

SECRET

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THE NORMANDY INVASION - JUNE, 1944

A Study prepared by the
German Air Historical
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A. GENERAL.

I. Effect of Enemy Air Raids before and during the Invasion

1. Traffic Installations, Rail and Road Communications. The decisive factor in the launching of the invasion was the difference in size and power between the Anglo-American Air Forces and our own. On June 6th, 1944, for example, the enemy employed 2,100 4-engined aircraft, 600 twin-engined aircraft and 3,500 to 4,000 fighter-bombers. On the same day, Luftflotte 3 was able to operate only on the following scale:-

Jagdkorps II	by day	121 aircraft
	at night	35 aircraft
Fliegerkorps II		51 aircraft
Fliegerkorps X		11 aircraft
Fliegerkorps IX	by day	9 aircraft
	at night	15 aircraft
2nd Flieger-Division		53 aircraft
and Aufklaerungsgruppe 122 (reconnaissance)		24 aircraft
T o t a l		<u>319 aircraft</u>

The opposing forces were thus in the proportion of approximately 1 to 20.

The following observations were made by the Officer detailed by the 8th Abteilung to visit the Luftflotte 3 area. This visit was carried out from the 15th to the 30th July, 1944.

The railway installations at Metz including water towers, railway workshops, engine sheds and sidings were heavily damaged, the craters being made partly by 500 and 1,000 kg bombs. The bridges and crossings were partially damaged but most had escaped direct hits. On the railway track from Metz through Chalons to Paris, most of the railway stations had been attacked and some were heavily damaged. The attacks on Bar-le-Duc and Chalons were the most effective. The through traffic on this line was held up for ten days and a large part of the rolling stock which had been standing at the stations was destroyed. Rail traffic on this line was very light and French civilian trains were almost empty. There were fuel carrying trains, munition trains and goods trains lying overturned and gutted beside the track. The focus of the attacks, which only reached their height some days after the beginning of the invasion, was on the great marshalling yards near Paris. A railway viaduct near Chantilly on the Paris - Amiens route was totally destroyed by three direct hits from four fighter-bombers. The goods yard at Creil, together with a large quantity of rolling stock, was totally destroyed.

The position on the 8th July shows that there is only one East to West line intact as far as Paris and from Paris to the West and South West all rail communications are broken. The traffic from Paris to Brussels has had to be diverted through Metz. The general opinion was that the French railway officials had deliberately caused the amassing of rolling stock at the great marshalling yards so that they might be destroyed by further air attacks. A strong raid by approximately 350 American four-engined aircraft during the night of 7th/8th July once again cut the rail communication from Paris in the direction of Chalons where traffic had been resumed on the 6th July.

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The material superiority of the enemy and the continuous low level attacks by the English and Americans by day and by night, even on single vehicles, convoys, pedestrians etc., have seriously hindered supplies. By night the English have used fighter-bombers and night fighters equipped with flares with which they illuminated important communication centres prior to attack. All bridges over the Seine to the West and North West of Paris were destroyed before the invasion by fighter-bomber and low level raids. Only a few ferries are available for traffic between the two banks of the river. The bridges in Paris itself are still intact.

The effect of Anglo-American air supremacy on the Normandy front and as far as Paris is so great that all convoy traffic is restricted to night time and even single vehicles are only used by day in the most extreme emergencies. The main highway, Paris - Versailles - Dreux is ploughed up by direct hits from the Western end of Versailles to the goods yard at St. Cyr. The villages of Laigle, Argentan and Falaise are reduced to ruins. The losses in motor vehicles amounted in some Units to as much as 40% of the original strength and at the same time large quantities of reserves, munitions and fuel were destroyed. The casualties caused by dive bombing by day and night were soon reduced to a minimum as troops had learnt how to adapt themselves to the conditions by means of observers on the vehicles, stopping at intervals to listen for the sound of aircraft and by taking cover rapidly.

2. Signals Communications

The start of the invasion was marked by the complete breakdown of landline communication. The basic means of control since the first day of the invasion has been by radio, and even this has at times been subject to atmospheric disturbances. Thus, contact with many Units was only possible after many difficulties and delays. A large number of underground cables were destroyed by sabotage at the start of the invasion and it was discovered later that faults had been previously built into the systems by French Post Office personnel. The use of these methods was a heavy blow when action began. Complaints have been made by the Signals Units concerning the lack of co-operation from the Operations Staff as the limitations and difficulties of Signals communications are not sufficiently appreciated. In the area of the IX Fliegerkorps, it was found that even though the line communications had been completely cut, contact by means of radio worked perfectly. The Operations staff were forced to issue their orders in very brief form and cases of sabotage have been few and far between. By the beginning of July, the long distance telephone lines had been restored.

3. The Ground Organisation of the Luftwaffe

The systematic destruction of the ground organisation of the Luftwaffe, especially of the fighter airfields, was very effective just before and during the start of the invasion. Hardly a single airfield of those intended for fighter operations is still serviceable. It became necessary to find emergency airfields some of which, in turn, were made unuseable by the continuous downpours of rain which made them too soft.

At the start of the invasion bombing was concentrated mainly against landing strips, so that losses in material and personnel were slight once dispersal had been carried out. Damage was sometimes repaired within 24 hours but airfields in the West, in the vicinity of the invasion front such as Chartres and Vannes are at the moment still unserviceable. At the end of July enemy air attacks on airfields in the south of France increased in intensity. The enemy now drops his bombs over an area of about 1,000 x 2,000 metres using small calibre fragmentation bombs aimed at the dispersal points and tactical installations on the airfield. Owing to these new tactics, material losses could not be avoided even if considerable dispersal had been carried out, as the bombing concentration was such that there was one bomb to an area of about 10 square metres. The anti-blast shelters gave hardly any protection under these circumstances as nearly all of them received direct hits.

At the suggestion of the former Commander of the 2nd Flieger Division, General Fink, the ground organisation on the French Mediterranean Coast and in the Rhone Valley will be extended. General Fink has suggested that large neighbouring airfields be connected by runways so that in the event of one airfield becoming unserviceable, the remaining ones could still be used.

At Divisional Headquarters, preparations are being made to withdraw operational units in the areas of Orange, Montelimar and Dijon and to evacuate the airfields at Montpellier, Nîmes, Salon and Istres.

II. Our Own and the Enemy Situation

1. Situation in the Air

The outstanding factor both before and during the invasion was the overwhelming air superiority of the enemy. The gradual concentration of the enemy Air Forces in Southern England was observed by our 'Y' Service. The imminence of the invasion was apparent from the following observations:-

- (a) On June 5th, at 2300 hours the transfer of British close combat air units was noticed.
- (b) During the night of 5/6th June, floating jamming transmitters entered the Channel between Dungeness and the Isle of Wight.
- (c) From 2200 hours, met. reconnaissance aircraft of the heavy American bomber squadrons began to give weather reports.

From 2300 hours the met. reconnaissance service of the American twin-engined squadrons also operated. As this reconnaissance had never been observed before at these times, units were advised to be on the alert..

From 0235 hours, a squadron of U.S. heavy bombers was noticed North of London. As the main concentration appeared to be of American Units our Operations Staff was led to believe that the English Units were being held back for a second landing. In actual fact, the reason was the short range of the British day units which the English only wanted to use from the beach-head itself.

The comparison between the operational units of both sides on the 6th June has already been made. On the night of 8th/9th July a total of 1400 fighters was flown into the invasion area. The ratio between our own fighter strength and that of the enemy in large scale operations is about 1 to 40, the average ratio being 1 to 20. On very active days of fighting up to 5,000 fighters were employed by the Allies. From dawn to dusk the English fighter cover operated over the invasion area with 400 to 600 fighters.

A special difficulty lies in the fact that our own fighter formations flying from the region North and North West of Paris, towards the invasion front are constantly endangered on their right flank by the enemy flying in from the Channel. It is, therefore, planned to move the fighter ground organisation to the South West of Paris. Our fighter-bombers have often been forced to drop their bombs before they reached the target area in order to defend themselves from fighter attacks. It has been impossible to carry out aerial reconnaissance.

The English air forces serve mainly as support for the Army, but in addition, they are used against our traffic and communication centres further inland. The chief effect of the V.l operations during the invasion was that strong enemy air forces were kept out of the fight, thus relieving our defences.

Our own air forces are unable to operate over the beach-head by day and their work has, therefore, consisted of protecting supply lines by means of flak and fighter operations. It has been impossible to move armoured forces during the day time.

It has not been possible to observe the results of our artillery fire or of the effects of the V.l operations as the enemy has 100 to 150 fighters flying in the form of a screen along his South coast from dawn to dusk. With these same aircraft the enemy is trying to prevent the easily recognised V.l. from reaching its target by shooting it down in mid-air and in this he has met with some success. V.l. operations will, therefore, be discontinued during cloudless weather. By continuous use of fighter-bombers and four-engined aircraft in attacks against the V.l launching sites in the region of the area of Calais and Dunkirk, some damage has been caused to the ramps. Although repairs can be effected within a short space of time, the launching schedule is inevitably upset. The results of V.l. attacks at night are difficult to observe owing to the use of decoy fires.

Enemy airfields in the beach-head were first spotted on the 9th June. On the 10th, the landing of all types of aircraft except four-engined, was reported. Up to the 8th July it appears that some 30 airfields were occupied, mainly by Spitfires with anything up to 60 aircraft on each field. Our own airfields in the beach-head area have all been destroyed. Whereas the Americans are building a small number of very large airfields, the English are constructing a larger number of small sized ones. For the use of 4-engined aircraft, runways about 2,400 metres in length are being constructed.

2. Situation of land

The course of the battle on the Atlantic coast can only be judged from radio reports, and from prisoner of war interrogations, as none of our own troops have returned from this front. As far as the success of the Anglo-American airborne troops is concerned, it is only known that they managed to capture some defence positions by taking them from the rear. At the beginning of the invasion, there were available in England 8 Airborne Divisions and 7 independent Parachute Detachments. According to a preliminary survey there are estimated to be 31 to 32 Divisions in the beach-head, this representing about one-third of the total forces available in Great Britain for use in the invasion.

Judging from previous experience, the English and Americans will so strengthen their artillery and armoured forces that they will be able to break through the German lines of resistance, moving in a South Easterly direction over the plateau of Langres, with their left flank along the Seine.

The forces required for a second invasion are certainly available but such an invasion is unlikely to take place along the Channel coast as the existing beach-head is considered adequate for subsequent operations. On the other hand, pressure of public opinion in England may have the effect of forcing consideration of a second invasion to be directed solely against the V.l. launching sites. The view of C-in-C West is that there will be a second landing in the Seine - Somme Region.

Up to mid-June, landings on the French Mediterranean coast were thought unlikely but at the end of July, opinions changed as some 600 to 800 single-engined aircraft had been assembled on Corsica and following this, twin-engined aircraft units were transferred from Southern Italy. Opinions differ as to whether these forces are designed for an invasion of upper Italy in the rear of the German positions on the Rimini - Florence front. In the event of such an invasion, it must be remembered that the effects of partisan raids will be felt very acutely especially by the weakly-defended ground organisation of the Luftwaffe.

/Contrary

Contrary to expectations, the Americans broke through at St. Lo on the 28th July in a South Westerly direction in order to enlarge the beach-head and to open the ports of Brittany from the rear. A noteworthy feat was the disembarkation of a complete American Division which had been brought over direct from the U.S.A., within 38 hours without any harbour facilities and using only barges.

The relation between the enemy artillery strength and our own is reckoned to be about 20 to 1 at the vital points, e.g. on the right flank of the Cotentin Peninsula. To this must be added the Naval Artillery consisting of 14 battle ships and heavy cruisers. This concentration of fire has prevented all movement by day.

On the 15th July, when there was total cloud at 1,000 to 1,500 metres, the English for the first time illuminated the lower cloud cover with strong searchlights and thus lit up the whole main battle field and then proceeded to carry out accurate artillery fire throughout the night.

The order "Imminent Danger in the West" (Drohende Gefahr West) was given in the morning of the 6th June by the Commander-in-Chief, Western area. The views of Staff Officers on the imminence of invasion were divergent. The Chief of the General Staff, Major General Blumentritt, was of the opinion that the landing would not take place but the Operations Officer, Colonial Zimmermann said "they must come".

The enemy's mastery of the air, his superior artillery and heavy English Naval guns caused part of the German land troops to be blown up before they could take any active part in the fighting.

The relief of the armoured divisions in order to form a new operational reserve had not been carried out by the middle of July owing to enemy pressure. The infantry Divisions which have been employed are not mobile and they can only make a fighting retreat. Behind the Dieppe Sector, there are still two infantry Divisions but these are not detailed for front line duties. At a conference held at the Headquarters of the II S.S. Panzer Korps on the 16th July, it was found that the supply position of artillery ammunition was very unsatisfactory, and also that replacement of S.S. personnel was not sufficient. The fighting strength of the Divisions has been seriously reduced and on the average, each Division has lost some 50 men every day.

It seems that the troops in the immediate vicinity of the coast line were only equipped with 1 to 1½ issues of ammunition and the enemy was, therefore, able after throwing in his first and second waves of attack, to beach his third wave and establish them on land with hardly any resistance. The Army has now ordered all available forces to be switched to the beach-head and for this purpose, forces from Southern France have been moved in, although the number of available units is small.

The following Army reserves were available:-

- Panzer Training Division
- 21st Panzer Division
- II. SS Panzer Division
 - I. SS Panzer Division
 - 2. Panzer Division
- 116. Panzer Division
- 19. Panzer Division (at present in transit from Breda, Holland).

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The II SS Panzer Korps was badly battered by Naval artillery and air attacks by night as it was standing by between Bayeux and Caen at the beginning of July. The control of fire from the Naval guns and that of the artillery on the beach-head is excellent. Isolated positions of the Signals Korps were, for instance, swamped by well aimed artillery fire only five to ten minutes after they had started sending signals.

The defences of the Cherbourg forts were without artillery for the forces available and scarcely a third of the positions could be manned when Cherbourg was completely surrounded. During the fighting around Cherbourg from the 20th to 30th June, TG.30 was used to drop supplies by air to the surrounded garrison. Altogether 188 tons were dropped by 107 aircraft but the losses sustained were high.

The Grenadier Regiments of the 12 SS Panzer Division have, in the course of operations, been reduced in size until they are only of battalion strength. The deciding factor on the Normandy front, besides the enemy's air supremacy, is the concentrated superiority of the British and American artillery. There seems to be no limit to the enemy's reserves of ammunition as is instanced by the use of 150,000 rounds in one night against Hill 112.

3. The situation at Sea

Minesweeping along the coast of Normandy and North East France was successful for quite a long time before the invasion. It was carried out by minesweepers on such a large scale that a focal point could not be determined. Around the coast line, later to become the beach-head, altogether 12 lanes were cleared. The landing itself took place at low tide and obstacles were clearly visible to the enemy. The G.O.C. Engineers at the Marine Gruppe West, attributed the success of the landing to the fact that the fleet of landing craft could not be broken up either by Naval guns or by aerial bombing. Against the advice of the Navy, no heavy quick firing guns were installed between Barfleur and Le Havre. Behind the Atlantic wall no defence positions had been prepared. Between Cap de la Hague and Marcouf there were 6 Naval Batteries, one 24 cm and one 21 cm whilst a 38 cm was still under construction; in addition there were twelve Army Batteries, mostly of 15 cm. calibre, thus making a total of 18 heavy batteries. Between Vire and Orne, there was only one Naval battery and two Army batteries of 15 cm calibre. Onwards from Merville the Heavy Batteries of the Navy and Army were closer together. The coastal defences were thus not able to affect materially the progress of the enemy invasion forces towards the beach-head.

The battery positions at Marcouf and Longues were only constructed at the last moment at the instigation of the Navy. Even now the most urgent requests from the Navy are still frustrated by the Army Units which exercise the final authority.

On the 28th July it became possible to obtain eye-witness accounts concerning the forces in Cherbourg Harbour which were then stated to consist of 80 to 90 transport vessels. The Naval Liaison Officer with Fliegerkorps IX who was at Le Havre at the time of the invasion, was of the opinion that the English achieved tactical surprise because of their great superiority in the air. Our own air and sea reconnaissance was ineffective both by day and night in the pre-invasion period. Naval Radar installations were attacked by bombers every day before the invasion and were largely put out of action. The enemy has for some time past laid acoustic and magnetic mines in the mouth of the Seine Estuary, using fighter-bombers. The small naval units in the Le Havre - Brest area suffered severe losses in torpedo-boats and minesweepers.

B. THE AIR FORCE.

I. Operations

1. Jagdkorps II

The available strength of JG.II is at present 30 aircraft (Fw.190). The operations undertaken by this unit generally consist of a double attack using the whole of the Geschwader and neighbouring Geschwaders but it has been found that on their way to the assembly point, formations often did not find each

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other or mistook each other for the enemy. The other attacks carried out have been mostly on a minor scale with small formations, some 4 - 6 times a day.

Subject to weather conditions, the enemy is using his complete air supremacy to penetrate far into the hinterland. The following tactics have, therefore, been evolved for our fighter units; fighter formations are not to be sent up in good weather or when enemy aircraft are reported as approaching in large numbers. In some circumstances formations which have already taken off will be recalled when enemy aircraft approach. According to the views expressed at Jagdkorps II, the most important operational aim is not the combat of four-engined formations as the dropping of bombs on targets could not be stopped by shooting down a few aircraft. It is vital however, to fight the fighter-bombers and artillery spotting aircraft as these endanger the reinforcements and communications of the Army. The duty of Jagdkorps II consists exclusively, therefore, of relieving the Army and of keeping our own supply lines clear at certain times.

In bad weather the enemy sends only small formations of fighter-bombers and ground attack aircraft with which our fighters can cope more readily. On the average, we lose three fighters for every enemy aircraft shot down. In personnel the ratio of losses is about 2 to 1. Nevertheless, the morale of the troops is high and reserves of material are arriving steadily.

2. IX Fliegerkorps

The aim of IX Fliegerkorps is to attack the enemy's sea communications in the Channel. Besides this, the enemy on the beach-head, particularly in the Caen Sector is also a main target. During the invasion, the main task was the laying of mines in the Seine Estuary. This work had not been predetermined but was only called for by the development of the situation during the first days of the invasion.

The LT.350 (aerial torpedo) has proved to be very effective but only when used in large numbers against shipping targets. One disadvantage lies in the fact that so few aerial torpedoes are available.

As the situation developed it was again necessary to make bombing raids on concentrations of enemy troops and artillery. These raids were made only at night and then en masse in one or two waves using on the average, 60 to 90 aircraft. No fighter cover was provided. Besides this, night fighter sorties over the bridgehead were carried out by Me.410's with diversionary attacks by fast bombers. JG.51, equipped with Me.410's is used in night fighting.

Owing to the enemy's air superiority no photo reconnaissance could be made to ascertain the effect of V.1 attacks on London. The Korps has made operational sorties every night since the beginning of the invasion except on two nights when bad weather precluded operations. The present operational strength of IX Fliegerkorps is approximately 120 aircraft.

3. Flieger-Division II

The Division comprises at the moment two Gruppen of K.G.26 (K.G.77 consists only of remnants), the long-range reconnaissance Staffel 1/(F)33 and one short-range reconnaissance Gruppe. An order was issued prohibiting the use of Luftwaffe 3 in the Mediterranean so that the torpedo Gruppen could be kept in readiness for duty on the invasion front. In mid-June a most successful sortie was made over the Seine Estuary in which complete surprise was achieved and 60,000 G.R.T. were sunk without loss.

Torpedo carrying units operate only by night, their average being one operation per week. The relative Gruppen are, however, in a constant state of readiness in order to take immediate advantage of suitable weather conditions. The sorties are made from bases in the South of France and the course flown is first to an intermediate landing ground in the Chalons sur Saone area, thence via Fecamp to the target, afterwards returning direct to base.

KG.26 pointed out that torpedo bombing sorties had been made for about two years in the Western Mediterranean and that, therefore, the enemy has been able to adapt himself to the method of attack. It has been suggested, therefore, that mobile torpedo bombing units be assigned to various Sectors in order to be in a position to make surprise appearances in the Mediterranean, the North Sea and the Atlantic. This suggestion has been rejected by both Flieger-Division II and Luftflotte 3 on the grounds that none of the higher authorities were willing to let torpedo-bombing units go. The average operational strength of KG.26 is about 40 aircraft for both Gruppen. The use of torpedo-carrying units in the Atlantic is unlikely to be successful because of insufficient range of penetration. Night photo reconnaissance flights are made by Ju.188's which are equipped with cameras for night work and with photo flashes. The area covered by reconnaissance is bounded by the Spanish coast, the Western part of Sardinia, Corsica and Ventimiglia. Radar and night photographic reconnaissance is concentrated on the ports of Oran, Tunis, Algiers and Bizerta. During the course of the year, the Staffel suffered nearly 100% losses.

II. The Supply Situation

1. Personnel

The start of the invasion coincided with the end of the period of operations against Great Britain. The technical personnel had hardly been to bed for weeks beforehand. Constant transfers during the period of air operations against England and the extra work involved called for the utmost efforts on the part of all personnel. Following the large supplies of aircraft, with which the reserves of personnel could not keep pace, bomber Geschwader began to have difficulties and each crew had to be used every night. To achieve the ratio of 1.5 crews to every aircraft, the target sought after by Fliegerkorps IX, the High Command demanded 110 crews. The total casualties through enemy action and accidents between the 6th and 30th June amounted to about 40% of the original strength of Fliegerkorps IX.

The 4th Gruppen of the bomber Geschwader have almost ceased to exist through the handing over of aircraft and through shortage of fuel for the training of new crews. Difficulties arising from the employment of bomber crews untrained in mine-laying were solved by means of brief instruction. The training of fighter pilot reserves leaves much to be desired. As a rule these reserves have flown no more than 50 hours on operational aircraft.

2. Material

In January, IX Fliegerkorps had 500 aircraft but the number had sunk as low as 165 by the beginning of June. Losses in the period 6th to 30th June amounted to 98% of the original strength (the strength on the 6th June was 223 aircraft). The Fw.190 and Me.410 were not successful on night operations. On the 6th June the Korps had 70 to 75% of its original total of first line aircraft but this figure decreased to 60% during the month of June. The average strength of the Gruppen was only 12 to 15 aircraft.

After the first days of the invasion the activities of Fliegerkorps IX changed from bombing to mine-laying. To achieve this it was necessary to transfer train-loads of mines from the Atlantic coast to North West France. Before the invasion no preparations were made for intensive mining operations in the supposed invasion area, one of the main factors being the fear that the enemy might capture one of our new type mines ("Dosen" mines) and use it against us in the North Sea. The operational use of these new mines was not begun until 16th June.

One Gruppe of jet-propelled bombers consisting of ten aircraft is to be formed within Fliegerkorps IX but the Korps Command is doubtful whether this Gruppe will be able to carry out tactical operations by night. The average serviceable strength of JG.2 is 30 aircraft. According to information received there were days on which the entire Geschwader could only muster 8 aircraft for operational duties. The supply of ammunition for fighters just covers the current needs. The greater part of the unserviceable fighters could be rendered serviceable within 48 hours if the necessary spare parts were at hand. These spare parts have been withdrawn from airfields in Western France in order to supply the fighter units within the Reich and they are thus no longer available in sufficient quantities.

The introduction of Hohentwiel in sea-reconnaissance formations and torpedo-carrying units has not been carried out on a sufficiently large scale. In the month of May, the total output of Hohentwiel sets for the whole Luftwaffe was only 15, this low production figure being due to the shortage of valves.

Flieger-Division II reports difficulties with the supply of material essential to maintain serviceability. For instance, flying units are forced to fetch spare parts and engines by air from Germany as the equipment kept in the French Sector is insufficient. The He.177 has not been a success as serviceability is only 30 to 40%. With a full load of 5.5 to 6 metric tons, a range of only 500 to 600 km is obtained. In the period from the 6th June to 7th July a total of 1,105 aircraft was received from holding Units, made up of 998 fighters, 83 bombers and 24 reconnaissance aircraft.

3. Petrol, Oil and Lubricants

The requirements in oil and munitions to meet the threat of an Allied landing had not been fully met when the invasion took place. The P.O.L. situation is still fairly good owing to the curtailment of flying by bad weather. Since the beginning of the invasion, use has had to be made of reserve stocks; with operations on the present scale, and without additional supplies, the stocks of Luftflotte 3 will suffice for another month, (i.e. from the 30th July). Supplies of M/T fuel are now obtained from the Army. Near Dijon two supply dumps were destroyed by sabotage and if raids on railway communications continue, shortage of fuel will become a real danger.

C. F L A K.

1. Organisation and Operations

When the Command of III Flak Korps was formed, it was decided on grounds of economy in manpower and material to omit the Divisional Staffs and this arrangement has worked very satisfactorily. The procedure adopted on the Eastern front of subordinating for operational purposes all Flak in any Korps area, to the Flak Commander, cannot be so readily applied to the invasion front. The S.S. Units continue to use Flak simply as an infantry weapon and they ignore the advice of the Flak Commander. The employment of Flak against ground targets using the same firing positions as for anti-aircraft defence has not been a success because the enemy has exact knowledge of our Flak positions. He is thus able to cover our batteries with artillery fire and cause serious deficiency in our firing capacity. It is, therefore, essential in such cases to take up gun positions for land fighting in good time as it is impossible to change positions under enemy fire.

As the Army artillery, other than the coastal batteries, had only one issue of ammunition and as reserves were not at first forthcoming, it often happened that Flak batteries, used as a last resort, prevented an enemy break-through.

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From the 6th June to the 16th July the casualties sustained by Flak Sturm Regiment 4 amounted to 4 Officers and 76 men killed and 7 Officers and 370 men wounded or missing. Claims amount to ten tanks destroyed and 60 aircraft shot down.

2. Supply Situation

The III Flak Korps was only formed at the beginning of the Invasion and the number of M/T vehicles is too small. All the units have only commercial models of various types and the cars are covered in. As an immediate measure roofs were cut open in order to make observation of enemy aircraft possible. The tyre situation is bad and units are forced to buy replacements in the black market. The total losses in vehicles throughout the Flak Korps amount to 360 vehicles, mainly lorries, most of these being caused by enemy fighter-bomber attacks during the move to the invasion front.

Reinforcements come from Germany as for the time being no vehicles can be supplied from the M/T pools at Limoges and Mont de Marsan on account of partisan activities. The lack of repair installations within the units is keenly felt.

Fuel and oil supplies were difficult from the very beginning and the quantities available to units were quite insufficient. Flak Korps III has the impression that with a little foresight and improvisation, many difficulties could have been avoided. The co-operation with the Todt Organisation, which answered every call for repair machinery and gear, is excellent.

D. THE INVASION AND THE WEATHER

The most widely differing opinions have been given by both English and neutral sources concerning the favourability of the weather at the beginning of the invasion and about the British Meteorological Service forecasts. Whereas the English radio stated that the weather was ideal, the Press had it that dissatisfaction had been expressed with the forecasts. The following is an attempt to clarify these contradictions.

A report in the Press of the 10th June shows that the English had three days at their disposal for launching their invasion. The first day it was impossible because the weather was too bad. On the second day it was decided to launch the invasion as otherwise it would have been necessary to wait another fortnight. From this report it is clear that tidal conditions along the invasion coast, changing every 14 days, must have been of the utmost importance in choosing the exact time for the invasion. It was not possible to wait for a date which promised to be followed by a long spell of fine weather. It was an essential condition, however, that the weather should not be such as to prevent the use of certain weapons.

In order to determine how far the enemy High Command had taken weather conditions during the first days of the invasion into account, and to what extent it was either surprised or hindered by them, it is necessary first to explain briefly the geographic and tidal conditions prevailing in the landing area.

The landing positions lie in the Seine Estuary which opens to the North and has a maximum depth of only 38 metres. The nature of the coast and of the beaches varies greatly to the West of the mouth of the Seine. Chalk cliffs reach as far as the Northern bank of the Estuary and further chalk cliffs are also to be found East of Trouville, East of Hougate and between Arromanches and Grandcamp. There are sand dunes in the region of the Orne Estuary between Cabourg and Grandcamp, North of Laurent - Villerville and on the East coast of the Cotentin Peninsula. The beach is flat and sandy between the Seine and the Orne and also to the North of Bayeux. The Plateau of Calvados lies between two stretches of sandy beaches and is covered with craggy rocks flooded by the tide. The beach on the Eastern shore of the Cotentin Peninsula is sandy but interspersed with rocks. Above it stretches a sandy and rocky belt of downs which carries the Island of Marcouf and stretches from

Cap de la Houge in the North West as far as Grandcamp.

The landings took place in the region of the Orne Estuary, North of Laurent as well as East of St. Mère Eglise with the main thrusts in the areas with flat sandy beaches and sand dunes. The laying of mine fields in the shallow coastal waters was possible only to a very limited degree. The landing obstacles could be readily recognised at low tide and were easily cleared. The airborne landings were designed to disrupt communications with the hinterland and thus facilitate the landings themselves.

The tidal conditions decided the timing of the attack. Though changes in the height of the water through high and low tides are influenced by the moon, the time and extent of the ebb and flow is also strongly influenced by the shape of the coast and its relation to the Ocean. The changes in the height of the water are generally much smaller along the English coast than on the opposite shores of the mainland. The smallest changes in the level of the water are between Orne and Vire. The biggest tidal rise was observed in the Bay of St. Michel on the South West coast of the Contentin Peninsula.

The tidal wave forces itself into the Channel from the West. It reaches Brittany and the Scilly Islands some four hours after the zenith of the moon and takes another seven hours to get to the Straits of Dover. On the night of the 5th/6th June, high tide on the Western tip of Brittany was at approximately 0500 hours, at the Northernmost point of the Contentin Peninsula, it was at 0830 hours, at the mouth of the Orne about 1045 hours, and at Calais at about 1200 hours. In the Seine Estuary the water rises very quickly from low to high tide and then remains unchanged some 2½ hours before slowly falling again. Low water at the Mouth of the Orne occurred at 0600 hours on the 6th June and from about 0630 hours the water began to rise very quickly.

On the morning of the invasion, the sun rose at 0553 hours. Between 0400 hours and 0545 hours the bombardment by Naval guns was opened up against the various landing sectors and at about 0545 hours a smoke screen was laid down. At about 0700 hours the actual landing started in rapidly-rising tidal waters. Landing operations were suspended at 1100 hours when high tide was reached.

From the foregoing it is apparent that the enemy had made a careful study of the local geographical conditions and made full use of them.

In assessing the effects of the weather on the invasion, the following observations are pertinent. The original plan for a landing in the night of 4th to 5th June was postponed for 24 hours because of the weather. The wind and sea conditions could not have been greatly different from those of the following night but airborne units would have been forced to fly through the cold front over the Channel. Apart from this the deterioration in the weather forecast for the invasion area during the morning of the 5th would have made operations by fighters and bombers more difficult. On the actual night of the invasion, large formations were able to approach under the ceiling of loose cloud at 500 to 1,000 metres. It was still rather squally, however, and some of the airborne troops were airsick. Under cover of cloud, the Naval forces could approach unobserved and unmolested by the Luftwaffe. The low bank of cloud on the morning of the landings was further intensified at the beach-heads by smoke screens which were very effective. During the afternoon the clouds dispersed and the enemy Air Forces were able to give full support to the landing troops. The weather was also suitable for further airborne landings on the night of 6th/7th.

/Summing

Summing up, it can be seen that the weather situation was not unfavourable for an invasion. It must be assumed however that the worsening of the weather on the afternoon of the 8th did hinder it, as owing to the rain and low cloud, the enemy was not able to give sufficient air support to his land troops. It was the task of the English Meteorological Service to keep the Operational Commands informed of the weather situation in the invasion area. That Eisenhower was clearly aware of the weather conditions was shown by the calling-off of the operation for the 5th June and his decision to go forward with his plans on the 6th is said to have been due in some measure to political pressure. We can safely assume that the enemy was in possession of full details concerning the weather as he had many more sources of information than we had, both at sea and from his own bases.

To forecast the development of the overall weather situation of the following days was much more difficult. A broadcast from the Daventry transmitter on the 21st June indicated that the enemy made use of a statistical work dealing with the weather forecasts in England for the last 45 years. This type of research was already developed before the war by the German Institute for Long Term Weather Forecasting situated in Bad Homburg. This Institute also predicted that the weather in Western Europe would change on the 6th June and that according to statistics a considerable period of fine weather could be expected. We can, therefore, assume that the enemy came to the same conclusion. As opposed to this, the German Meteorological Service indicated on the 4th June that the enemy had not taken advantage of three previous periods of fine weather and that further fine periods in the coming weeks could not be depended upon with any certainty. This tends to show that the system employed by the Meteorological Service, using current observations of the weather up to a height of 20 km. and the use of more modern methods leads to far better results in making long-term forecasts than the employment of statistical methods alone.

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