targets for German attacks. As a result of the growing deterioration of weather conditions, the number of major attacks in December fell to four.

In the first three months of 1941, the air war against England could not be kept up at the same pace as before.

It was not until March 1941 that Luftflotten 2 and 3 took up the attack again in full measure. London and numerous other cities again lay under the hail of German bombs. Luftflotte 5 was put into operations against Scottish ports.

Then political events forced the Germans to re-group their forces taking considerable strength from the formations operating against England.

From April, news coming in from the East pointed more and more clearly to the Soviet Republic's intention of attacking the German Reich. At the end of May there could be no more doubt that the invasion of Germany by the Bolshevik Army was imminent.

On May 22, 1941, Luftflotte 3 took over alone the command of the formations remaining in the West, and the strength of these formations decreased from 44 combat groups to 8. Luftflotte 5 turned towards the Norwegian border.

A new period began in the air war against England.

The main task of Luftflotte 3 was now to attack merchant shipping and supply installations in the ports, and to mine the river estuaries. For this, only small forces were available.

In the years 1941-42, the battle against England was carried out only by Kampfgeschwader 2 and 30, and in the years 1942-43 by Kampfgeschwader 2 and 6.

The remaining fighter formations were required for defence against the enemy's attacking forces, which flew over the occupied territories in ever-increasing measure. Operationally they no longer appeared in raids against the island.

II.

What means and what tactics contributed to England's success ? How were these means used ?

1. The fighting resources of British air defence.

The air defence of Great Britain consisted of the coastal air defence, the home defence fighters, the anti-aircraft defences, the searchlights, the balloon barrage, and the aircraft reporting service.

The coastal air defence guarded the sea area up to the limits of their operational range (in the East, as far as the Continental coast and the German North Sea ports). It cooperated with naval patrol vessels.

Fighter operations began seawards over the coastal waters. The state of things on July 15, 1940 was that the British Fighter Command had at their disposal over 675 serviceable fighter aircraft, against 898 German fighters. (cf. OKL.Gen.Qu.6Abt. "Serviceability of fighter formations").

The British ground organisation was a particularly close network. Of the 357 known airports, 83 could be claimed as first-class airfields, 58 as second-class airfields, and 62 as third-class airfields.

/The

The regular A.A. artillery was not part of the Air Force, but belonged to the Army. The territorial home A.A. (Militia) was subordinate to the operational command of Fighter Command.

Of the 1,194 heavy anti-aircraft guns available, some 400 were modern; 150 (11.4 cm.) were in permanent positions, and 250 (9.4 cm.) mobile. Some 600 mobile anti-aircraft guns (7.62 cm.) were of an older design. The calibre of the light anti-aircraft guns was 2 cm. and 4 cm.

As a rule, the calibre of the searchlights was 60 cm. and the modern searchlights, with a calibre of 1.52 cm., were mostly situated on the coast.

On the average, the barrage balloons reached a height of 1200 m., and in some cases almost as far as 4,000 m.

The Royal Air Force did not have a signal corps at its disposal as a branch of the service. The organisation and training of signal units came under an Air Ministry Department.

The most important commands were Bomber Command, Fighter Command, and Coastal Command.

A comparison of the performances of British and German fighters shows that they were about equal. On the British side, first-line aircraft were the Gladiator, Spitfire I, Hurricane I, and Blenheim Fighter; on the German side were the Bf 109 E and the Bf 110 D-1.

On both sides, the speed of the fighter aircraft was about 450-500 Km. per hour at a height of 5,000 m.

BRITAIN				GERMANY			
Type	Speed	Ceiling	Armament	Type	Speed	Ceiling	Armament
Gladiator	<u>395/295</u> 4.7	10 km.	4 M. G.	Bf. 109 E	<u>455/350</u> 5	10.3 km.	2M. G. 7.9 2M. G. 20
Spitfire I	<u>560/480</u> 5.6	10 km.	8 M. G.				
Hurricane I	<u>530/450</u> 5.3	10.5 km.	8 M. G.	Bf. 110 D-1	<u>495/380</u> 5	10 km.	4M. G. 7.9 2M. G. 20
Blenheim fighter	<u>440/335</u> 4.7	10.5 km.	4 M. G.				

As is shown in the table, the British fighters' armament was to some extent superior, as regards the number of machine-guns, but in battle these lacked the penetrating power and explosive effect of the German cannons.

2. Type of Tactics.

The German air offensive came as no surprise to the British air defences. After the conclusion of the previous campaigns in Poland and France, the British High Command expected an air attack on their ground organisation.

Numerically, the Royal Air Force was inferior. However, this disadvantage could be overcome by skilled leadership in battle, for which every opportunity was offered by the ground organisation with its maze of branches.

/ Most

Most of the fighter formations were massed in south and south-east England, especially in the London area, but as a precaution, some were stationed in Central England. Scotland was less strongly covered, although some fighter formations were stationed on the Orkney Isles for the protection of the Fleet.

When all the German forces joined in the operations after August 15, 1940, the Royal Air Force met with great difficulties. However, as the main weight of German attacks fell only on the south and south-east of the island, many of the bases in the Midlands were undamaged. On the German side, the losses were considerable, especially those inflicted by British fighters. During the period from August 12, to August 19, 166 German aircraft were missing. (cf. the Wehrmacht report)

Even although the Luftwaffe had scored a great success against the British ground organisation - according to the reports at hand, 644 enemy aircraft had been destroyed in the period August 12 - 19, (cf. the Wehrmacht report) their avowed aim, to destroy the Fighter Arm, had not yet been realised. (For German aircraft losses from August 1, 1940 - June 30, 1941, see appendix.)

The British fighter formations were heavily hit, but they were still strong enough to impede German bombing activity. The British defence was reinforced to such an extent, that two or even three times as many German fighters as bombers had to be used for protection.

But even this strong fighter protection did not lead to a decision, because the German fighters had too short a range. Sometimes they had only ten minutes in which to engage in combat. Consequently, the losses incurred on day attacks mounted so much that German attacks could only be carried out at night.

The large-scale attacks took place during the moonlit periods. London alone was attacked on dark nights, because of its greater target areas.

The change in German tactics presented British air defences with new problems. On the ground, formations were dispersed. The defences necessary against low-level attacks were brought into use in increasing numbers - light anti-aircraft guns and balloon barriers. In the air, night fighters now came into prominence.

British fighter operations were made easier by the technical operational aids used by the German bomber formations. Navigation depended on radio-beacons. Aircraft took off singly at intervals of a few minutes, and flew to the same target from different airfields. As far as possible, the attack lasted the whole night, and flying operations were based on a fixed plan. Thus, the British fighters had only to follow the guiding beams of the German ultra-short wave beacons (Knickebeine) in order to engage the enemy.

After the Germans had ascertained the reason for their losses, the discovery of flight-direction was made more difficult and partly ineffective by the setting of several guiding beams, and later by other technical measures.

In the meantime, British Fighter Command had thoroughly organised night fighting. The single-engined fighters gained their first successes. Moreover, the performance of the aircraft spotter service on the coast and on escort vessels had greatly improved.

Early reports on the approach of German bomber formations made possible a concentration of defence forces at the main points of attack; this concentration was made as heavy as possible. Fighter formations had at their disposal a well-constructed signals network over which they could pass orders.

The position of the British fighter defence improved still further when after the beginning of September German bomber activity concentrated on a few economically important targets. London had no less than 268 attacks. Bristol and Cardiff followed with 52, Liverpool with 40, Birmingham with 12, Lincoln with 36, Middlebrough with 15, and Newcastle with 19 attacks.

/In

In October, the picture was even more impressive. The London area alone sustained 333 attacks. At a good interval, the area between the Thames Estuary and The Wash followed with 86 attacks. For the rest, the number of targets attacked decreased considerably.

After the decrease in German bomber activity caused by the adverse winter weather, the attacks switched over to the Midlands and the North of England after the early part of 1941; meanwhile, the Germans did not betray their intention of destroying the air bases.

From the middle of May 1941, the weight of the German air offensive showed a marked decline. The majority of formations were being transferred to the East.

The main task of the British anti-aircraft batteries was to barricade an area by a concentration of fire. It was the task of the fighters to shoot down the attacking forces during the inward and outward flights.

This policy was also shown in the distribution of anti-aircraft batteries. The main weight of the anti-aircraft concentration in July, 1940, was situated in the South of England: in particular, in the London area, with 340 heavy and 220 light anti-aircraft guns, 1,000 searchlights, and 600 barrage balloons. The ports of Southampton and Plymouth were strongly protected. In central England, further protected areas were Hull, Birmingham and Liverpool. The greatest anti-aircraft protection in the North was given to the ports of Middlesbrough, Newcastle and Edinburgh.

The most marked contribution to the successes scored by British night fighters was made by the searchlight batteries. (cf. Lfl.3.War Log 17.8.-26.8.40. App.24. 26.8.40.).

They showed the area of approach by vertical searchlight-beams, and by the beam's describing a semi-circle round the vertical axis.

The direction of approach and course were shown to the night fighter by red signals. The answer from the air came by means of turning on the searchlight or by using Verey ammunition.

To sum up, it is clear that the successes of the British air defence depended on:

- 1.) The suitable concentration which prevented their destruction by the German air assault in August, 1940.
- 2.) The inadequate penetration of German fighters, which were unable to follow the German bomber formations as far as the target.
- 3.) The British Fighter Staff's concentration of defences at the main points of attack.
- 4.) The efficiency of the British aircraft reporting service through use of the most modern radio equipment.
- 5.) The growing capacity of the British aircraft industry.

These causes alone were not decisive in the failure of the German air offensive. Further circumstances were also present.

/ III.

III

In what way did Germany fail to take proper action?

1.

Influences of the operations and of the general war situation.

After the first World War, Britain's Air Force had seen only inadequate developments. It was far behind in its equipment and in its production of aircraft types. Britain's predominance during the years of the League of Nations allowed her to make the power of the British Empire felt in other spheres.

The British armament industry had achieved a production capacity of 32,000 aircraft in 1918. Thus, the Royal Air Force had a tradition in aircraft construction when, in 1934, it was decided to re-arm. But the organisation was by no means equal to the demands made by the mass employment of aircraft in war.

Shadow factories were constructed beside the large motor factories, which during the war were to prove an indispensable supplement to the aircraft industry. Factories which were purely concerned with the production of aircraft employed 80,000 workers in 1937, as against 30,000 in 1935. At the beginning of 1939 3,000 factories were engaged in the production of aircraft.

In the meantime, the measures taken for large-scale air armament came into force. The new factories, like those already in existence, were not planned from the point of view of air-raid precautions.

The endeavours to expand the production capacity in Canada and Australia were still in their infancy, and at the beginning of 1940, the maximum capacity had by no means been reached.

In this situation, Britain's French ally was attacked in May, 1940, and was defeated in a few weeks by Germany. When the Armistice was signed on June 25, Britain stood alone against the European Powers. But after the disaster at Dunkirk, it had become obvious to every Englishman that this was a war for existence itself. The result was a radical switch-over to total war.

In so far as it was possible, men in the armaments industry who were fit for military service were replaced by women, who continued work on Sundays. Women also held important posts in the air defence.

Tremendous armament began. For the first time, the British air budget surpassed that of the Navy. In most factories, preparations were made for mass-production.

Thus, if the war went on longer, the Royal Air Force could grow to considerable strength, and could achieve an increase in over-all production which would constitute a danger to Germany. The same was true of the armament production for the British Army. All measures were still in their infancy, but they were bound to reach complete effectiveness within a reasonable space of time.

Dunkirk had been the warning signal.

Action had to be taken on the German side, before the British armament efforts threatened to overtake the German position.

If the measures to be taken by Britain as a result of the adverse course of operations had been obvious, Germany was faced with decisions which, within the framework of the over-all war policy, depended on time, place, and strength.

/Despite

Despite the speed with which the French campaign was brought to a victorious end, autumn, as was to be expected, came on before the preparations could be completed which had to be made by the Air Force, the Army and the Navy. But the difficulty of the fighting conditions increased with the advancing season.

Germany had advanced from the Bight of Heligoland as far as the Atlantic Ocean, and its western operational bases lay along the coasts from Norway as far as Biarritz. The mainland of England had come within range of the German coastal front, while the German U-boats constituted a dangerous threat to Britain's supplies.

The future would show whether the strength of the Luftwaffe was sufficient to destroy the Royal Air Force. Everything pointed to the fact that the present difficulties could be overcome. Thus, Germany was acting correctly when an immediate landing was planned. Britain should not be allowed to gain any time !

2.

Criticism of the German conduct of the air war.

The destruction of an enemy Air Force is only possible in certain circumstances. In the Polish campaign, this was achieved by means of an air attack with far superior forces. (There were 1,538 German aircraft as opposed to 1,000 Polish aircraft. Of the latter, only 400 were suitable for use in war.) In the war against France, air superiority was gained under favourable conditions. (The ratio of strength was about 2 to 1.) The battle against the Royal Air Force was infinitely more difficult, although numerically the Luftwaffe was superior to the Royal Air Force also.

When, on August 15, 1940, Luftflotten 2, 3 and 5 operated together for the first time, they faced the enemy with combined forces of about 1,000 bomber and dive-bomber aircraft, and 1,150 fighter aircraft. Against these forces, Britain had over 860 bomber aircraft and about 675 serviceable fighter aircraft.

The almost ceaseless operations caused a severe crisis on the British side, and it was a year before the British armaments industry recovered from these blows.

On closer scrutiny, however, it can be seen that the numerical superiority was partly eliminated for the following reasons.

Strategic operations of the Luftwaffe in France were aimed at the concentration areas, whose positions were known from the plans of the French Army (see accompanying map). Thus the Champagne district became the centre from which the Luftwaffe attacks were chiefly launched, while the areas where the Army and Air Force were concentrated had to be reckoned as areas important for air defence, where a strong concentration of fighters and anti-aircraft guns had to be retained.

Thus, the German Air Force was tied down to relatively far forward battle areas because of the imminent Army operations, while in contrast to this, Britain's air strategy, which was concentrated solely on defence, allowed a deployment in depth.

As long as Germany did not threaten actually to set foot on the island, the British air defence was on its own. It was the country's first line of defence; in the second line, the Fleet stood ready to repel a landing, and not until the last would the Army have to intervene.

/ Correspondingly,

Correspondingly, the British air defence was not forced to keep its fighters far forward. Even if the supposed main points of activity demanded a concentration of fighters over the object to be protected, the positions of the British fighter arm still showed a tendency towards dispersal. In the critical weeks of August and September, 1940, the British Fighter Command withdrew part of the formations to the Midlands, thus removing them from the German grasp. This was possible without important tactical disadvantage, because, as has already been shown, German fighter cover did not reach the depth of penetration of the bomber formations. While the British fighters, without being greatly troubled by German fighters, could ward off German attacks, German bomber formations over the target were exposed without protection to the British fighters. This explains the considerable German losses during the day attacks in August and September, 1940.

From this situation the German High Command suffered the following disadvantages:

- a) The numerical superiority of the German fighter arm had no bearing on the situation, since British fighters could use evasive tactics while the German fighters were in no position to bring them to battle. The result of this for the German bomber formations was that their operations were only protected by an inferior fighter arm.
- b) An indirect result of this was a shortening of the bombers' depth of penetration, since they were too greatly endangered when they were far over England without fighter cover.

These facts answer the question why the German High Command had, at the beginning of the air-offensive, to restrict itself to attacking the ground organisation in south and south-east England.

It can therefore be established as a result of this that the Luftwaffe was too weak to strike and destroy the Royal Air Force.

But if Britain was to gain no time, then Germany had to fight for air superiority at least with the forces at hand. After the great performance of the Luftwaffe in Poland and France, the German High Command could rely on their winning the victory. Therefore it would have been wrong if Germany had given up the air war against Britain at once.

3.

Results of operations from the Continent.

In the battles on the Continent, the Army and the Luftwaffe had in combined operations dealt the enemy a speedy and destructive blow.

Now for the first time the air forces opposed each other alone.

Now it had to be seen whether it was possible to break the enemy's air power by strategic air operations alone.

The Royal Air Force had the greatest fighting strength of all the enemy Air Forces. The air-battles, in which the German fighters had to engage Spitfires and Hurricanes, had been extraordinarily hard. Britain's insular position made operations difficult, because the Luftwaffe had to fly long distances, partly over the sea.

The disadvantages of operations from a base on the Continent were obvious:

- a) Gaining air superiority caused considerably more difficulty than in the previous campaigns. On the Continent, the beginning of the air-offensive coincided with the Army's invasion of enemy territory.

/After

After the Luftwaffe had destroyed the ground organisation by strategic operations, the Army's mobile formations advanced quickly to occupy the airfields, thus consolidating the Luftwaffe's successes. Directly and indirectly, the Luftwaffe supported the Army operations.

On the other hand, the British bases remained in British hands. Despite severe losses in repair shops and aircraft, it was still possible to carry out repairs and to bring forward reserves which were prepared for action.

Thus, the conditions under which the British air defence fought were much more favourable than those which the Polish and French Air Forces encountered.

- b) A further power factor which has not yet been brought to notice was the British Fleet.

As long as air superiority had not been wrested from them, the British Isles had not lost their protection. Britain had fully realised the significance of an air threat for the operations of her naval forces.

A great readjustment to the new conditions had taken place. The Naval Air Force had been taken over by the Navy. The number of aircraft-carriers had risen from 7 to 13. The vessels had armour-plating and anti-aircraft guns. Besides these, special anti-aircraft cruisers were available for air defence.

In these circumstances, it was unavoidable that the operations of the Army and the Luftwaffe could not be combined. The weaknesses resulting from the operations on the Continent were known to the German High Command. They had to be overcome if Britain was to be defeated. If the wresting of air superiority from the enemy was the first condition for the success of the landing, then the commencement of Army operations could not and dared not coincide with those of the Luftwaffe.

4.

Final observations.

The long-range fighters which were lacking in 1940 were now available. Under the protection of a strong fighter-umbrella, the Royal Air Force gained air superiority during the Normandy landing on June 6, 1944. Under the same conditions, the Americans succeeded in occupying the Marianas, the Marshall Islands and the Gilbert Islands. According to the communique from the Japanese government, published on September 9, 1944, the islands mentioned had been lost because of the disparity in air power.

A glance at the following summary shows the great progress made in the development of fighters:

/ BRITAIN

BRITAIN				GERMANY			
Type	Speed	Ceiling	Depth of penetration.	Type	Speed	Ceiling	Depth of penetration.
Spitfire XII	<u>650/550</u> 5	12 km.	400 km.	Bf.109 G	<u>625/530</u> 6.5	11.5 km	210 km.
Typhoon	<u>650/560</u> 5	12 km.	?	Bf.109 H			
Tempest	<u>780/600</u> ?	12.5 km.	?	Bf.109 K			
Mustang			1,000 km.	F.W.190	<u>650/550</u> 7	10.8 km.	330 km.
Thunderbolt			1,000 km.	Me 163	<u>950/-</u> 12	12 km.	-
Lightning	<u>690/550</u> 9	12 km.	750 km.	Me 262	<u>860/-</u> 9	11.5 km	400 km.

Depths of penetration up to as far as 1,000 km. created revolutionary conditions in bomber tactics.

In 1940, the Luftwaffe had not the technical means at its disposal to inflict a crushing blow on a strong air-power. Since however strategical possibilities are connected with the weight of load carried, speed, and range, the decisions and successes at that time must be judged from this point of view.

The great success of the German attacks shows that the measures taken in 1940 were correct. After most of the airfields south of the line from London to Gloucester were destroyed or considerably damaged, up until the end of August, the Royal Air Force was hard pressed.

When the landing planned for September 1940, had been postponed, the Luftwaffe shifted the main weight of attack to economic targets, but the struggle for air-superiority had to be broken off by Germany herself, when political developments in the East forced her to take military counter-measures, in the course of which most of the Luftwaffe was concentrated for war with the Soviet Union and the forces which were left were not strong enough to continue the air war against England to the same extent as before.

Britain learned from experience gained during the German air offensive, and the following conclusions were drawn:

- 1) An air attack to be effective must be pressed home day and night.
- 2) The attack must be mostly independent of the weather.
- 3) Pinpoint-targets must be found and hit, even in night-attacks.

To meet 1), British four-engined aircraft were built and classified according to their tasks, as day and night bombers. At the same time, to counteract the growing losses by day, the range of fighter escorts was increased.

To meet 2), a navigational process and the necessary equipment was developed from primitive radar procedure. By means of these, British bomber formations could be guided to the target in all weather conditions.

/ To

To meet 3), Germany's early attempts in this sphere were surpassed with H2S equipment. The new process enabled the British, even when flying blind, to find and attack the target with sufficient accuracy while at the same time the German defences were to a large extent put out of action and had to be completely reorganised.

The battle for air-superiority is waged from the following point of view:

- (a) The aircraft strength and the armament industry of the Luftwaffe are to be reduced as much as possible, while production in America and Britain is stepped-up.
- (b) German fuel factories and stores are to be destroyed to such an extent that those aircraft which are available cannot be used operationally.

Indirectly, this measure hits the production of those fighter factories which cannot be attacked from the air.

In the same way as the British succeeded at the time in making day attacks so costly that the Luftwaffe had to switch over to night attacks and later abandon them completely, the Reich-defence must be strengthened so much that the British are forced by heavy losses to cease their attacks on the Reich. When this is achieved Germany can again go over to offensive tactics.

Appendix

In the attacks on England from August 1, 1940 - June 30, 1941, German aircraft losses were as follows: +)

August	200
September	80
October	100
November	40
December	20
January	20
February	40
March	45
April	80
May	65
June	40
	<hr/>
	730 lost

Of a total of 51,946 aircraft used

= 1.4%

The average percentage of German losses, 1.4%, is about half of the Anglo-American losses in aircraft during day attacks from May until July, 1944, which showed an average of 3% fighters and anti-aircraft guns). ++) At night, these rose to an average of about 8%.

During these months, the individual percentage losses were as follows:

1944	Day		Night	
	Fighter	Flak	Fighter	Flak
May	2.06%	0.95%	6.66%	1.02%
June	1.9%	0.88%	15.62%	0.75%
July	1.30%	1.15%	3.15%	1.11%

The percentage figures are average values based on the total number of enemy machines which were attacking (fighters and bombers).

+) According to statistical documents of Gruppe VI.

++) Compiled according to Ic reports, Jagdkorps I.

A.H.B. 6. Distribution:

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