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P.R.C.

GERMAN AIR DEFENSE
1933-1945

Part II

EXPERIENCE GAINED IN AND LESSONS TO BE LEARNED
FROM THE GERMAN AIR DEFENSE EFFORT

CHAPTER 1

BASIC DOCTRINES OF AIR DEFENSE

I. DEVELOPMENTS PRIOR TO WORLD WAR II

The fundamental purpose of air defense activities is to prevent hostile air action against friendly territories. This purpose can be considered achieved if the means available to the enemy for air action against friendly territory are destroyed.

German concepts provided for an offensive accomplishment of this mission: from the first day of warfare on a strong bomber arm was to destroy the enemy air forces at their bases and through attacks against air armament factories.

This basic doctrine can be traced like a red thread throughout the German field manual on the conduct of air operations, Air Manual #Dv-16, and it is on the basis of this doctrine that the build up of a strong bomber arm was stressed in the initial stages of the development of German air power.

1403 The doctrine found expression in the program established for the activation of air units, which provided for the creation of fighter and bomber forces in a ratio of 1:3.

With the entry of German military forces, in March 1936, into the Rhineland, declared a demilitarized zone in the 1919 Treaty of Vereailles, Germany for the first time incurred the hazard of military intervention by foreign powers. At the time the newly established German air forces, known as the Luftwaffe, comprised

5 bomber wings totalling 15 groups

1 dive-bomber wing of 3 groups

2 fighter wings totalling 7 groups.

The most potent threat which this air armada presented was its strength in bomber forces, although the Ju-52, Do-23, and Hs-123 standard bomber models then in use could not be considered particularly modern when compared with the models in foreign air powers. There can be no doubt that the prestige of the Luftwaffe was one of the primary causes that foreign powers accepted without resistance the fact of German reoccupation of the Rhineland.

On the German side this was accepted as a politico-military success, and it did much to strengthen the concept of the wisdom of placing primary emphasis on the creation of a strong bomber arm.

1404 The capabilities of the German aircraft manufacturing industry served to support the intentions of the German Government:

In January 1939 the firm of Heinkel offered its He-111, a bomber superior in speed to all foreign fighter models then in existence. The firm of Junkers had a similarly modern bomber in its Ju-86, powered by Diesel engines, while the firm of Dornier had its Do-17, a fast bomber as elegant and maneuverable as a fighter plane.

In the fighter field the Me-109, together with the Do-17, made its appearance at the International Aviation Meet at

1405 Duebendorf. With its at that time sensational speed it demonstrated its absolute superiority over all foreign models.

This opened up brilliant prospects for the Luftwaffe, which thus had bomber and fighter models superior to anything foreign powers could produce.

Concurrently with the above developments, the antiaircraft artillery grew into an air defense force of unprecedented precision, armed with guns of excellent construction and equipped with excellent aiming devices. Although consideration had to be given to the fact that the excellent firing results registered were obtained in practice firing against targets towed at speeds of only between 108 and 120 miles, these results could be described as satisfactory at the time in view

1405 of the outdated bomber types in service in foreign air forces.

The above circumstances contributed to create the impression in the minds of the German Command that Germany with her Luftwaffe had superiority in both attack and defense. This feeling of security must be regarded as a governing factor in the politico-military calculations of the German Government.

Relying on the striking power and superiority of its Luftwaffe Germany in 1938 accepted the risk of military conflict arising from the entry of German forces into Austria and the annexation of the Sudetenland, and continued on this hazardous political course in the spring of 1939 with the liquidation of Czecho-Slovakia.

1406 In all of these developments the prime factor of military support within the Luftwaffe remained the aggressive air forces, and all strategic planning was based on the premise that these forces in any conflict would have the logical and primary mission of neutralizing hostile agressive air forces and their armament resources until the strategic objective was completely achieved.

The fighter arm also was designed primarily to serve this purpose, since experience in the Spanish Civil War had shown that even the modern types of German bombers in the

1406 execution of their missions had to rely on fighters to protect them against attack by enemy fighters. This realization resulted in 1937 in steps to build up the fighter arm at a forced pace, with the concurrent emphasis on a special type of long-range fighter, the Me-110.

If an enemy in the event of war should succeed in preserving parts of their aggressive air forces against destruction by German bombers and should commit these forces in attacks against German territory the German Command felt fully confident that it could rely on the defense capability of its strongly developed antiaircraft artillery forces.

From the developments described above it is possible to deduce as follows:

1. The concept involving the creation of a strong aggressive air arm in the 1933-1939 period proved the determining factor in the achievment of the expansionistic plans of the German Government.

2. In view of Germany's military superiority in the field of air armaments, foreign powers had to accept these developments as a given factor.

1407 3. German military superiority thus became the key factor in all political planning, meaning that the successful implementation of German policies was possible

1407 only if the necessary military support was available against the opposing political powers.

II. WARTIME DEVELOPMENTS.

THE AGGRESSIVE ACCOMPLISHMENT OF THE AIR DEFENSE MISSION

The commencement of war in September 1939 placed the peacetime doctrine calling for a strong aggressive air arm comprising bombers protected by fighters in the balances. It now remained to be proved in practice that aggressive action against hostile air forces would remove the necessity for defensive action against such forces over friendly territory.

Events proved this doctrine sound in every respect. Not a single Polish bomb fell on German territory, and after a few days of systematic attack against the Polish airfields and aircraft factories, the Polish air forces ceased to constitute a military factor.

If any proof was still necessary that the German fighter arm with its superior Me-109 and Me-110 aircraft was so capable even in missions of a strictly defensive nature that enemy air attacks against areas controlled by German fighters would be impossible, this proof was produced on 18 December 1939, when British bombers attempted to attack Wilhelmshaven. The action can be described as a classical air defence victory for the German fighter arm, since the fighters inflicted losses which obviously were so intolerably heavy that the enemy

found themselves compelled to cease their daytime operations with bomber forces against the German zone of interior.

However, this defense success produced another result, which was not given proper consideration by the German side: From the operation on 18 December 1939 the British Royal Air Force drew the logical conclusion that it would have to shift from daytime to night operations in its strategic air warfare against Germany and proceeded to prepare itself systematically for this purpose.

On the German side this danger was underestimated to such an extent that in October 1939 the development of a night fighter organization was considered as not being a current problem. Fighter units activated in August 1939 specifically for night fighter defense missions were transferred to the daytime fighter forces.

These German views can be explained by the fact that the German Command believed that after a Blitz campaign against France the German aggressive air forces operating from bases along the coast of the English Channel would be able to neutralize British air power. This assumption is evident as early as in September 1938 from instructions given by Field Marshal Goering to the Technical Office of The Reich Air Ministry to develop a fighter with a striking range adequate

for operations across England.

The peacetime doctrine concerning the role of the aggressive air arm was vindicated as strikingly in the 1940 campaign in the west as it had been in the Polish campaign. When air operations commenced against Britain in the summer of 1940, however, it was no longer founded on a realistic basis.

In the light of experience gained in the campaign in the west there should have been no doubts that German daytime bomber operations against Britain would be possible only within the striking range of German escort fighters.

Initially, the Me-109 fighter of the D series had had a total time-in-air capacity of 2.5 hours with its Jumo-210 engine. After installation of the DB-601-A engine, this was reduced to 1.5 hours, and the same cause reduced the time-in-air capacity of the Me110 from 3 hours 40 minutes to 2 hours 40 minutes. With the existing ratio of 4 twin-engine to 10 single-engine fighter wings, and with an operable strength of 248 twin-engine and 1016 single-engine fighters in May 1940 the selection of strategic targets was governed by the striking range of the single-engine fighters. This range permitted a maximum tactical penetration depth of 120 miles at operating altitudes between 15500 and 20 000 feet, and thereby prescribed the limits for bomber operations. Bomber operations were predicated on daytime precision bombing attacks, since the strate-

1409 strategic concept was based on the assignment of airfields and air armament factories as point targets. Under current conditions at the time, the only possibility to destroy such targets was by means of daytime attacks with good visibility offering sufficient expectations of effective bombing.

The outcome of the Air Battle for Britain, which lasted

1410 from August to November 1940, proved the fallacy of the German concept.

In accordance with the pattern which had proved sound in the past, attacks in the first phase of this offensive were directed against the ground service organization of the Royal Air Force. Owing to the limited striking range of the German fighters, however, the attacks struck only the installations located in southern and eastern England, which were within the range of German fighters.

When the Luftwaffe, in the second phase of the Battle for Britain, shifted the emphasis in its selection of targets to the general area of London, it was able to commit its entire strength in single- and twin-engine fighter forces to protect its attacking bomber forces. However, the attacking forces met British fighter defenses as yet by no means decisively weakened. During this phase of the air offensive attrition exacted a heavier toll from the attacker than from the defenders. German single- and twin-engine fighters shot

1410 down over England and over the coastal waters of that country involved the loss of planes and crews, whereas British pilots frequently succeeded in landing and salvaging their damaged planes or could bail out and after landing by parachute were available to man replacements planes.

Through its persistent selection of important military installations in the London area as targets for its bombing attacks the Luftwaffe departed from its own concept, which was stated unequivocally in Field Manual LDv 16 and which had proved sound in the campaigns in Poland and France. It disregarded the stressed priority of attacks to destroy the enemy air forces and their direct resources. Instead it turned its attention to military targets of secondary importance before achieving the elimination of the enemy air forces as the prerequisition for such secondary action.

1411 The reason for this development was obviously the influence of political factors on the selection of targets for attack in air warfare, normally a matter to be decided exclusively in accordance with military considerations.

The attacks against the general area of London were designed primarily to serve a psychological purpose. The maintenance of a constant threat over one of her main nerve centers was to influence Britain to come to peace with Germany. This political move failed at the cost of heavy

1411 losses to the Luftwaffe in both bombers and fighters.

The following can be established from developments in 1940, as described above:

1. As had been the case with the Polish campaign, Germany was able to bring the 1940 campaign in the west to a relatively quick close and to prevent enemy air action against army operations or the homeland. This was due solely to the doctrine established during peacetime and tested in practice in Spain and Poland which called primarily for a concentration of all efforts on action to destroy the enemy air forces and only after achieving this aim to shift to attacks against targets of general military importance and to action in direct support of the Army ground forces.

German air supremacy over the western territories completely deprived the enemy of the initiative during daylight in the conduct of air warfare against Germany and the German military forces.

2. In the air battle for Britain the Luftwaffe, because of the inadequate striking range and inadequate strength of its fighter forces, was unable to put into practice its doctrine calling primarily for action by fighter-protected bomber forces to destroy British air power.

1412 The attempt to wage strategic air warfare without first creating the essential condition of air supremacy over enemy territory was doomed from the outset to failure at the cost of heavy losses in bombers and fighters, which made it imperative to break off the operations.

3. The following principles can be considered as the outcome of the experience gained and the lessons learned from what has been recounted above:

a. The execution of strategic air attack missions is possible only as long as the means available to the attacker are superior to those of the defender.

This superiority will be indicated by the extent of the losses incurred within the limits of tolerance in the operations.

b. Air defense becomes a matter for immediate attention from the moment it is no longer possible to systematically destroy the air forces of the enemy.

c. The successful conduct of air warfare presupposes own air supremacy over friendly and enemy territory.

d.

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THE TRANSITION TO DEFENSE IN NIGHT AIR OPERATIONS

The German military command drew the proper logical inferences from the situation existing after loss of the air battlefor Britain and decided that it was now essential to concentrate on a speedy and purposeful build up of air defenses against night attack.

Realizing its inability to strike the British night bombers in England by means of bombing attacks the command renounced its principle of an offensive solution of the air defense mission and adopted the defensive solution with the purpose of shooting down the British night bombers during their operations against territories under German control.

This plan was effectuated with remarkable circumspection, speed, and thoroughness. The way in which the night fighter arm was developed under direction by General Kammhuber can be considered as an outstanding performance of the Luftwaffe in tactical, technical, and organizational respects.

A second logical conclusion to be drawn from the situation as it existed in the autumn of 1940 was that the means had to be created to make possible the resumption of strategic air warfare against the entire area of the British Isles. This conclusion the German Command failed to draw or act upon.

Even if the fact is taken into consideration that the

1413 right course was adopted in measures to continue development of the new He-177 bomber, a 4-engine model, the fact remains that nothing whatever was done to create an escort fighter

1414 with a commensurate striking radius, something which experience had shown to be an inescapable necessity.

The reason for this error of omission was that the politico-military plans of the German supreme command authorities for 1941 were oriented towards the east. The idea here was to conquer the Balkans and Russia in swift action and then, supported by the gigantic resources of these areas, to resume operations, in about 1942, designed to decide the issue with Britain and to bring the war to a successful conclusion by the sheer weight of an absolute superiority in military potential alone. This whole concept was based on calculations including one unknown factor, Russia, calculations which it was assumed with confidence could be worked out satisfactorily.

The starting point in these calculations was obviously the conviction that, in defensive warfare, the fighter forces stationed along the Channel Coast could handle the air defense mission during daylight, while adequate security was assured by the night fighter and antiaircraft artillery forces against attack at night.

In the eastern theater the aggressive air forces were to be committed, in accordance with the tried and tested pattern

1414 of the past, in the primary mission of destroying enemy air power and thereby eliminating any possibility of enemy air action against the operational zones of the army forces on the ground and against the entire extent of the rear areas. The basic factor in calculations here was the assumption that the air forces of the eastern states were not modern enough to offer successful resistance against the accomplishment of this mission.

1415 These calculations proved sound in 1941 in military respects, so far as daytime air defense in the west and the destruction of the hostile air forces in the Balkans and in Russia were concerned.

Two points were not resolved in accordance with plans:

1. The plan for a quick end to the campaign against Russia designed to end the possibility of a "second front."

2. The plan for night air defense against the British bomber forces, which executed their nightly operations against the German interior systematically and on a steadily increasing scale unimpressed by the losses they incurred.

It was in the nature of things, in view of the immense requirements in personnel and material for the purpose, that the German night fighter organization could not be expanded at a pace commensurate with that at which the Royal Air Force was able to increase its aggressive air units and perfect

them in the tactics and techniques of night attack.

Obviously, the German Command calculated that in the long run a perfect night fighter system and a continuously growing antiaircraft artillery system would achieve the desired result of inflicting such heavy losses on the enemy that they would be unable to continue their operations.

The time lead which the enemy had gained was made indisputably clear by the 1000-bomber attack carried out by Royal Air Force units against Cologne on the night of 30-31 May 1942.

The reaction of the German Command was expressed in requirements and recommendations for the reinforcement and expedited development of the night fighter arm, objectives which could not be achieved in such short time that they could be expected within the foreseeable future to exercise any decisively deterring effect on the enemy.

The fact that while this was going on its aggressive air units were committed in the southern and eastern theater left the German Command no other choice than to do everything possible to improve the air defenses by night fighter and antiaircraft artillery forces against the Royal Air Force night attacks against the German interior.

Hopes were probably entertained here that it would still be possible by means of a new offensive in the summer of 1942

1416 to bring the Russian campaign to a successful close, in order then to have all air power again available for aggressive air warfare against Britain. This was due in no small degree to Reich Marshall Goering's view, as stated in a night fighter forces conference on 1 September 1942, that this would be a more economical solution for the night air defense problem than the establishment of a gigantic organization for a strong night fighter arm.

This optimism of the German Command is all the more astonishing since it was known as early as in the spring of 1942 that the US were building up a strong force of 4-engine bombers in Britain and that these bombers in their initial operations against targets in France in August 1942 had produced an entirely new problem for the defending German daytime fighter and antiaircraft artillery forces, for the fighter forces because of the enormous firepower and resistance to weapons fire of the new bombers, for the antiaircraft artillery because of the extraordinarily high altitudes at which the new bombers operated, altitudes which were barely within the extreme effective range of the standard 88-mm AA guns.

No decisively important precautionary measures were

1417 introduced on the German side against this threat which was shaping up for the German homeland.

In the light of a sober appraisal of the overall military situation as it existed in the autumn of 1942, with due consideration to the diversified commitments of Germany's military potential in the southern and eastern theaters for the conduct of mobile warfare, the the very least that should have been done was to establish plans, with the highest priority, designed to achieve the following requirements:

1. A strong force of heavily armed long-range fighter aircraft in the west to protect the armament potential and render it invulnerable without regard for possible developments in any theaters;

2. The establishment of modernized antiaircraft artillery forces capable of effective action against aircraft increasingly resistant to weapons fire and operating at increasingly great altitudes and speeds;

3. A purposeful exploitation of all possibilities to establish a perfect defense system against daytime and night air attack to protect the homeland until conditions developed which permitted the resumption of offensive air warfare.

Decisions and measures of the above nature were all the

1417 more necessary in view of the fact that all prerequisites were lacking at the time to materialize any intentions which might have existed to eliminate the air threat in the west

1418 through attacks against the Western Allies' air forces, and because no tangible plans existed to create such prerequisites.

For any such purpose the following would have been required:

1. A bomber equal in quality to the American B-17 or B-24 types;

2. For the protection of such bombers a fighter with a tactical striking range extending to the extreme limits of the territories under hostile control in Europe and Africa, including the Azores.

The Ju-88 did not meet the requirements stated under (1) above, and no reasonable indications existed that a fighter type would soon become available which could have been considered suitable for the missions described in (2) above. Numerous but unsuccessful experiments were carried out with the He-177 model in efforts to solve the technological problem of a single propellor driven by two engines.

For the above reasons no realistic basis existed for any concept of an aggressive solution of the air defense problem in action against the western opponents within the fore-

foreseeable future.

ON THE DEFENSIVE IN ALL THEATERS OF OPERATIONS

1943

1419 After the catastrophe at Stalingrad in January 1943, the German Command found itself compelled to abandon all hopes of eliminating the "second front" in Russia together with its utopian plans for once again committing its aggressive air forces against the Allied air forces in the west.

At the same time the Anglo-American air forces were beginning to assume the initiative in air warfare in the southern theater.

If there was any need, after a sober appraisal of the military situation, for proof of the high significance of the need for the German side to find a sound solution for the air defense problem, that proof was forthcoming in a striking manner when the US air forces in January 1943 extended their operations to attacks against targets within Germany.

No completely effective solution had been found as yet at that time for the problem of night air defense. Successful results had admittedly been achieved at adequately tolerable costs for the defense, but no decisive results had been obtained which could have served to prevent continuation by the Royal Air Force of its attacks. Every time the German defenses achieved above-average success, the Royal Air Force within a

1419 short while countered with changed attack tactics and techniques which again placed them ahead of the German defense tactics which were geared to a particular system.

In spite of this the fact remains that the German night defense system was founded on concepts adapted to the exploitation of the most favorable current opportunities and geared to develop with vision all avenues which held out promising prospects for the future. This is evident in the long-range planning undertaken for improvement of the night fighter organization through equipment with radar instruments, in the introduction of the He-219 night fighter model and its equipment, and in the progressive modernization of the antiaircraft artillery through equipment with more effective guns (88-mm Type 41, and 105-mm and 128-mm guns), and electrical fire control equipment, such as radar target locating instruments and Models 36 and 40 fire control instruments.

It is in the nature of defensive warfare, however, that the attacker always has the advantage of the first move, which involves all the advantages of choice of time and areas for the attack.

The situation was even far less favorable in the field of daytime fighter defense. The extent to which the daytime fighter forces had been increased, both in numerical strength and in point of technical performances, in the west, was in

1420 no way commensurate with the size of the mission they were called upon to perform when the US air forces commenced their air attacks against targets in Germany. This in spite of the fact that events in the zone of the Third Air Fleet had proved unmistakably that the daytime fighter forces with their current equipment could not put up an effective defense against the American 4-engine units. The insignificant losses inflicted by the daytime fighter forces on attacking US air forces in the autumn of 1942 should have been recognized as an urgent signal that a fundamentally new factor had been introduced in these areas and that serious thought should be given to ways and means counter to/the new threat by an enemy with exceedingly great potentials and supported by an invulnerable armament supply base on the far side of the Atlantic Ocean.

Logical reasoning along these lines in the light of the ruling circumstances should have led to the following conclusions:

1. That the concentrated form of attack by the US forces must be countered by tactics of concentrated fighter defense;

2. That a concentration of fighter forces to obtain effective defensive action in all threatened areas was predicated on the following conditions:

a. Transition from the peripheral system of air defense with its concurrent dispersion of forces to a system of defense from the interior linethrough the concentration of

1421 the available fighter forces in an areas from which they could reach all threatened areas;

b. Increased time-in-air capabilities for fighter aircraft through the installation of jettisonable reserve fuel tanks;

c. Improved armament for fighter aircraft designed to achieve concentrated fire effect at ranges between 440 and 880 yards;

d. Fighter pilots trained in instrument flying and blind navigation which enabled them to master the conditions of bad weather for commitment in large-area operations;

e. Equipment of fighter aircraft with DF apparatus for blind navigation and to enable them to land under bad weather conditions.

1422 3. Reconversion of the former twin-engine fighter units and their reequipment with twin-engine aircraft with centrally controlled heavy fire power and with long-range capabilities for commitment as large-area and all-weather fighters.

There can be no doubt whatever that the German Command was fully aware of the necessity to increase its fighter forces considerably in the west to counter the daytime attacks by US air forces. However, it was impossible to meet the requirements because of the shortage of forces available. The only

1422 way in which conditions could have been created to meet the needs would have been to have established a large-scale program for the reinforcement of the daytime fighter forces immediately after loss of the air battle for Britain, or at the very latest as soon as the decision was taken to take military action in the east, since Germany from then on obviously had to adapt to a war of long duration.

Even the entry of America, with its enormous potentials, into the war against Germany in December 1941, failed to produce vigorous action on the part of the German Command to increase its air armaments, although industrial circles spontaneously took the initiative, in the form of the memorandum submitted by Director F. W. Siebel, by offering well-founded advice in this direction.

This omission left the German Command no choice up to 1943 but to shuffle its fighter forces around to the currently critical defense areas. The forces in these areas were reinforced locally and temporarily through forces moved in from the eastern theater to the zone of interior, to the western

1423 and/or eastern theaters and vice versa in a constant tiring and wearing roundabout. This system of creating one gap in order to close another could not possibly produce positive results.

1423 It was August 1943 before withdrawals from other theaters finally brought operable strengths in the Zone of Interior up to 405 single- and 79 twin-engine fighters and produced the first sizable defense successes in the form of 60 and 70 4-engine bombers downed on the 17 August and 14 October, respectively, loss percentages which exceeded the tolerance limits which the enemy could accept as a justifiable hazard.

At this moment the German Command failed to act in accordance with an old military axiom:"After victory tighten your helmet!"

The minutes of the comman conference at Reich Marshal Goering's Headquarters in October 1943 reveal clearly that, the moment the daytime air defense--a source of constant concern in the past--, appeared to have proved intact, the Luftwaffe High Command immediately returned to its concepts of resuming offensive air warfare against Britain. In one point, however, concepts at this time differed fundamentally from the original doctrine: The objective in the newly planned offensive was to counter the nightly intimidation attacks of the Royal Air Force with similar attacks against large British cities, primarily against London.

This departure from established doctrines proved at the same time a serious fallacy: The German retaliatory attacks were mere pinpricks compared with the powerful blows they

1424 were intended to avenge, and, furthermore, their bombing was nowhere near as accurate as that done by the British units.

The only measure which would have been logical in the existing situation would have been to follow the pattern which had served so well in Poland and France of creating the possibility to strike the enemy air forces in their bases and by attacks against their armament sources. These possibilities could not be created through normal air warfare with night bombers but would have required the commitment of long-range night fighters capable not only of bombing attacks but also of attacks with weapons fire. Attempts in this direction started in October 1943but ceased again after a very short while. Resumption of this type of action was recommended urgently time and again by the field commands in 1943, but all such recommendations were rejected by the Commander in Chief of the Wehrmacht, who failed to realize the tactical necessity.

THE NIGHT FIGHTER DEFENSE CRISIS OF 1943

At the time when the German daytime fighter defense forces were begibing to prove a serious hazard to enemy air forces operating over Germany, the German night defense system, both by night fighters and antiaircraft artillery, found itself in the most serious crisis hitherto experienced. This crisis started when the Royal Air Force units attacking Hamburg on

1424 the night of 24-25 July 1943 used tinfoil for the first time and at a single stroke put out of action the Wuerzburg radar instruments on the functioning of which the German night fighter defense system (waiting position tactics) as well as the direction of antiaircraft artillery fire by electrically procured data were predicated.

This event revealed in an alarming manner how dangerous

1425 it was to base the entire air defense system on the technical functioning of one single type of instrument. It remains incomprehensible that the possibility of this type of interference had been known to the Luftwaffe High Command since the autumn of 1942 from German experiments with tinfoil and that the only conclusion drawn from this knowledge was that the matter was to be treated with the utmost secrecy in order to preclude any possibility of the application of the tinfoil method of interference by the enemy. The inescapable result of this faulty decision was that after the fateful night of 24 July 1943 the first steps had to be initiated in a feverishly urgent search for countermeasures against the British tinfoil radar interference method. It must be considered as a serious error of omission on the part of the Luftwaffe that no measures had been taken immediately after discovery of the effects of tinfoil on radar operations to develop an "anti-tinfoil" device, such as the Wuerzlaus and Taunus instruments developed later

1425 in haste and under the pressure of enemy attack, and to build such a device into all radar instruments as speedily as possible as a precautionary measure.

Generally speaking, the following inferences can be drawn and lessons learned from the above:

1. It must be assumed that the enemy within a reasonable time will find ways and means to disturb or completely eliminate the functioning of any electrically functioning technical system used in air warfare and relying on electrical frequencies.

2. Concurrently with the development of any technical system intended for introduction in air warfare it is necessary to devote equally energetic research to the development of methods for serious interference with its functioning. From this point, in turn, it is essential to develop countermeasures to prevent such interference. This chain of development must continue in an interplay of action and reaction right up to the end of a war.

3. In the field of technology every new idea developed must be considered being "universally existent." It must be assumed that what might be called "human antennae" will exist on the enemy side which sooner or later will pick up the new idea and translate it into action.

1426 THE DAYTIME FIGHTER DEFENSE CRISIS OF LATE 1943

While the night fighter and antiaircraft artillery forces were beginning to recover from the shock of tinfoil interference, with the night fighter arm in particular once again achieving some measure of success with the new methods of direct target night fighter defense and night fighter pursuit tactics, a new crisis was developing in the field of daytime fighter defenses. This crisis was due to the radically changed tactics of the US air forces, which created for the defendin German daytime fighters the problem of all-weather operability and of combat action against enemy bomber forces operating under fighter escort protection over Germany.

The German fighter forces were not adequately prepared for the accomplishment of either of these two missions:

1. Both in training and in point of equipment the German fighter forces lacked the ability to navigate closed closed cloud ceilings in order to operate in concentrated formation against the enemy bomber units approaching above the clouds to attack their targets with blind-bombing methods.

2. By their nature, twin-engine fighters could have coped with such conditions. However, the German twin-engine fighter units lacked aircraft with technical capabilities adequate for action against the US fighters. Furthermore,

1427 they were numerically too weak at the end of 1943 even for really effective action against 4-engine units operating without fighter escorts, something which happened only very rarely from the autumn of 1943 on and then was due to faulty planning on the part of the enemy in respect to the point and time at which their bomber forces were to meet the assigned escort fighters.

3. At great expenditure the Me-109 and FW-190 day-time fighter planes had been equipped with spare fuel tanks, supplementary weapons, and armor protection for large area operations against the US 4-engine bomber forces. All this added weight so far reduced their technical performances that they were no match in fighter-fighter combat against the American P-47 and P-51 models at high altitudes.

All of the above weaknesses existed in spite of the fact that the field commands had not failed to draw attention to them and had recommended ways and means to remedy them.

Owing to a report he had submitted concerning the technical superiority of the American P-47 fighter aircraft over the German FW-190 at altitudes above 30 000 feet the present author, at that time in command of Fighter Command Holland-Ruhr Region, as early as in April 1943 had to answer personally to Reich Marshal Goering in the presence of General Galland, Chief of Fighter

1427 Forces. Reich Marshal Goering refused to be convinced that the report was true and minimized the performances of the American fighter aircraft models. The only concession he was willing to make was that in each fighter wing one group equipped with Me-109 aircraft was to be modified as a "light" fighter group for special high-altitude performances. The mission of this group was to be to contain the enemy fighter escorts while the "heavy" and twin-engine fighters attacked the 4-engine bombers thus deprived of the fighter escorts.

The field commands in 1943 also stated the requirement that fighter pilots should receive training in blind flying. This demand received small consideration in Luftwaffe High command circles at the time and was rejected with remarks concerning the inacceptable burden it would involve for the training establishment.

A sober appraisal of the situation as it was developing in the field of daytime fighter defenses at the end of 1943 should have led to the following conclusions:

1. That it was impossible to expect adequate protection from fighter forces which were dependent on favorable weather conditions once the US air forces adopted the tactics of blind bombing in attacks against targets located in bad-weather regions, and of giving their bomber forces fighter escorts which enabled them to

1428 penetrate to their target areas protected by fighters with a striking range adequate for the purpose. It should have been realized that against such forms of air attack the entire German fighter defense system as it existed had become antiquated.

2. The effectiveness of the antiaircraft artillery defense system was seriously curtailed because of the extreme altitudes at which the US 4-engine bombers operated. Furthermore, antiaircraft artillery operations were predicated on the use of electrical equipment to furnish the necessary firing data for action against aircraft flying above cloud ceilings, and this complicated matters seriously. Added to this was the fact that, since the enemy had commenced using tinfoil it was no longer pos-

1429 sible to rely on the proper functioning of antiaircraft radar equipment.

3. The impossibility to take direct aggressive action against the enemy bomber forces in the form of attacks against their bases within the foreseeable future created the categoric necessity to give absolute priority within the whole armament program /to measures aiming at the reinforcement and modernization of the air defense forces.

4. At the end of 1943 the following possibilities

1429 existed for the creation of effective air defenses:

a. Daytime Fighter Defense. Conversion of the twin-engine fighter units to all-weather fighter units equipped with Do-335 aircraft. Propelled by one suction and one pressure propellor, each driven by a separate engine installed within its body, this was the only available model which held out prospects of a twin-engine fighter with performances superior to those of the American single-engine, single-seater fighters.

Reequipment of the single-engine daytime fighter units with Me-262 aircraft. This would have increased their striking power during good weather to such an extent that the hazards of precision bombing attacks with visual aiming would have been too great for the enemy to accept.

b. Antiaircraft Artillery Defenses. Acceleration of the antiaircraft artillery armament program so far as the manufacture of Model 41 88-mm and 128-mm AA guns and interference-proof AAA radar equipment were concerned.

The German Command failed to take commensurate measures in the situation as it existed at the end of 1943 which could have served to improve the performances of pilots and their aircraft.

In the field of antiaircraft artillery the modernization program continued to proceed in accordance with an established

1430 plan and no special measures were taken to accelerate its realization.

A more serious and realistic appraisal of the air defense situation would have been particularly important at the end of 1943, since the forces of the Western Allies in the southern theater had been advancing northward steadily in Italy, and because the capture of the Foggia airfield gave the enemy a base which enabled their strategic air forces to strike at targets in southern Germany, eastern Germany, Austria, and the Balkan areas.

Sober consideration necessarily would have produced the realization that immense air defense forces would be required as long as no possibility existed for an aggressive solution of the air defense mission by strong German aggressive air forces.

Instead of bending all efforts towards placing main emphasis on the air defense mission, the Luftwaffe High Command in 1943 occupied itself far more intensively with the problem of a resumption of offensive air warfare against Britain under the slogan of "vengeance." Enormous efforts were expended in the autumn of 1943 to build up to a great strength the bomber forces, which had been so seriously depleted in the eastern and southern theaters, and prepare them for operations against Britain. Reich Marshal Goering, whose prestige had suffered

1430 seriously in the field of home air defense, was desperately anxious to restore that prestige by means of a successful air offensive against Britain. Therefore he was exceptionally receptive to all recommendations made by the Director of Operations against Britain, who, with the enthusiasm and ambition of a youthful and successful front line officer endeavored to accomplish his assigned mission. After lengthy preparations, all supported by a top priority program, the air offensive against Britain commenced in January 1944.

The whole offensive was no more than a duplication of British night attack tactics and collapsed after a short while because of the lack of aircraft and crews and because of the repeated disruption of the ground service organization in the west by continuous Allied air attacks. Remembering the German offensive of 1940, which they had called the "Blitz the British sardonically but correctly named the new offensive the "Baby Blitz."

The whole operation did nothing to support defense against the Anglo-American air attacks, since it was not directed against the Allied air forces. Instead, it was an abortive attempt with inappropriate means to apply the axiom of the Commander in Chief of the Wehrmacht to "Break terrorization through terrorization." In this attempt the substance of the German bomber arm was wasted shortly before it could

1431 have proved a significant factor in defense against the Allied invasion in the west in June 1944.

AIR DEFENSE WITH INADEQUATE MEANS 1944

When the Anglo-American air forces in February 1944 commenced their offensive against factories of the German air

1432 armament industry the time had passed in which it would have been possible for the German Command to adopt a course which could have resulted in an effective strengthening of the entire air defense system.

Nevertheless, these attacks served to bring the Luftwaffe High Command to a realization of the problems of air defense. Suddenly the realization dawned that it was imperative to make an all-out effort to protect the Zone of Interior against the deadly massed and precision-bombing attacks by US 4-engine bomber forces and against the devastating area-bombing attacks by Royal Air Force units.

It was clearly understood that the fighter defenses must be increased speedily and radically, since improved defense results could not be expected from the antiaircraft artillery because of the unsolved problems of how to protect the electrical fire control equipment of the antiaircraft artillery within the foreseeable future against interference by tinfoil

1432 amd by enemy radio and radar jamming.operations.

The direly important problem in this crucial moment was that of choosing a course which would strengthen the defenses in a manner to achieve a greater repelling effect through large numbers of enemy planes destroyed.

Two possibilities existed here for the daytime fighter arm:

1. A numerical increase consonant with the principle of using "masses to counter masses."

2. Improved performances in an effort to balance numerical inferiority by qualitative superiority.

The Luftwaffe High Command chose the "mass to counter mass" course by increasing the number of its fighter units.

1433 This decision can be considered to have been due to the following causes:

1. It was assumed that German fighter units equipped with the standard Me-109 and FW-190 could immediately shoot down larger numbers of bombers if enough German fighters were available to contain the enemy escort fighters while the bulk of the German fighters attacked the enemy bomber forces.

2. The fact that orders from Hitler to reserve the Me-262 exclusively as a fast bomber precluded all

1433 hopes of relying on this new model which, as a fighter, would have been vastly superior to any other fighter in existence.

3. The preference of industrialists for orders calling for mass production of types already in serial production rather than for orders for a new type, which would have required lengthy preparations.

4. The fact that no new fighter model with superior performances was available at the time with the exception of the Me-262. The latent possibilities of the Do-335 were not fully recognized.

This situation was a logical and inescapable consequence of the former failure to take timely action towards developing and placing in serial production superior fighter models to take the place of the Me-109 and FW-190.

The numerical increase of the fighter forces was achieved through marvellous organizational and technical performances, but the hopes that this would bring about a marked improvement and strengthening of the daytime and night air defenses proved a fallacy.

This circumstance can be traced to two causes:

1434 1. Daytime Fighter Defense.

a. Apart from a small number of Me-109 planes powered by DB-605-AS engines, the large bulk of all

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aircraft produced were inferior to the American fighter models.

b. No solution had been found for the bad-weather operations problem in daytime fighter defense, so that it was possible to commit daytime fighters in mass operations only during large-area fair weather conditions.

c. Owing to the pressure of time and the lack of adequate fuel supplies, fighter replacement personnel were inadequately trained.

d. The combat morale of fighter pilots was poor, since they felt that they lost the confidence of their Commander in Chief and since they themselves had small confidence in their weapons and their own ability and therefore conceded that their opponents had better chances of success.

2. Night Fighter Defense.

a. Success in night fighter operations had always been a matter of expert ability in blind flying and instrument navigation, night vision, and weapons aiming at night, plus experienced airborne radar and radio operators.

The inexperienced crews and new planes used to bring about a numerical increase in operations decreased performance standards and did nothing to increase the chances of success. Under the extraordinarily difficult condition

1434 of the times it was still the old "flying aces" who shot down enemy planes, some of them running up scores of as many as seven enemy planes downed in one single mission.

1435 b. During periods of unfavorable weather, and these were the periods which the Royal Air Force intentionally selected for its attacks, only planes manned by experienced top-flight crews were able to take off, so that the numerical strength of the night fighter arm could rarely be brought to bear.

c. From the autumn of 1943 on fuel shortages brought about a further drastic curtailment of night fighter operations.

Peak strengths achieved in the fighter defenses of the Home Air Defense Zone were as follows:

Daytime Fighters. On 2 November 1944 with 695 conventional type operable aircraft distributed over an area extending from the Bight of Helligoland to Vienna.

Night Fighters. On 28 November 1944 with 684 operable aircraft distributed over the same area as the daytime fighters.

At this time the number of fighters committed in a single large-scale penetration over Germany by the US air forces was up to 1400.

From all of the above it is clear that the German

1435 Command had failed to even approach realization of its plan to "oppose mass by mass" in daylight operations when it is taken into consideration that

a. the enemy could concentrate their 1400 fighters within the penetration area of their escorted bombers, and

b. The full German strength in defense fighter could only be brought to bear under favorable weather conditions which permitted movements over long distances and only in centrally located areas, such as Central Germany.

1436 At night the number of night fighter aircraft available would have been perfectly adequate to achieve resounding successes against Royal Air Force attacks by bombers of approximately equal numbers. In practice, however, it was only on rare occasions that large forces of night fighters succeeded in contacting the enemy, since the Royal Air Force with its tactics of deception frequently succeeded in misleading the defending German night fighters.

For the above reasons the measures decided upon in the spring of 1944 to increase the fighter strengths committed in home defense proved to be founded on a false appraisal of the means applied, produced no results which could have impressed the enemy, and failed completely to exercise a determining effect.

1436 In contrast with developments in the field of fighter defenses, it can be considered as an established fact that the Luftwaffe High Command fully realized the limitations of the antiaircraft artillery for action against aircraft of increasing resistance to shellfire and operating at great speeds and altitudes, that the proper conclusions were deduced from these realizations, and that well considered requirements were stipulated for the future. These facts are impressively documented by the production program and specifications for development established by the Antiaircraft Artillery Inspectorate in February 1942 and approved by the Commander in Chief of the Luftwaffe in September of the same year.

If, out of the conventional type antiaircraft weapons still in use in 1944, one considers the type 41 88-mm gun, the 105-mm gun, and the 128-mm single and twin-mount gun, together with the Type 40 fire control director, and the Mannheim, Kulmbach, and Marbach electrical target finding equipment, it must be admitted that considerable progress had been achieved in the antiaircraft artillery arm in comparison with the equipment available at the outbreak of the war.

1437 However, the progress thus made was not adequate to keep

1437 pace with developments in the weapons of attack. This was not due to neglected development on the German side, but to the fact that the increasing speeds and operating altitudes of aircraft and their increasing resistance to shellfire, as achieved by the attacking forces, had reached the extreme limits for effective counteraction with antiaircraft guns of the conventional type within the scope of the laws of ballistics.

Another complication was that one factor in the whole complex of antiaircraft artillery operations had becom questionable. This was the determination of the position of a target, with precise lateral, range, altitude, and speed data, which had been rendered a neuralgic issue by the methods of blind bombing developed by the attacking side and had practically eliminated the antiaircraft artillery as a defense factor.

This eventuality had been recognized in time by the antiaircraft artillery. In its development program of February 1942, the Antiaircraft Artillery Inspectorate had clearly stated the possibility of the threat and specified that appropriate measures must be taken to develop interference-proof target-locating equipment for the antiaircraft artillery arm.

German experiments with tinfoil in 1942 had shown how acute this threat was. The decision of the Commander in Chief

1437 of the Luftwaffe to keep the records on these experiments under lock and key and treat the results as strictly secret in order to preserve the element of surprise for his planned offensive against Britain, instead of making those results available to high frequecency specialists with urgent instructions to develop a remedy proved a serious error in two respects: It resulted in a technological dilemma for both the night fighter and antiaircraft artillery forces when the Royal Air Force made use of tinfoil for the first time on the night of 24-25 July 1943.

1438 The study submitted by the Antiaircraft Artillery Inspectorate in February 1942 also gave a clear prognosis of the limits to the effectiveness of the conventional types of antiaircraft weapons and stated unequivocally the requirement to depart from the existing antiaircraft artillery principles, as a precaution against expected future developments on the attacking side, and to adopt an entirely new form of antiaircraft defense, namely that of the remote-control rocket or of the homing rocket.

It appears that the Luftwaffe High Command failed to adapt its thought to the categoric necessity of this requirement in time and with the necessary energy. Otherwise Field Marshal Milch would hardly have considered it necessary to draw the attention of Reich Minister Speer, in a personal

1438 letter, to the inadequate support which the antiaircraft rocket development project was receiving.

However, it was impossible to make up for lost time, so that there was no hope that the various types of rockets under development, such as the Wasserfall, Schmetterling, Enzian, and Rheinfall projects, would become available as a promising factor in air defense before 1945.

In the light of these circumstances it is incomprehensible that any real significance was attached to the directive issued by Hitler on 4 November 1944 calling for a considerable reinforcement of the antiaircraft artillery as a decisive measure to protect the Zone of Interior against air attack.

Obviously, the same false conclusions concerning the importance of numerical strength were drawn in this case as had happened in the case of the fighter arm. At this juncture the important requirement in efforts to secure greater effectiveness in ground air defenses was not one of quantity

1439 but exclusively of quality. The assignment of 500 heavy antiaircraft artillery guns to assign a single hydration plant could do little to improve matters as long as the problem of obtaining precise target data remained unsolved and as long as there was no possibility to shorten the time of missile trajectory flight in order to reduce lead allowances

1439 to reasonable limits.

Even though the antiaircraft artillery armament program of 4 November 1944 was not effectuated in practice it must be stated here that from the outset it represented an experiment with improper means and that the interference with other armament missions which the efforts to implement it caused undoubtedly exercised a retarding influence in other fields without producing any positive results in the field of air defense.

For the enemy the German antiaircraft artillery up to the end of the war undoubtedly represented a serious nuisance, but it was not considered a factor of fatal significance in the German air defense system when the Allied air forces prepared their plans for an offensive against the hard core of the German armament potential within Germany, although the areas concerned were heavily defended by antiaircraft artillery.

ANTIAIRCRAFT ARTILLERY DEFENSES IN THE OPERATIONAL ZONES OF THE ARMY

An evaluation of the antiaircraft artillery as a factor of air defense in the army zones of operation presents a far more favorable picture than in the Zone of Interior.

1440 In contrast with strategic air warfare against the German interior, the enemy bomber formations committed to support their army operations in front areas had to rely on visual

1440 bombing and daylight operations because of the danger of striking their own lines. As a rule this removed all limitations imposed on the antiaircraft artillery through interference with their electrical target locating and other fire control equipment.

The German Command paid too little attention to this factor in visualising the measures which would have to be taken in reinforcing its defenses to repel an invasion in the West. It was fallacious to expect that the commitment of all available German fighter forces which could be spared from the Zone of Interior and from other theaters of operations would suffice to break enemy air supremacy within the invasion areas.

The immense numerical superiority of the enemy in air power was a known factor, and the after-action reports submitted by the Third Air Fleet in 1943 showed clearly that the German fighters were unable to achieve decisive results against enemy bomber forces operating under fighter escort. It was to be assumed that the enemy would commit between 1500 and 2000 fighter aircraft of the most modern types alone. A sober appraisal should have shown that a numerically superior force of German fighters, roughly 2000-2500, would have been the minimum requirement to achieve German air superiority.

On 31 March 1944 the total actual strength in daytime fighters totalled 1696 aircraft, of which 1188 were operable.

1441 The German Command must have realized that, in the event of invasion, the daytime fighter forces could not achieve success in air defense operations.

This realization could have led to the conclusion that it was of more decisive importance for defense on an invasion front to reinforce the antiaircraft artillery to the greatest extent possible.

The antiaircraft artillery forces committed in the Home Air Defense Zone on 9 January 1944 comprised 1327 heavy plus 708 medium and light gun batteries.

The west front at the same time had a total of 243 heavy plus 350 medium and light gun batteries.

In view of these strengths it definitely would have been possible to reinforce the antiaircraft artillery forces in the west by between 500 and 600 heavy plus between 300 and 400 medium and light gun batteries.

Measures of this type, if they had been taken not later than in April 1944, would have produced the following advantages:

1. A strong antiaircraft artillery barrier established along the Channel coast would have made it extremely difficult, already during the period of Allied air preparations for the invasion, for the Allied air forces to reach their objectives.

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2. An antiaircraft artillery barrier of this type would have compelled the Allied air forces committed in strategic air warfare against the German interior to make wide detours, and this would have facilitated the concentration of German fighter forces along the routes outside of the antiaircraft artillery barrier.

3. In the light of repeated experience an antiaircraft artillery barrier along the Channel coast would have provided the best support in antitank action.

4. Medium and light antiaircraft guns were the only really effective weapons for defense against enemy low-altitud and fighter-bomber attacks.

5. In contrast with the fighter forces, antiaircraft artillery forces at all times were able to protect themselves against air attack.

The German Command failed to take proper cognizance of the possibilities outlined above. The antiaircraft artillery forces transferred to the west between 24 May and 24 June 1944 comprised 75 heavy plus 57 medium and light batteries. This was far less than could have been transferred and represented no significant reinforcement of the antiaircraft defenses. This is all the more surprising in view of the fact that the Fuehrer Directive of 3 November 1944 specified that in the event of an invasion the antiaircraft artillery forces in the west

1442 were to be reinforced to the greatest extent possible through assignment of all mobile antiaircraft artillery units available within the Zone of Interior.

No valid arguments can be advanced to justify the incomplete manner in which the Luftwaffe executed the terms of this directive, so that the Luftwaffe must be considered as largely responsible for the success achieved by the Allies in the invasion.

What has been said above aplies equally to the successful Allied landings in Sicily and Italy in 1943. The inadequate effectiveness of the fighter arm for air defense purposes in the southern theater of operations had at the time already become clearly evident, and the command failed to draw the logical conclusions from this knowledge and to compensate for the visible weakness by a corresponding reinforcement of the

1443 antiaircraft artillery as the second component of air defense.

In view of the above it must be considered an established fact that, in the decisive phases of the war, the Luftwaffe endeavored to effectuate its intention of placing main emphasis on defense against enemy air attacks by using inappropriate means, namely, its fighter forces, and failed to commit its more appropriate means, the antiaircraft artillery, in concentration at the proper point and time, namely in the Army zones of operations at the invasion fronts.

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III. LESSONS TO BE LEARNED FROM GERMAN PRINCIPLES OF AIR DEFENSE.

Broadly speaking, the following lessons can be learned from the evolution of German air defense doctrines:

1. Air defense can be conducted in the form of aggressive or defensive air warfare.

2. The commitment of air power in aggressive operations designed to destroy the hostile air forces in their bases and to destroy their sources of supply, proved definitely the most effective form to prevent the enemy from executing air attacks against own territories.

The basic condition for this type of action is that the friendly air forces possess air supremacy or at least local and temporary air superiority over the enemy territory.

3. If the enemy should secure the initiative in aggressive air warfare, emphasis in air warfare must be placed on air defense until air supremacy can be established over friendly territory and conditions created for recovery of the initiative in aggressive warfare.

4. The basic weakness in air defense operations is that the defender is not able in time to concentrate all defending forces within the current combat area to counter enemy concentrations in such areas.

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If the means of defense (such as antiaircraft artillery guns) cannot be moved from place to place at a speed greater than that of the attacking enemy forces they will be required in enormous numerical strength to protect all vital installations and the civilian population in friendly territory and will therefore be exceedingly costly in personnel and materiel.

Even in the case of speedily mobile weapons of defense, such as fighter forces, it will rarely be possible to concentrate all such forces available at the right time and place in the areas to be protected. The defender is therefore compelled to have such strong fighter forces available for the protection of the perimeter areas that they can balance the concentrated strength of the attacker. This means that the defender must have a plurality of the enemy's fighter strength for defense purposes.

5. The effectiveness of air defense weapons is governed at all times by the factor of quality.

6. If the means of attack available to the enemy are superior to the means available to the defender, the only possible solution for the defense mission is aggressive action.

CHAPTER 2

COMMAND PROBLEMS

1446 I. ORGANIZATION.

An examination of the command organization of the German air defense system and its evolution prior to and during the war reveals widely varying trends consonant with the changing views:

1. Pre-War Period.

a. In the era of the Regional Air Commands (or Luftwaffe Administrative Area Commands), up to 4 February 1938, controls were as follows:

The fighter forces, together with other flying forces were under the command of the "Senior Air Commander"at headquarters of the Regional Air Command;

The antiaircraft artillery forces were under the command of the "Senior Anti-Aircraft Artillery Commander", also at headquarters of the Regional Air Command;

The aircraft reporting and passive air defense services were controlled directly by the Regional Air Commands.

b. The establishment of Air Group Commands 1, 2, and 3, Air Command Eastern Prussia, and the Naval Air

1446 Command on 4 February 1938 brought the following changes:

aa. The "Senior Antiaircraft Artillery Commanders" were now "Commanders in the Air District" (Kommandeure im Luftgau) and were assigned command over the fighter forces, the antiaircraft artillery forces, and the aircraft reporting and passive air defense services;

bb. All other flying forces remained under the "Senior Air Commanders."

1447 c. Early in 1939 the twin-engine fighter units were removed from control by the air district commands and assigned, for purposes of strategic warfare in cooperation with the bomber units, to the air division headquarters which had meanwhile been established from the headquarters of the former "Senior Air Commanders."

This pre-war organization reveals the clear concept of concentrating all means of air defense within each air defense area under one centralized command. The decision to remove the twin-engine fighter units from the air defense organization and include them in that of the aggressive air forces was a logical result of the experience gained in the Spanish Civil War that bomber forces required fighter protection in the execution of their missions.

The distribution of the air defense forces among the various air district commands gives clear expression to

1447 the idea of direct target defense, the governing factor in the basic concepts on the Luftwaffe.

So far as the antiaircraft artillery forces, and the aircraft reporting and passive air defense services, were concerned, this system of command organization for air defense was appropriate, since it corresponded to their areas of responsibilities. It is questionable, however, whether the assignment of the fighter forces to the air district commands in 1938 was appropriate to the areas of responsibility of these forces, and this question must be answered

1448 in the negative.

However, as long as the fighter units were equipped with the old He-51 and Ar-68 types of fighter aircraft, which had an average speed of 150 miles and a time-in-air capacity of 75 minutes, their striking radius corresponded approximately to the size of the average air district command area. There were thus good reasons to assign the fighter forces to the various air district commands, since most of the fighter units in early 1938 still had the old types of fighter aircraft.

The reequipment of the fighter units with Type Me-109 aircraft, even those of the E and C series, with their time-in-air capacity of 75 minutes, gave them a considerably greater striking radius because of their increased speed

1448 of 240 miles. Introduction of the Me-109-D series with a time in air capacity of 2.5 hours again considerably increased the striking radius of the fighters. In the autumn of 1938 fighter units had more than 471 Me-109-D and 112 Me-109-E/C aircraft so that their radius of action extended far beyond the boundaries of the individual air district commands.

In order to secure maximum effectiveness and insure the development of power concentrations by fighter forces in large-area air defense operationsit would have been appropriate at this juncture to consolidate the fighter forces under their own commands, making these responsible to the appropriate air group or air commands.

This solution would have had the added advantage that the fighter forces could have been committed according to the requirements of current situations,either to support the operations of the aggressive air forces consolidated under the "Senior Air Commanders," or to execute large-area air defense missions,within the command zones of the air

1449 group commands.

The assignment of the twin-engine units under the air divisions early in 1939 was a half-measure. It would have been better to consolidate the single- and twin-engine fighters under fighter commands at headquarters of the

1449 group commandsheadq

2. At the opening of the campaign in Polandin September 1939 the necessity to provide fighter escorts for bomber units and the inadequacy of the number of twin-engine fighter units available for the purpose created the necessity to release some of the single-engine fighter units for strategic missions and place them under the officers commanding units of the aggressive air forces. The fighter forces commited for air defense within Germany remained under the air district commands distributed all over western Germany.

This command organization for control of the fighter forces committed in air defense again gave expression to the idea of direct target defense and would have been extremely hazardous if the western opponents had commenced air warfare against the German interior in earnest immediately after declaring war against Germany on 3 September 1939. This was so because all attempts to concentrate sizable numbers of fighter units from a number of air districts at the right time to counter a strong enemy force attacking at one point necessarily would have failed because of the complicated control and command system through the various air fleet headquarters as the superior headquarters of the air district commands.

1450 It was a fortunate occurrence that the first British

1450 attempt to attack Pocket Battleship Scheer at Wilhelmshaven on 4 September 1939 was beaten off at heavy cost to the attacking bomber force, and that the German air defenses in the west were not exposed to further strains during the Polish campaign.

It would have been a better arrangement to establish a fighter command under the Second Air Fleet and another under the Third Air Fleet immediately after the outbreak of war. Each of these commands should have been assigned the responsibility for the concentrated commitment of all fighter forces within the air fleet zone, and should have been assigned command over all single- and twin-engine fighter forces stationed within the zone.

3. After the end of the Polish campaign the entire Luftwaffe for the first time was engaged exclusively in a mission of air defense against the west.

An examination of the command organization as such and of the chains of command controlling the fighter forces in the October 1939-beginning of the Campaign in the West shows that no uniform and logical solution was found. During this period the fighter forces initially remained partly under the air district commands, while other parts were controlled by the air divisions and later by the air corps to which the division headquarters were expanded at the end of 1939.

1450 Although the air fleets, as the superior headquarters of both the air corps and air district commands within their zones, were able to coordinate the commitment of all fighter forces within their entire zones the awkwardness of such chains of command precluded complete exploitation of the striking range of the fighter forces, since that range, in the case of both the twin-engine units and of those single-engine units still equipped

1451 with Me-109-D aircraft, extended beyond the boundaries of the air fleet zones.

It would have been wiser and more practicable already at this juncture to consolidate all fighter forces under a central fighter command responsible for fighter defense operations in the entire area from the Danish frontier to the borders of Switzerland. Three fighter commands should have been established under the central headquarters, one responsible for the Helligoland Bight area, one for the Ruhr Region, and one for the Frankfurt-Freiburg area.

For the defender the problem of where to develop power concentrations is governed by two factors:

a. The priority assigned to the area to be protected. This priority is determined by the necessity to preserve the vitally essential potentials required to

1451 bring the war to a successful conclusion.

b. Recognition of the strategic objective of the enemy as becomes evident from the system of their air attacks against specific categories of areas.

From this it is evident that the headquarters controlling overall air warfare is also the place at which control of the defensive air forces capable of large-area operations should be centered to insure an effective direction of the operations of such forces without delay.

It isatime-honored military axiom that "he who would defend all can defend nothing."

The manner in which German air defense was organized in the period between the Polish and Western campaigns shows strong indications of the "intention to defend all."

1452 That the whole system did not prove anorganic and erroneous was due exclusively to the fact that it was not put to the crucial test owing to the reserved attitude of the western opponents.in the matter of air warfare.

Nonetheless, the establishment of a separate fighter command under the Second Air Fleet and another under the Third Air Fleet early in 1942 reveal tendencies toward a development which would have made uniformly directed large-area commitment of the fighter forces possible at least within the zone of each air fleet.

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4. In view of the wide expanse of the areas to be defended against the west, which extended from the Channel coast and the coast of the Atlantic to the eastern borders of Germany, realization of the necessity to divide this whole expanse into separate areas of responsibility resulted on 5 March 1941 in separation of the occupied territories in the west from Germany. A centralized air defense command was established at the same time to control air defense operations centrally within Germany. Initially designated "Central Command" it was redesignated "Air Command Center" on 21 March 1941.

In establishing the new chains of command the Luftwaffe at this juncture once again made the mistake of not applying logically the lessons learned from experience gained in the past eighteen months of warfare. This is obvious from the wide difference noticeable in the various command organizations established for the air defense forces:

a. In the west the Third Air Fleet adhered firmly to the tried and tested principle of placing its fighter forces intended for large-area operations under complete control by fighter commands responsible directly to air fleet headquarters, leaving only stationary air defense units under air district commands in Holland, Belgium/Northern France, and Western France.

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b. In the Home Air Defense Zone the arrangement was as follows:

aa. The night fighter forces came under direct control by Headquarters, Air Command Center;

bb. The daytime fighter forces and the ground defense forces were assigned to the various air district commands.

This confusing situation was changed on 1 May 1941, however, by placing the daytime fighter defenses under the Night Fighter Division, and assigning the division responsibility for the direction of daytime and night fighter operations within the entire Home Air Defense Zone, including Denmark, Holland, and Northern Belgium.

Further development of the command organization within the Night Fighter Division was appropriate and logical: The Night Fighter Division was raised to the status of a night fighter corps headquarters in August 1941; the daytime fighter forces were consolidated under a Fighter Command Center, in December 1942, responsible for daytime fighter defense operations within the entire command zone of the Night Fighter Corps; 2d Fighter Division Headquarters was established at Stade in January 1942; and finally, as a clearly defined further step in the development of the entire command framework, 3d Fighter Division

1453 Headquarters was established at Metz and at the same time the daytime and night fighter forces were placed under control by the three division headquarters at Deelen, Stade, and Metz. These steps were followed in the autumn of 1942 by the establishment of the 4th Fighter Division at Berlin to secure proper command control in the rearward areas of the Home Air Defense Zone. In December 1942 the southern areas of Germany were built into the overall organization through establishment of Fighter Command Southern Germany, with headquarters at Schleissheim, and finally Fighter Command Austria was established at Vienna to control fighter operations in that country.

It can thus be seen that the development of a fighter command organization within the Home Air Defense Zone in 1941 was governed by a clear and farsighted concept which placed the XII (Night Fighter) Air Corps in a position approximating that of the British Fighter Command, as a central headquarters responsible for a large defense area.

The command organization described above was appropriate for the exigencies of daytime and night air warfare.

Developments in the command organization controlling the ground air defenses within the Home Air Defense Zone

1454 during the same period were not as clear-cut and logical.

The measure of 5 March 1941 placing the antiaircraft artillery forces in Air Districts VII (Munich) and XII/XIII (Wiesbaden/Nuremburg) under tactical control by Air Command Center but leaving them otherwise under the Third Air Fleet was an impracticable and organizationally unsound solution.

In German military tradition the form of "tactical assignment" was in frequent use involving military forces temporarily employed to develop local concentrations or in the execution of a special operation. It is a practical form in all respects if the assignment of a unit is only temporary, since it prevents disrupuion of the normal administrative and supply lines of the unit with its parent unit, if those lines are to be restored within the foreseeable future. It is definitely unsound practice, however, if the time at which the temporary assignment will cease cannot be foreseen, since it is impossible to prevent occurrences in which the command authority of the two commands concerned will overlap, and since it produces a feeling of uncertainty in the troops in the matter of to whom they are responsible.

The situation is impossible if the headquarters directing the operations of a unit and appraising its

1455 performances has no administrative and disciplinary authority over the unit, meaning that it has not authority to praise or reprimand, promote, decorate, or punish the troops, but has to request such measures from the appropriate superior headquarters.

In the case of Air District Commands VII and XII/XIII it was impossible to foresee when the temporary, tactical assignment would come to an end, in fact it was inconceivable that it would ever end. That this anomalous situation was maintained merely out of consideration for the sensitive nature of one person, Field Marshal Sperrle, Commanding General of the Third Air Fleet, makes the flaw in the organizatio even harder to understand.

Another mistake made in the organization of western air defenses in 1943 was also most probably due to a reluctance to hurt the feelings of certain persons:

General Kammhuber, in command of the XII (Night Fighter) Air Corps, was acting in accordance with perfectly sound principles in the spring of 1943 when he recommended that the command organization controlling air defense against the west should be arranged in successive zones from west to east, corresponding to the direction of the routes of approach and departure by enemy attack forces, instead of as it was actually arranged, from north to south in a forward

1456 and rear zone.

This a categorically logical concept in view of the fact that the opposing air forces considered the entire area--forward and rearward zones--as one homogeneous whole in their operations, and had done so in night attacks for a long time and in their daytime attacks since the first attack by US air forces on 27 January 1943, so that it was necessary to adapt the defense organization accordingly.

This recommendation by General Kammhuber, which undoubtedly in the end would have resulted in a uniform air defense command for the German interior plus the entire western areas, failed because of opposition by two persons, as follows:

General Weise, Commanding General, Air Command Center, whose headquarters would have been unnecessary under the recommended organization, and who probably would have had to make way for General Kammhuber;

Field Marshal Sperrle, commanding the Third Air Fleet, who under such an organization would have retained control over only the few air units remaining in the west and committed in air operations against Britain and at sea over the Atlantic.

When, in addition to the above, Reich Marshal Goering also found cause for displeasure because General Kammhuber allegedly had compromised him before Hitler through the

1456 the figures Kammhuber had given in his study concerning expected enemy strengths, the whole recommendation was rejected.

1457 General Kammhuber from then on remained in high disfavor until relieved of his command over the XII Air Corpsin July 1943, a measure probably directly connected with the reverses suffered by the night fighter forces as a result of the British use of tinfoil.

What followed does not reflect credit on the German air command:

Instead of the necessary firmer centralization of the fighter defense organization in the western areas from the eastern borders of Germany to the English Channel and the Atlantic coast, what actually occurred was a further decentralization. The fighter defense system, hitherto under uniform command by the XII Air Corps, was separated into two command zones, Northern Germany and Southern Germany, and placed under Air Command Center. Although the establishment of the 5th Fighter Division at Schleissheim for southern Germany had been intended as a first step in the creation of a second fighter corps headquarters, the division into two zones could have waited until the corps was ready for operations with one fighter division in southern Germany and one in Austria. In practice these conditions were never brought about, and

1457 later events proved that one centrally located fighter corps headquarters at Treuenbrietzen was perfectly capable of directing fighter defense operations for the whole of Germany plus Austria and Hungary.

As a result of the circumstances outlined above, the fighter commands responsible from 15 October 1943 to 1 April 1944 in the three separate zones for defense against air attack from t the west and south (by units of the US Fifteenth Air Force) in all cases had to operate with forces of strengths inferior to those of the enemy. This was the case in all three air defense command zones, that of the Third Air Fleet, with headquarters at Paris; the I Fighter Corps, with headquarters at Zeist, Holland; and of the 7th Air Fighter Division (formerly 5th Fighter Division), with headquarters at Schleissheim and also controlling Fighter Command Austria.

1458 If these three command zones had been consolidated under one uniform fighter command headquarters, as recommended by General Kammhuber, it would have been possible to concentrate the fighter units from all three zones in the currently critical areas of enemy air attack with a flexibility facilitating continuous changes in the areas of main effort. However, the Luftwaffe was extremely hesitant and incomplete in the organization of its air defense system in reaction to the large-area strategy of the enemy.

1458 Assignment of the 7th Fighter Division, Schleissheim, under I Fighter Corps Headquarter, Treuentrietzen, on 1 April and of Headquarters, General Commanding Luftwaffe Forces in Hungary under the Home Air Fleet on 1 May 1944 was an important step in the right direction. However, this measure was faulty in one respect: For air defense purposes the vitally important Balkan oil regions, particularly those in Rumania, were within the command zone of the Fourth Air Fleet, the operations of which were oriented primarily against Russia. An assignment of these areas under the Home Air Fleet for air defense purposes would have had the advantage that reinforcements for the areas could have been made available more easily and more speedily from the large reserves of the Home Air Defense Zone whenever necessary to protect the oil regions of Rumania and Bulgaria. It is a matter of experience that any command headquarters will resist vigorously all efforts to transfer forces to areas outside its own zone of responsibility. In most cases a speedy reshuffle of forces whenever required by the current situation to bring about the necessary power concentrations for air defense is possible only within a zone under a uniform command. The size of such a zone will be determined largely by enemy action, and as a rule will correspond to the enemy zones of

1459 operations.

It follows from the above that from the moment on when the Anglo-American air forces commenced launching their attacks from bases in Italy and Britain against targets in the entire area extending from the Balkans to the North Sea, and to the Atlantic Coast, it was essential to have one central command headquarters directing air defense operations within the same overall area.

Any command headquarters responsible concurrently for aggressive and defense missions will be unable to execute its defense mission in the best possible manner from the moment on when the strategic objective in its aggressive operations ceases to serve directly the purposes of air defense, namely, when its operations are not directed primarily at destruction of the enemy air forces.

Compelled to restrict itself to defensive air operations, the Luftwaffe neglected to take timely action to adapt its air defense organization to the exigencies of the current air situation. All necessary changes were brought about only when rendered inescapable by enemy pressure and in reaction to situations which had already become untenable. For this reason the Luftwaffe remained incapable of securing decisive results in air defense action.

This reluctance to take sweeping decisions again became

1459 apparent in September 1944, when deactivation of Third Air
1460 Fleet Headquarters raised the question of command control over its successor headquarters, Luftwaffe Command West.

In view of the fact that the enemy advance on the ground had already reached areas close to the Franco-German frontiers the obviously logical course would have been to consolidate control over all air defense forces operating against the west and the south under the Home Air Fleet by placing Luftwaffe Command West under that headquarters.

By this time the German interior and the remaining occupied territories in the west had become one homogeneous whole, so far as enemy air activities were concerned. A division of the air defense mission between a front zone and a home zone necessarily had to produce conditions in which it would be impossible to conduct the defense with concentrated forces at any one point. If everything had been consolidated to form one uniform air defense zone, in contrast, it would have been possible to commit all forces, consonant with the requirements of current situations, either at the front, or in action to protect vitally important targets within Germany.

During an important phase of the war in the west the Luftwaffe refused to recognize these possibilities by placing

1460 Luftwaffe Command West under direct control by the Commander in Chief of the Luftwaffe on 21 September 1944, compelling that command to conduct air warfare in the west with the inadequate forces available in the front areas.

When Luftwaffe Command West was finally assigned under the Home Air Fleet on 1 December 1944 the situation had so far deteriorated that it could not be restored.

It is necessary only to visualize the possibilities for effective action which would have been created in October 1944 alone by the transfer of the bulk of all medium and light, as well as all 88-mm antiaircraft gun batteries, committed in the Home Zone to the front areas. In the front areas these batteries would have had infinitely better opportunities for effective action, against low-flying Allied bombers, fighters, and fighter-bombers, than in the German interior, against bombers relying largely on blind-bombing tactics and operating anyway at altitudes which placed them beyond the effective range of all but the most modern antiaircraft guns. However, the Home Air Fleet would only have been ready to take such action if it had been assigned full responsibility for air defense against the west in all areas.

The rearrangement of the command organization of the flying forces on 26 January 1945 for air warfare against the west had hardly more than a token significance. Luftwaffe

1461 Command West with its inadequate forces remained responsible for air warfare in the front areas, while the IX (Fighter) Air Corps became the headquarters responsible for fighter defense activities within the Home Air Defense Zone. In whatever light the matter be considered, one of these two headquarters was unnecessary. The strengths available in the aggressive air forces under Luftwaffe Command West were too insignificant for the conduct of aggressive air warfare. Moreover, they tied down four fighter wings, required for their protection. Together with the fighter units under the IX (Fighter) Air Corps, these four fighter wings would have created better opportunities for strongair defense action at one point, in the front areas or in the home zone.

The antiaircraft artillery presents very much the same picture. The forces of this arm remained under the command of their respective air district headquarters until the withdrawing front lines on the ground brought them within the Army zones of operations. Then they were assigned under the locally responsible antiaircraft artillery corps headquarters of Luftwaffe Command West. The AAA corps thus received an increment of operable strength only at a time when when such an increment could no longer serve any useful purpose. This was particularly the case with antiaircraft artillery units when they were to be used in ground combat,

1462 since a certain measure of time was always required for them to adapt and train themselves if they had hitherto been employed exclusively in air defense missions.

In a concept viewing the front areas in the west and the home zone as one homogeneous defense area it would have been more easily possible, so far as the antiaircraft artillery was concerned, to develop power concentrations in the forward areas, particularly in view of the fact that a large part of the available antiaircraft artillery forces would have remained in the permanently emplaced batteries to protect the rear areas.

SUMMARY

The experience gained with the German organization for air defense and the lessons to be learned from that experience can be summarized as follows:

1. If the possibility exists to use the aggressive air arm in direct air warfare against the enemy air forces,

1463 all elements of air power engaged in such action must be consolidated under the aggressive air forces command.

The stationary air defense forces must be consolidated for the area they are to defend under a command headquarters of their own, responsible exclusively for execution of the air defense mission.

2. If direct combat action against the enemy air forces in their own territory is not possible, all mobile and stationary air defense forces must be consolidated under a uniform command for the protection of friendly territories.

3. The size of the overall area to be defended will depended on the size of the zones of operations of the hostile air forces.

4. If control and command requirements necessitate a subdivision of the overall air defense area into defense zones, the subdivision should, as far as possible, be organized parallel with the main routes of approach which the enemy forces will use.

5. Within the individual defense zones thus established a joint command headquarters for all arms and services participating in the defense mission must direct all defense operations against air attack.

6. The organization must insure the possibility to concentrate all available forces stationed within the overall defense area for action at one single point at any given time.

1464 II. SELECTION OF COMMAND PERSONNEL.

One marked feature in the development of the German command organization during the build up of the Luftwaffe is the fact that none of the officers assigned to command the regional air commands up to 1938 came from the World War I generation of military airmen. Generals Ebert, Helm, Kaupisch, von Wachenfeld, and Zander were all Army or Naval officers, had held high field commands in the former Reichswehr (Germany's reduced military establishment allowed under the post-World War I Treaty of Versailles), and some of them had already been retired when the Commander in Chief of the Luftwaffe called them to service in the Luftwaffe.

The result of this measure was that, in the initial stages, main emphasis in development of the Luftwaffe was in the strictly military field. This evidences a proper realization of the fact that, even in a military service governed as largely by technological considerations as the Luftwaffe was, maximum effectiveness can be achieved only if the best military qualities are ingrained in the troops through proper training and education.

Once these foundations had been established a change of command personnel occurred in 1938 which was considered radical at the time. In this reshuffle consideration was

given to specialized service experience gained in World War I and during the build up of the Luftwaffe. The new personnel assigned in high-level command positions were all officers with superior command qualities very well able not only to maintain the strictly military element in the Luftwaffe but also able to develop the specific characteristics of the service in the fields of strategy, tactics, and technology.

A noticeable feature at this juncture was the inclination to assign relatively young officers as squadron leaders and group commanders in the fighter arm. In contrast with the personnel policies in the other arms and services of the Luftwaffe, the policy in the fighter arm from 1 April 1937 on was to assign officers with captain rank to command fighter groups and base areas, and officers with 1st lieutenant rank to command squadrons. This practice came under much criticism by bomber personnel, where the majority of squadron leaders were at the time in the rank of major.

The practice was sound, however, in principle. It was a known factor, established by experience in World War I, that the capabilities of fighter pilots decline after the age of thirty. This is due to the following circumstances:

a. The abilities for quick reaction and spontaneous action, essential qualities in a fighter pilot for success in air-air combat, as a rule decline in a measure

1465 commensurate with the growing influence of logical reasoning on a person's general actions and behaviour.

b. Outside circumstances, such as firendships, family ties, etc., exercise a retarding influence.

c. Youthful exuberance is gradually replaced by the deliberation of maturity.

1466 d. Fighter operations place a severe physical strain on pilot personnel.

On the other hand, a certain measures of maturity is essential in an officer commanding a fighter unit, which will enable him to assert his authority and maintain a superior military morale in the troops under his command.

In selecting personnel to command fighter units, those responsible for the personnel policies of the Luftwaffe, at times showed a lack of wisdom and deliberation so far as the above diverging qualities were concerned.

One fundamental mistake made in the early phases of the war was that the qualifications of an officer to command fighter units were computed on the basis of the number of enemy aircraft he had shot down, and exclusively on that basis. From that point on a proper balance of fighter pilot abilities and human qualities was not always evident in command personnel of the fighter arm. In cases where the unit commander lacked human and fundamental military qualities, this fact

1466 was soon reflected tangibly in the appearance of his units in the form of personnel wearing widely different articles of clothing, swanky caps, highly colored scarves, and swagger stick, practices which obviously exceeded the limitations of military tradition.

It was always difficult to find personnel possessing the qualifications required for assignment to command positions in which they would control units of various arms and services. This became evident for the first time in 1938, when the fighter units were placed under the officers heading the various air district commands. At the time practically all of the

1467 officers assigned as air district commanders were from the antiaircraft artillery arm, and had no experience in the tactics and techniques of fighter operations.

The feeling of confidence in subordinates to their superiors always depends largely on the knowledge that they are being given expert leadership. Whenever this certainty is lacking the command relationship deteriorates to nothing more than an exterior facade, and any strain imposed on it will result in serious crises.

At the time under discussion here the Luftwaffe did not have enough officers available who had been able in the course of their career to gain the necessary experience in the various arms and services. This was an unavoidable outcome of the

1467

quick pace of the build up. In planning for the command organization it was therefore all the more important to insure that command personnel had the appropriate knowledge on the necessary subjects commensurate with the troops they were to control. In the same measure that tactical requirements made this a necessity, the factors of personnel policies in 1938 should have resulted in a command organization in which the fighter forces within each Luftwaffe group command area were consolidated under an experienced fighter command officer.

In wartime the proper functioning of a command organization depends in a far greater measure than in times of peace on the application of proper personnel policies in the selection of personnel for command positions, and on the pursuit of proper personnel policies in general.

Two requirements above all must be met here:

a. Consistency;

b. Combat experience.

To some extent these two requirements are contradictory. On the one hand too quick rotation of personnel in command positions will harm the integration and morale of the troops; on the other hand, the necessity for real live and personal combat experience calls for a change of command personnel when the conditions of planning and combat as they change

1468 in the course of a war are of such a nature that they can only be understood and translated into useful lessons in the light of personal experience. Nothing can be more harmful in the field of command than that the plans and decisions of a command are governed by outdated experience.

In the personnel policies of the Luftwaffe exaggerated importance was frequently attached to the factor of consistency, while on the hand changes at times took place too quickly and frequently, and the required factor of experience was disregarded. For example, Fighter Division Berlin had six separate commanders during the war, in the case of the other fighter division the commanders changed only twice or three times, from which it is evident that careful consideration was lacking in the personnel policies pursued.

One experiment for which it is hard to find an explanation is that of assigning officers from the bomber arm to high positions in the fighter command organization at the time of serious crisis in the fighter defense system. The solution adopted here was merely an easy way to escape justifiable criticism. Implementation of the solution was favored by the fact that the Commander in Chief of the Luftwaffe was highly dissatisfied with the performances of the fighter defense forces and had lost prestige in his relations with the Commander in Chief of the Wehrmacht, Hitler. This made him all the

1469 more easily inclined to accept what appeared to be very promising ideas and recommendations by younger officers of the bomber arm for an improvement of the fighter arm and of the conduct of air warfare in general, although the officers concerned lacked the necessary functional knowledge and their ideas and recommendations lacked any realistic foundation. This is flagrantly apparent in the records of the command conference at Reich Marshal Goering's Headquarters on 7-9 October 1943.

Basically it can be said that in the Luftwaffe the officers who in the long run at all times gave satisfactory services were those whose personalities were the result of exceptionally high qualifications in all respects. These qualities included intelligence, imaginative powers, intuition, the capacity for logical thinking, general maturity, and an irreproachable military attitude.

CHAPTER 3

THE FIGHTER DEFENSE SYSTEM

1470 **I. DAYTIME FIGHTER DEFENSE.**

1. Direct Target Defense; Areal Defense. It is only natural that the viewson air warfare which had evolved from experience in World War I exercised a very strong influence on the evolution of the initial concepts of the Luftwaffe in the establishment and development of the fighter defense system. In both military and industrial circles these views produced ideas of an aircraft, for defense purposes, which would have the following features:

Speed

Great climbing abilities,

High Maneuverability

Rigidly mounted weapons.

In shape and performances the first German types developed, the Ar-64, Ar-65, and He-51, differed little from foreign fighter aircraft types.

To insure that the fighter plane would give maximum performances in meeting the requirements specified, it was impossible to give the first types developed a larger radius of action, since the factors of engine power, fuel consumption, weight, size, and maneuverability were interrelated in a manner

1470 that the volume and weight of fuel which could be carried along were subject to certain limitations.

1471 The restricted radius of action resulting from the maximum overall time-in-air capability of 60-90 minutes naturally also placed limitations on the possible uses of the first types of fighter aircraft. Given a duration of 60 minutes of tactical flight and a speed of 150 miles, and allowing for the time spent in climbing to combat altitudes and the time spent in air combat, the area within such planes could operate was thus only about that covered by a radius of 60 miles from which they were operating. These considerations perforce resulted initially in the evolution of the direct target defense concept as the maximum usability of fighter defense aircraft in operations.

These tactical maxims of fighter defense had the decided disadvantage that the defender from the outset, because of striking range reasons had no possibility to concentrate all fighter forces from throughout his territories in full strength at one point against an attacking enemy force at that point.

At this time the importance attached to fighter aircraft as a weapon of defense was at least equalled by the importance with which it was considered as a weapon of attack, for use in low-level attacks with weapons fire and small (22-pound) bombs against near-front enemy airfields or to serve as direct support for Army operations on the ground.

1471 This concept of the fighter missions was founded largely on the practices of World War I. These ideas found expression in the regulations established prior to the war for fighter personnel training, where the space devoted to training in air combat equalled that devoted to training in low-level attack operations.

1472 Development of the Bf-109 fighter, the features of which represented a departure from the original concepts of what a fighter plane should be, introduced a number of new factors into the appraisal of fighter aircraft as a weapon of air defense because of a sudden increase of speed from 150 to 240 miles. These factors were as follows:

a. The increased speed considerably reduced the time lag between take off from the ground and visual contact with the target;

b. Given an equal duration of tactical flight, the radius of the area which could be covered was approximately double that of the Ar-68 or He-51 fighter;

c. In point of speed the advantage over the conventional types of bomber and reconnaissance aircraft was considerably increased, which in turn greatly facilitated attack against such aircraft.

The Luftwaffe clearly recognized the advantages of the Bf-109 and geared its planning for the development of the

1472 fighter arm entirely to a programm providing for the earliest possible serial production of the new fighter type and for the equipment of its fighter units with these aircraft.

At the same time it was realized, however, that the operational range of the Bf-109 was still too small to permit air defense operations with strong fighter forces at all points within German territories. For this reason instructions were given as early as in 1935 specifying the development of what was called a heavy fighter capable of sustained flight over a distance of 1 200 miles. The idea here was that with fighters of this type it would be possible to intercept any enemy air unit at any point over Germany, without regard for current weather conditions.

So far as tactical thought in Luftwaffe circles on the subject of fighter defense was concerned this development represented a logical and farsighted transition from the concept of direct target defense to one of large area defense.

The first plane produced as a result of the above development specifications was the Bf-110, propelled by two Jumo-210 engines.

In view of the tactical requirements specified, namely a plane capable of 1800 miles sustained flight and independent of weather conditions, and in view of the types of aircraft engines available at the time and their rate of fuel

1473 consumption, and in consideration of the existing navigation facilities, the only solution conceivable to an aircraft designer was a twin-engine, two-seater plane manned by a pilot and a radio operator.

The plans of the Luftwaffe to base its home air defense system from 1938 on on a defensive fighter arm equipped with Bf-110 heavy and Bf-109 light fighter aircraft in a ratio of 1:3 contained all the elements of maximum success, since it was possible to move the heavy fighter units whenever required to any point within German territories for the purpose of developing a power concentration.

Thus far it can be considered as an established fact that the fundamental concept of the Luftwaffe for the development of its fighter arm was well considered, farsighted, and logical.

1474 2. <u>The Role of the Fighter Arm in Aggressive Air Warfare</u>. Before its was possible to effectuate the idea of activating heavy fighter units and employ them to insure the possibility of large area air defense, came the basic development of the German strategic concept that air attack was the primary mission of air power, with the purpose of destroying the enemy air forces.

Foreign powers were already following Germany's lead by

1474 developing their own fighter aircraft similar to the BF-109; and in the light of experience gained in the Spanish Campaign, where it had been demonstrated in actual combat that even the modern German bombers could not execute their missions unless protected by fighters against enemy defense fighters, it was essential to commit available fighters in this escort mission, for which reason the fighter arm now had to be considered primarily as a component of the aggressive air forces.

These conclusions could be drawn and accepted without concern, since the excellently developed German antiaircraft artillery forces available were an adequately effective air defense weapon under the conditions as they then existed, and since the commitment of the fighter arm to cover the bomber forces attacking enemy air bases would serve as direct support of the friendly air defense system.

In two respects, however, these views were not logically

1475 thought out:

a. The majority of the fighter units were equipped with Type Me-109 aircraft, which had a limited radius of action and were dependent on weather conditions; their use in escort missions automatically limited the operating range of the bomber forces to the penetration range of the Me-109. The purpose of the bomber mission, namely, while operating under protection by escort fighters to destroy the enemy air

1475 forces on the ground at their bases, could therefore only be achieved if the enemy air bases were within the range of the Me-109.

b. There could be no doubt that the advantage of the Me-110, in respect to its performances, over foreign fighter aircraft types would not be of long duration, since a similarly modernized single-engine single-seater type would necessarily be superior by all the principles of physics and aerodynamics. This would neutralize the value of the Me-110 as a bomber escort plane. All that the enemy would need would be a small number of superior defensive fighter aircraft to engage the escorting Me-110 fighters, and the German bombers would be defenseless against the rest of the enemy defense fighters.

There was no danger that the above flaws in the German concept would produce harmful results as long as the bulk of the enemy air forces were based in areas within the penetration range of the German Me-110 fighters, as had been the case in the campaigns in Poland and France, and if a sudden air offensive struck the bulk of the enemy air forces on the ground at their bases as had been the case at the beginning of those campaigns.

In the case of the Air Battle for Britain, however, the faulty German concept became the determining reason for the German failure and inability to achieve the objective of

1476 eliminating British air power and thereby creating the conditions necessary for the invasion of the British Isles.

Later in the war the German fighter arm repeatedly had an opportunity to play its role as a component of the aggressive air forces. In all such cases, however, the necessary conditions for such operations existed, namely, the enemy air forces were within the penetration range of the Me-109 fighters, for example, in the campaigns on the Balkans, in Africa, and Russia.

On other occasions the lack of a superior long-range fighter not only prevented resumption of the bombing attacks against the bases of the Anglo-American air forces in Britain, but also made strategic air warfare in the eastern theater impossible at a time when the (potentially) powerful Russian opponents were mobilizing their last available military reserves, which enabled them to inflict on the German armed forces the catastrophe of Stalingrad.

From the above it can be seen that the fighter arm as a component of the aggressive air forces was the key factor in the successful conduct of air warfare in every respect, as long as the bases of the enemy air forces were within the penetration range of its units.

1477 3. Daytime Fighters in Defense Operations. When the German Command in its conduct of air warfare was compelled to assume the defensive, a number of problems developed in the field of fighter defense:

a. a. The ratio of strength on the attacking and defending side. This was a problem of numerical strengths as well as of quality.

(1) In the matter of numerical strengths because the possibility had to exist for the defender to concentrate at any point within the areas to be defended a commensurate number of defense fighters to contend with the strength committed by the attacker.

(2) In the matter of quality because the aviation and weapons performances of the fighter aircraft employed had to be adequate to enable the defending fighter to shoot down the enemy planes at an acceptable risk so far as the pilot and his plane were concerned.

In its Me-109 and (from the autumn of 1941 on) FW-190 planes, the Luftwaffe was convinced that it possessed the "best fighter aircraft on earth," and that with the fighter strengths available it was in the position to accomplish all missions which might develop for the fighter defense arm. These assumptions could be justifiable in all respects as long a a comperi-

1477 comparison between the results achieved against opponents in all areas showed a balance in favor of the German fighters, even though the German types of aircraft were not in every respect clearly superior in their technical performances.

1478 Even in 1940 the British had a Spitfire model, powered by an engine for high-altitude performances, which was superior to the German Me-109 in climbing performances and high-altitude operations. In all encounters between these two types, because of the superior dive speed of the opponent the Me-109 found itself compelled to break off action. The introduction of the FW-190 also brought no decisive progress as a fighter plane. In its performances it was about equal with the Me-109, with certain advantages and certain disadvantages when compared with that model. Its advantages were greater maneuverability, sturdiness, and simplicity of servicing, its disadvantages were smaller altitude performances and a smaller dive capacity of speed.

The deciding issue in competition against the British air forces was not the construction of the fuselage but the performance of aircraft engines. In the aerodynamic properties of aircraft the German side was superior, while the British had engines with a more powerful drive. The final product on both sides was about equal, the disadvantages on the one side giving the other side certain advantages and vice versa, with each side endeavoring to exploit to the utmost

1478 the advantages of its type of plane in air combat.

In August 1942 the appearance of the American 4-engine bomber in operations against targets in France brought about a radical change in the German fighter defense situation.

It became evident immediately that these "Flying Fortresses" were able to offer unprecedented resistance to attack by German fighters, and that no matter how much ammunition a German fighter fired into one of them it was insufficiently effective to bring down the bomber under attack.

The reasons here were as follows:

(1) The special insulation devices built into the 4-engine bomber gave it a greater degree of resistnace against the effects of normal aircraft ammunition, particularly the incendiary effects. In addition the bombers had protected fuel tanks.

(2) The 4-engine bomber could bring heavier fire power to bear against the conventionel fighter attack from the rear. This considerably increased the risks for attacking fighters.

(3) The "light spray" effect of the tracer ammunition encountering fighters taking a 4-engine bomber under attack caused the attacking fighter pilot to open fire too soon : Instead of waiting in order to open fire at the closest possible range, he would break off

1479 before coming within the most effective range of the bomber's defense fire. The field of dispersion in fire with aircraft-mounted weapons was so great at ranges of more than 400 yards that no concentrated effect could be achieved, even with proper aiming, and scattered fire could never cause a 4-engine bomber, which could continue in flight even with only one of its engines, to crash or make a forced landing.

The conclusions drawn by the Luftwaffe from such negative experience were as follows:

(1) The armament of German fighters with fire weapons was too weak. In 1942 this armament consisted of the following:

(a) In the case of Me-109-F2 fighter aircraft:

1 20- or 30-mm canon firing through the propellor hub

2 Type 17 7.9-mm machine guns firing through the propellor disk.

(b) In the case of FW-190-A2 fighter aircraft:

2 ~~13~~-mm machine guns and

2 Type 151 20-mm machine guns firing through the propellor disk.

In both cases the requirement was stated to increase the fie power by one 20-mm canon mounted in each of the

1480 In 1943 measures were taken to modify planes of the two types currently in service to carry these canon, and to adapt the new Me-109-G and FW-190-C series accordingly.

(2) More effective ammunition was required. This requirement resulted in the development of the incendiary-fragmentation shell, combining the blast and incendiary effect of ammunition.

(3) The conventional fighter tactics of attack from the rear were considered outdated, since it involved too great a risk for the attacking fighter because of the heavy defensive fire power of 4-engine bombers.

Experiments with new methods of attack proved that the most effective form of attack was from the front, but that it was at the same time the most difficult. It required an approach, head-on, at the same altitude as the bomber, with fire directed at the bomber pilot seat, and called for very precise calculation to enable the fighter after his burst of fire to escape through a gap in the bomber formation under attack. At the high combined speed of approach, the time during which the fighter pilot could fire at ranges between 600 and 200 yards was not more than 1.5 seconds.

1481 A fighter operating alone had good chances of success with this form of attack. For a unit of fighters in formation the new tactics involved time-consuming maneuvering, and during this time the enemy could frustrate the whole operation by a very slight change of course, causing the whole fighter attack to pass by harmlessly.

The fact stated in the after-action report of the Third Air Fleet for April 1943 that, because of the resistance of the enemy 4-engine bombers to weapons fire, only very few of them could be shot down although engaged in action by full-strength fighter units for a duration of 27-35 minutes, reveals clearly that the measures taken by the Luftwaffe to increase the effectiveness of its fighters against the American 4-engine bombers had disregarded the central point of the problem.

It is self-understood that the fighter aircraft required increased weapons fire power commensurate with the new and modernized construction of the 4-engine bomber. The decisive requirement for solution of the problem, however, was a fundamental change in the mentality of fighter personnel. What was needed was greater determination to accept the increased risk, in order to taken the enemy under fire at the closest possible range, and it was wrong to expect that the greater risk could be eliminated by means of increased effectiveness

1461 at longer ranges in fighter weapons.

This touches on a problem which was one of the most important arising from the experience gained and the lessons to be learned from the German air defense effort.

4. Combat Morale of German Daytime Fighter Personnel.

With the statement "Never did so few accomplish so much" quoted from his memoirs on the Second World War, British Prime Minister Winston Churchill paid the highest conceivable tribute to British fighter pilots for their devoted service in the Air Battle for Britain in 1940, and recognized their decisive contribution towards the failure of the German air offensive.

Most of them still equipped with Hurricane planes, which were inferior to the German fighters, British fighter pilots deliberately exposed themselves to the risk of attack by the escorting German fighters and concentrated their action against the German bombers. Finally, the Luftwaffe was unable to accept the risk of such heavy losses in bombers, which mounted steadily, and had to restrict itsbombing attacks to nights, because of the smaller risk of losses involved. With this transition to night attack, the Luftwaffe had to abandon its principle of precision bombing, and this was a definite disadvantages in view of the strategic objectives in operational air warfare.

1482 In contrast with the mentality of British fighter pilots, a mentality had developed in German fighter personnel already during operations in the Spanish Civil War. In the light of

1483 this mentality the highest art in fighter action was considered to be a form of surprise attack in which the fighter shot down his opponent without himself incurring any risk.

This psychological development was due to the initially vast superiority of the Me-109 against foreign fighter aircraft. In any conditions a slower opponent had better chances in curving maneuvers, so that the Me-109 had no chance of downing an enemy fighter in such maneuvers. Its chances of success resided in an undetected and quick approach to within firing range before the enemy plane could go into an evasive curve. Its second chance came when the enemy fighter endeavored to disengage in a dive, since the superior diving speed of the Me-109 enabled the Me-109 to overtake any enemy plane quickly, and because the enemy plane then had no chance of escape in a curve because of the enormous steering pressure.

The first condition for full exploitation of the advantages of the Me-109 was a pilot with above-average vision. The second was a calm equanimity, which enabled the pilot to withold fire until very close to his unsuspecting opponent, so that the first burst of fire would prove fatal. The third condition was good marksmanship.

1483 In Moelders, later Inspector of Fighter Forces, the Luftwaffe had the prototype of this kind of fighter pilot. After

1484 assignment to command the German J-Group in the Spanish Civil War in 1938, the present author for orientation purposes flew several missions as a "Rotte" leader with Moelders, at the time squadron leader in the J-88 Group, and had the opportunity to observe this method of shooting down an enemy at practically no personal risk. Moelders became the symbol of a form of fighter tactics which consisted of (a) securing the advantage of altitude, (b) gaining a position which made it possible to approach unobserved from the direction of the sun to within firing range of the opponent, (c) insuring that the attacking plane was at all times covered by other planes of its unit against enemy attack, and (4) returning to a high altitude immediately after downing the enemy plane.

In tactics of this type ~~of tactics~~ the chances of success were naturally better the smaller the size of the fighter unit concerned, since small unit size made for greater maneuverability and improved the chances for unobserved approach.

Realizing the importance of these advantages, German fighter pilots directed their attention primarily to the air above them and in their rear, in order to protect themselves against surprise attack by small enemy fighter units.

* Usually two planes. Not a standard unit.

1484 If a German fighter pilot found himself attacked by an enemy fighter from above in the rear, the best counter-move was considered to be a dive, in order to escape the attack by exploiting the superior speed of his Me-109. In fighter Jargon/this was known as "verreisen" (going on a journey), "stiften gehen" (walk out), or "Verrauschen" (going with the wind).

As early as during their assignment to escort bombers during the Air Battle for Britain, and particularly when they were assigned to escort dive-bomber forces, German fighter personnel protested against this type of operations which restricted their operations to medium altitudes , since it exposed them to attack from above and gave this advantage to the enemy. They insisted on commitment in roving fighter missions at predetermined times and within assigned areas, because their opinion was that this would have provided better protection for the bombers.

The German Command firmly rejected all such recommendations, and were right in doing so, since experience showed that the British fighters concentrated their attention exclusively on the German bombers and ignored German fighters flying at great altitudes and at some distance from the bombers, since such fighters constituted no direct and immediate threat to them during their action against the bombers. A compromise solution was found finally, with a certain per-

1485 percentage of the single-engine fighters plus the twin-engine fighters assigned to provide close escort protection while the rest of the single-engine fighters were assigned what might be called an indirect escort mission and maintained loose contact with the bomber formation.

The British fighter arm countered these tactics with a highly effective measure: they posted Spitfire patrol units

1486 at great altitudes near the Channel coast with the mission of attacking and containing the German indirect escort units. The first reaction of German fighters in such cases was usually completely wrong. The moment the warning was sounded, that came from a rear unit, to the effect that a Spitfire was in sight higher up, the German fighter formation usually made its getaway at once in a downward swoop. Through this maneuver the whole formation was usually scattered and, because of the limited time-in-air capacity of its aircraft was rarely able to continue in the execution of its mission or to participate in any way in the current air operation. The result was/during that the close approach, over the target area, and on the return route the German bombers were protected by only more or less strong elements of the close escort units to encounter the bulk of the British defense fighters.

In the case of twin-engine units, whose mission of close-escort tied them to the close vicinity of the bombers, expos-

1487 exposed them continuously to British fighter attack from the rear and above, the usual method was that only one "swarm" * maneuvered into position against the attackers. If the British continued their attack this meant that they themselves would thus come under attack, so that they were compelled to break contact.

The urge to climb to high altitudes and to dive away when threatened by attack from above developed into such a strong element in the mentality of German fighter personnel that the Commander in Chief of the Luftwaffe in September 1943 felt compelled in a written order to forbid use of the word "verreisen" (travel away) in the fighter arm under threat of severe penalties.

1487 This prohibition was a wise measure. The"dive-away" tactic had been a method of escape at a time when the German fighter models still had a superior dive speed, although even then it could hardly be considered suitable for fighter operations. To attempt this method of escape in an encounter with P-47 Thunderbolt, P-51 Mustang, or the British Tempest fighters, with their greater dive speed due to the greater weight, was nothing short of suicide. However, the habit had become so ingrained in German fighter personnel that they found themselves unable later in the war to adopt the only possible method of curving in against the attacking enemy

1478 fighter. The effects of this element of mentality are typified by the fact that even General Galland with all his experience as a fighter pilot almost lost his life in an attempt to make a dive-escape from an attacking Mustang fighter, an incident described in his book "Die Ersten und die Letzten" (page 284).

This unfavorable development in the mentality of the average German fighter pilot was also influenced considerably by a further factor: the personnel policies under which commander personnel were selected, and preferential promotion and decorations were awarded in the fighter arm.

It is only too natural that prior to the war and in the first years of warfare the Commander in Chief of the Luftwaffe, Reich Marshal Goering, who himself had been a famous fighter pilot in World War I, regarded young fighter pilots with particular favor. As early as during the Spanish Civil War his particular regard for the fighter arm found expression in a decree that all fighter pilots who had a score of five successful air-combat encounters in that campaign were to be given preferential promotion to the next higher rank.

For the average fighter pilot the beginning of the war brought increased advantages, dependent on the number of enemy planes he downed, in the matters of rank, assignment, and decorations.

1488 Reich Marshal Goering held the view that a unit leader who did not excel in the number of enemy planes he had downed could not be considered suitable to command single- and twin-engine fighter units, and established certain minimum requirements in this respect for such assignments as well as for the awarding of the highest decorations, which were as a rule combined with preferential promotion.

On the basis of these principles considerable changes in the command personnel of the twin-engine and single-engine fighter forces occurred after the 1940 campaign in France. Group and wing commanders, as well as squadron leaders, who had a record of only a small number of enemy planes downed or no such record at all were relieved of their posts and replaced by more successful younger officers.

With their appointment to higher positions and after decoration with the Ritterkreuz (Knight's Cross to the Iron Cross) these young officers were soon promoted to the rank equivalent with their current assignments, squadron leaders became captains, group commanders became majors, and wing commanders became colonels. These promotions were permanent.

The natural psychological outcome of these methods was
1489 the development in fighter pilots of an ambition to shoot down the standard number of enemy planes as speedily as possible which would qualify them for the highest decorations.

1489 These circumstances produced a certain measures of rashness on the one hand but at the same time an inclination to weigh the chances in any situation. Thus, a fighter pilot who required only another three enemy planes downed to his credit in order to qualify for the Ritterkreuz was far more likely than a pilot who had only five to his credit to await ~~xxchancexfor~~ a favorable chance to down an enemy plane without risk . His action was dictated by an attitude of "maybe the chance will be more favorable next time."

Aggressiveness was thus frequently influenced by the hope of profit rather than being founded on the ethical concept of duty to the Fatherland.

In such a frame of mind a fighter pilot would naturally find the way of least resistance particularly inviting. This way of least resistance was to be found more easily in an attack against enemy fighter planes than against enemy bombers, since the bombers were protected by fighters more usually flying at the highest possible altitude rather than lower down, because high altitude insured the advantage of position, an advantage any airman would be reluctant to accede to the enemy.

The younger the commander of a fighter unit was, the greater was the danger that he would succumb to such

1489 temptations emanating from exaggerated ambition, because of his immaturity in the human and military qualities.

This development illustrates one side of the German fighter pilot mentality. The severe criticism to which Reich Marshal Goering subjected the morale of fighter pilots in the commander conference on 7 October 1943 was fully justfied in the formulation he gave it so far as the personnel motivated by this mentality were concerned, and the percentage of personnel so motivated was by no means small as an examination of the success records with critical eyes reveals.

However, German fighter pilots would not have been so successful in World War II if a different type had not also evolved, the type of the true fighter, besides the calculating ambitious type. The true fighter type was the pilot who was motivated exclusively by the determination to destroy the enemy, a determination which was founded on a keen military sense of duty.

Captain Marseille, who earned fame in the African campaign can be considered the prototype of the true fighter. It is characteristic of this man that he refused to be satisfied with the comfortable solution of the dive escape because of the poor curving qualities of the Me-109. Instead, he schooled himself in severe training to master curving maneuvers with the Me-109 to perfection. To this end he practised

1490 almost daily, only a few feet above the ground, at following a course marked out on the ground in an inward spiral. Through this practice he achieved such perfection in curving that he was able to outcurve any opponent and shoot him down in a curving maneuver. This was a method which always came as a surprise to an opponent and left him no chance of escape, since he was accustomed to counter any attack by an Me-109 by curving maneuvers, relying on the allegedly superior curving abilities of his plane.

Wherever a true fighter of this type was encountered as a unit commander, he placed his imprint on his entire unit in every respect: in the average performances of his unit, in the combat morale and aggressiveness of his personnel, and in the whole outward appearance of his unit.

From the experience outlined above it can be said here that:

a. If too much emphasis is placed on reward for combat performances in war the healthy ambition of military personnel candeteriorate into a weakness, and it is likely that they will be motivated exclusively by the urge to increase their personal successes and thereby earn the advantages accruing therefrom.

b. Although youthfulness provides better prospects of the carefree rashness required in fighter action, a

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certain measure of maturity in the military and general human qualities must be stated as an essential qualification for assignment in command of a unit.

ƀ. The pilot of a single-seater fighter plane has to rely exclusively on his own abilities in flying his plane, in combat action, and in navigation. He is denied the moral support of companionship. As an individual fighter the demands made on his firmness of character are particularly severe. Only highly qualified personnel can meet these demands.

d. A system of preferential permanent promotion for unit commanders with outstanding combat performances creates the danger of a stagnation of the impulses coming from a true military sense of duty if personnel thus regarded are of weak character.

The British system seems sounder, under which a unit commander received temporary promotion to the rank equivalent with his assignment, and retained that rank only as long as he gave satisfactory service in the assignment.

e. In the matter of the highest decorations for courageous action fighter personnel received unjust preference over the personnel in other arms and services.

The downing of an enemy plane in combat is not

1492 necessarily the equivalen of above-average courage. To approach an unsuspecting opponent from the direction of the sun and shoot him down requires just as much personal courage as it would take to shoot a deer. Success here is due to a combination of cool calculation and good marksmanship. In contrast, the downing of a 4-engine bomber in the face of defensive fire from all guns the bomber has requires some measure of personal courage, since it entails a personal risk of being hit. However, the courage required in such action is still within the ethical scope of what can be expected of a fighter pilot, since every soldier in war is required to bring his weapon to bear even when under enemy fire.

Decorations for courageous action in war therefore should only be awarded in the case of acts actually exceeding by far the scope of what must normally be required from military personnel.

Not to be too cowardly is not equivalent with being particularly courageous.

1492 f. In peace and during war the unit commander must consider the education of those under his command as a mission of equal importance with his mission of operations. A permanent foundation for the maintenance of

1493 excellent morale can evolve only from an ethical basis. It is more important for a unit commander to instill this basis into his subordinates and make it a part of their very being than to be concerned about his own personnel success.

g. The command has the high responsibility of insuring the equipment of its forces with weapons which will give them at least a feeling of equality with their opponents.

Good troop morale cannot be maintained permanently if the troops believe that they are constantly expected to fight against a superior enemy.

The fact that German fighter personnel from 1943 were constantly required to fight with inferior strengths and inferior quality against the Anglo-American air forces resulted from the failure of the German Command to plan in time for a strengthening of its fighter forces both in respct to numerical strengths and in point of quality. This failure of the command was therefore one of the most important reasons for the deterioration of morale in the daytime fighter forces.

1494 5. The Training of Daytime Fighter Personnel. A proper selection of pilot personnel and their thorough training are essential conditions for success in fighter operations.

At the beginning of the war the units available in the German fighter forces by no means consisted primarily of experienced airmen. The speedy establishment and the continuous expansion of the units prior to the war left them no time to achieve proper unit integration. However, a very good system w was applied to insure that new units established around elements released by old units for this purpose would achieve standards equal to those of the former units of the cadre personnel. For this purpose the already existing unit was required to submit to its superior wing headquarters lists showing an equal division of its personnel. Wing headquarters then decided which group would remain with the old units and which was to establish the new unit. This prevented a practice of getting rid of inadequate personnel. The advantage was that after the division each unit had a hard core of old and experienced pilot personnel.

The personnel in this hard core not only had the qualification of thorough peacetime training, but by reason of their long flight service in the fighter squadron had a good fund of general flight experience. In addition, some of them also

1494 had gained actual combat experience during their service with the J-88 group of the Condor Legion in Spain.

For the above reasons it can be assumed that the average German fighter unit as it existed at the beginning of the war contained approximately one-third particularly experienced pilots and two-thirds younger pilots with normal peacetime training.

The authorized ratio of officer pilot to enlisted-men pilot personnel was 7:5 in fighter squadrons, 6:6 in the twin-engine fighter squadrons. The natural result was that the officer pilots served as swarm (usually about 5 aircraft) and Rotte (usually two aircraft) leaders within the squadron, with the rest of the positions as Rotte leaders going to enlisted personnel.

In actual fact this high ratio of officers to enlisted personnel was never achieved in squadrons prior to or during the war. The reason was that the number of officer candidates with adequate formal school education (matriculation was required) was at no time large enough to fill the overall requirements of the military establishment. For this reason advantage was taken during the war of the possibility to raise to commissioned rank noncommissioned personnel who had rendered conspicuous service in combat action. However, even this measure was insufficient to bring about the desired ratio of

1495 officers to enlisted personnel in the fighter forces during the war.

This failure resulted in the following disadvantages:

1. In periods of heavy loss in unit commanders, the officers assigned to replace them were frequently too young and lacked front experience and general maturity.

2. The steadily growing severity of combat conditions

1496 during the war called for personnel of a particularly high mental status. This quality was to be found only in personnel with a high rate of intelligence and with trained intellects.

Generally speaking, enlisted personnel with only primary education could not meet these requirements.

3. In the case of a fighter pilot, who is thrown completely on his own resources in combat, satisfactory performances are largely dependent on the degree of his sense of duty and responsibility. Generally speaking, officer personnel are superior to enlisted personnel in this respect owing to their special training and education.

For the above reasons it must be considered a mistake that the Luftwaffe did not give enough consideration to the severe demands made on the mental and general human and military qualities of a fighter pilot and did not insure at an

1496 stage that only highly qualified officer personnel would be assigned as aircraft pilots in fighter units.

Although German air pilots were not superior in quality to enemy pilots, so far as training and experience were concerned, at the beginning of the war, the superior quality of German fighter aircraft resulted in a quick increase of experienced pilots in the fighter arm, since German losses in this field were relatively small. For some time the German fighter arm was able to subsist on this surplus of experienced personnel after the western opponents had caught up with the German lead in the point of the quality of fighter aircraft.

With the introduction of superior fighter aircraft on the enemy side it was unavoidable that German losses in fighter pilots increased. From then on depletion of the fund of highly qualified fighter personnel on the German side was a rapid process. The reason was that the replacement fighter pilots received on the German side were inferior to those on the enemy side in flying experience.

A comparison of the German and American training program for fighter pilot personnel shows a ratio of 1:3 hours of actual flight experience in favor of the American side. American fighter pilots in addition had one particular

1497 advantage over their German opponents: they received thorough training in the subjects of blind flying and instrument navigation and, in contrast with their German opponents, because of the great radius of action of their aircraft, had no need to worry constantly, even during bad weather, right from take-off on "how and where will I be able to land safely with my plane."

This factor of superiority in flight experience on the American side did much to balance the initial disadvantage of a lack in combat experience.

With the decline of combat experience in the German fighter arm due to continuing heavy losses in experienced pilots and particularly in unit commanders, the inferiority in flight experience naturally also reacted in favor of the American side. Gradually the conditions of a vicious circuit

1498 developed: while the number of Anglo-American fighter pilots with flight and combat experience increased steadily because of their small losses, those available on the German side declined in numbers at a progressively growing pace in a direct ratio to the growing necessity to assign newly trained young pilots who lacked flight and combat experience.

The life expectancy of the average pilot and plane dropped in a sharp spiral. In 1944 German fighter personnel were so resigned to their fate that they estimated that a newly

1498 assigned pilot coming from training could at best last seven missions without being shot down.

It must therefore be considered as a flaw in the training program of the Luftwaffe that fighter pilot trainees were not given the opportunity to accrue more flight experience. The lack of a feeling of confidence in their complete mastery of their aircraft not only did much to increase the feeling of inferiority in German fighter pilots in comparison with their American and British counterparts, but also contributed largely to the development of critical conditions in combat morale.

It would have been wiser to increase the number of fighter pilot schools immediately after the beginning of the war, with the purpose of having six schools to give each pilot 150 hours of training in fighter pilot subjects and blind flying instead of only two schools giving each pilot only 50 hours of training. With 150 hours of training German fighter pilots would have been in a far better condition later in the war to accomplish their mission of home air defense under all weather conditions. This faulty training po-

1499 licy was also the cause of the losses which occurred through weather conditions after 1943, which frequently exceeded the losses due to enemy action.

The question arises here to what extent it was possible for the Luftwaffe to improve its fighter pilot training pro-

1499 program during the war. This question involves the problems of

a. Trainer personnel available

b. Training aircraft available

c. Fuel available.

Due to an assignment in command of the 2d Twin-Engine Fighter School at Memmingen in 1941-42, the present author gained personal experience on the fighter pilot training situation. A very acute shortage in aircraft, fuel, and personnel existed already at that time. The most important factor was that of the rationing of fuel, since the supplies made available were so inadequate that it was impossible to give trainees the prescribed number of hours in flight training, while in other cases the course of training dragged on too long before it could be brought to an end.

In the matter of trainer personnel, front line units were reluctant to release well qualified personnel for assignment as trainers in schools. One can understand this attitude both from the viewpoint of the units and from that of the front line fighter pilots themselves. The units as a rule had a surplus of inexperienced rather than experienced personnel, and front line personnel deplored missing the chances of earning decorations and promotions, quite apart from their reluctance to leave the free-and-easy atmosphere of the

front and fit themselves into the strict military discipline of a home command.

The cause for these developments can be sought only in faulty planning by the Luftwaffe Command, which underestimated the training requirements. In order to insure the quality of the training given and to make certain that it would be adapted currently to actual and current combat tactics and techniqu techniques it would have been necessary to establish a firmly regulated rotation of front line pilots and instructor personnel.

Bearing in mind that the Chief of the Luftwaffe General Staff during the decisive years of planning in 1940-41, General Jeschonnek, considered that a monthly rate of 360 fighter aircraft and 130 replacement fighter pilots would be amply sufficient to maintain the fighter arm at full strength and at its high standards, the conclusion forces itself on the mind that training requirements were underestimated and that this error could have been avoided if the opinion of Field Marshal Milch had been accepted, who at the time recommended a monthly output of 1000 fighter aircraft.

In summarizing, the following lessons can be learned from German fighter personnel training policies and activities:

a. Relying exclusively on his own resources, the fighter pilot bears a maximum load of personal responsibility.

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b. The more thorough the training a fighter pilot receives, the greater will be the extent to which flight experience can compensate for the lack of combat experience in replacement pilots received from training during war.

c. The time and effort expended in training pay off in a plurality in the form of reduced losses.

d. Daytime fighter pilots require a program of training which will make fighter units just as independent of weather conditions as the bomber forces of the enemy will be.

This means that the fighter pilot alone, in addition to his other functions, will have to perform the functions of blind flight and instrument navigation, functions performed by special personnel on a bomber, where the various duties can be shared among the multi-member crew.

e. Inadequate training leads to serious self-deception on the part of a command in the matter of the combat value of its forces.

For these reasons timely action must be taken to provide the necessary training establishments in the required scope.

1502 II. NIGHT FIGHTER DEFENSE.

1. Organization. From the very outset the systematic development of the German night fighter defense system, which commenced in July 1940, proceeded under favorable circumstances

The officer assigned the mission, General Kammhuber, held a dual position. As a field commander in his capacity of Commanding General, Night Fighter Division, he was responsible directly to Headquarters, Second Air Fleet, from March 1941 on to Headquarters, Air Command Center; in his concurrent position as Inspector of Night Fighter Forces he was responsible directly to the Commander in Chief of the Luftwaffe. This second position gave him the opportunity, as representative of the Commander in Chief of the Luftwaffe, to put his intentions into effect throughout the Luftwaffe. Furthermore, he was supported in the execution of his program by special authority from the Commander in Chief of the Wehrmacht.

It was only because of the above circumstances that it was possible to build up an entirely new organization at the pace made necessary by enemy air activities.

The program on which the whole build up was based was logical and sound in the light of the strategic objectives aimed at by the enemy:

1502 a. From the outset the program provided for two concurrently active forms of night fighter defense

(1) defense action by night fighter forces stat-

1503 ioned forward of the more important defense areas of Germany, namely, the Bight of Helligoland, the Ruhr region, and Berlin;

(2) aggressive defense action by long-range night fighter forces against the bases of the British bomber forces and against British bomber formations along their approach and home routes.

b. The built-in principle of centralized control prevented any dispersion of effort or scattering of forces and permitted the consolidation of forces from large areas to develop power concentrations at currently critical points.

c. Direct assignment of the night fighter forces under the appropriate command headquarters responsible for night defense in all areas exposed to night air attack insured maximum effectiveness in combined action and cooperation with other participants in night air defense activities.

The pattern of the night fighter defense organization evolved logically and necessarily from the knowledge available on the operational tactics of the enemy in 1940 and

1503 from a realization of the possibilities of shooting down enemy aircraft at night.

Under the conditions resulting from the standards achieved at the time in navigational aids and bomb aiming devices, the enemy, in attacks against any specific target, still had to rely on the following factors:

a. Optical recognition to permit identification of the assigned target;

b. Individual plane approach, attack, and departure tactics.

This meant that the enemy needed good visibility--moonlight--, clear nights, and at the most light clouds as essential conditions for night operations.

These conditions provided the best chances for night fighter operations supported by searchlights to light up the enemy aircraft, which the night fighter would take under attack in the same manner as during daylight, but himself remaining in the dark.

In order to prevent collision with antiaircraft artillery stationed at targets to be protected and in order to insure that the two defense arms (night fighters and antiaircraft artillery) could both operate without interference, it was a logical measure to base night fighter operations on a searchlight belt forward from the main defense areas and to

1504 establish this searchlight belt in a continuous line extending from the Bight of Helligoland to the Frankfurt basin area as the first phase in the organization of the night fighter defense system.

If it was found that enemy units on their way to attack Berlin areas bypassed this searchlight belt by flying north of its flank, it would become necessary to establish another searchlight belt around Berlin. It was also foreseen that it would be necessary to extend the first belt from Frankfurt to Metz in order to prevent enemy units from flying around its southern flank.

The decisive factor in this phase of the organization of the night fighter defense system was to have the night fighters in that section of the searchlight belt which the enemy were crossing and to have them there at the right time. Since enemy forces in those days still operated on a broad front both during the approach and home flight, it was possible to commit several night fighters concurrently, also on a wide frontage, and in successive waves according to the depth of the enemy formation.

It was essential to detect at an early stage the course of the approaching enemy force and to decide in which zones it was likely to cross the searchlight belt. For this reason it was necessary to include in the defense system

1505 a network of long range radar positions. Early warning by radar was absolutely essential to insure timely arrival of the night fighters in the zone of the searchlight belt which the enemy would cross.

Initial experience in the use of the few Freya and Wuerzburg radar instruments available to track enemy aircraft gave rise to the thought of using these instruments both to track the enemy and to control the defending night fighters, thereby enabling the night fighters to attack enemy forces in all conditions of weather during their approach and return flight. This would have made the night fighters independent of the searchlight belt, the operations of which were subject to serious restrictions by weather conditions.

The positive results obtained in experiments with this type of "dark" night fighter operations resulted in the establishment of a program for the final organization of the night fighter defense system. This program provided for a network of night fighter control positions, each with several radar instruments, to cover the whole of Germany and certain areas of the occupied western territories.

The night fighter defense organization thus evolved logically in reaction to the given conditions created by enemy action and in accordance with the most favorable possibilities

existing for successful night fighter defense operations. The logical thought processes involved found tangible expression in the systematic development of the command and control organization, which in all cases was adapted to the existing stage of development reached in the development of the ground service organization.

Bearing in mind the possibilities which existed at the time, a better organization is hardly conceivable even in retrospect. That no sensational results were achieved is not due to the unavoidable flaws which admittedly existed in the organization, but to the following causes:

a. The weakness inherent in every defense organization that it requires a far larger expenditure in personnel and materiel than an attacker requires for the execution of his offensive operations, so that a long time is required for its development.

b. The way in which the Luftwaffe Command had neglected its night fighter forces prior to the war and during the first year of warfare. It was extremely difficult to make up for the time thus lost, and what made it more difficult was the necessity to act under the pressure of enemy air attacks and at a time when the armament potential was strained to breaking point.

The Night Fighter Command was fully aware of the weak

1506 points in its night fighter defense system based on "illuminated" and "dark" and "combined" operations and took timely action to formulate specifications for future technological development work to provide against the eventuality of a change in the enemy tactics in the form of a complete transition to operations restricted exclusively to dark nights and the application of blind bombing methods during bad weather.

The tactical-technnological specifications stated by the Night Fighter Division in the winter of 1940-41 resulted in the development of the following by 1941:

The Wuerzburg-Riese radar instrument, a considerable improvement over the Wuerzburg-D instrument;

The Lichtenstein B/C air-carried radar instrument for target detection;

The Seeburg plotting table;

The He-219, developed specifically as a night fighter aircraft.

In the matter of the organization established for the night fighter defenses basic problems only developed after establishment of the four fighter division headquarters at Deelen, Stade, Metz, and Berlin, as well as the fighter command headquarters in Southern Germany and Austria was completed to form a control framework.

1507 The fact has been pointed out previously in this study that General Kammhuber's requirement and recommendation that the command area under the Third Air Fleet should be included under a centrally controlled fighter defense system was appropriate to the situation resulting from the tactics employed by the British in their night operations. The Luftwaffe High Command not only made the mistake of rejecting this recommendation but went even further on its wrong course. The measure placing the fighter division at Metz under the II Corps (Third Air Fleet), and assigning the I Fighter Corps and the 7th Fighter Division separately under Air Command Center, all of them up to then under the XII (Night Fighter) Air Corps, destroyed the last remaining vestige of a consolidated control over night fighter operations within the Home Zone and within the outpost areas in the occupied western territories.

Another serious error was the failure to carry out consistently the plan to consolidate the close- and long-range fighter forces for combined action and the complete discontinuation of the long-range fighter arm after a brief attempt at reinvigoration with unsatisfactory means in the autumn of 1942.

This decision was due largely to the negative opinions held by the Commander in Chief of the Wehrmacht and is

1507 particularly hard to understand in view of the fact that the idea of an aggressive solution of the air defense mission had always played the major role in the basic concepts of the Luftwaffe.

Apart from the units established for the night fighter (long-range) arm, namely the 1st Group, 2d Night Fighter Wing, and the 4th Group, 2d Night Fighter Wing, in 1940, up to the time when the arm was discontinued, in 1942, no further units were activated for the purpose. This is evidence of a flagrant neglect of this field of activities on the part of the Luftwaffe High Command.

The fact is that better means were available in the autumn of 1942 for the attempt to revitalize the long-range night fighter arm. The use of Ju-88 and Do-217 bomber type aircraft in long-range fighter missions over Britain at this juncture held out no prospects of success, since their use in night bombing missions against Britain had produced abundant experience showing their complete inferiority to the planes of the British night fighter arm.

The Me-210 in contrast, would have been far more suitable in 1943 for use in long-range night fighter missions. It was 48 miles faster than the other planes, and could have been made still faster by the removal of needless weight; it had a time-in-air capacity of four hours and was equipped to carry

1508 two 1100-pound bombs. In 1943 it could have been replaced by the even faster Me-410.

In view of the extreme vulnerability of the Royal Air Force units during their highly complicated take-off and

1509 landing maneuvers for their steadily growing night operations, a strong long-range night fighter arm would have held out exceptionally good prospects for successful action. That the Luftwaffe voluntarily rejected this opportunity for effective action must be considered as one of the cardinal mistakes made in the organization of the German night fighter defense system. Responsibility for this obviously rests with the Commander in Chief of the Luftwaffe, who failed to convince the Commander in Chief of the Wehrmacht of the necessity for long-range night fighter operations.

Resumption of the air offensive against Britain, as planned by the Luftwaffe High Command to commence as soon as possible, could not have served to compensate for the failure to take action with long-range night fighter forces, since the strategic objective to be aimed at in the planned offensive evolved from the concept of retaliation attacks against large British cities and not against the currently most dangerous opponent, the Royal Air Force.

1509 In the spring of 1944 the 7th Fighter Division and a few months later the 8th Fighter Division, at Schleissheim and Vienna, respectively, were placed under the I Fighter Corps, witnessing a return to the principle of a central control over night fighter operations in the night fighter organization of the Home Air Defense Zone night fighter defense system. In practice events proved thereafter incontrovertibly that a central command controlling large areas was the soundest form of organization.

It has been pointed out previously that the time at which the Allies in their offensive against the oil industries in Germany and the Balkans began treating the whole expanse thus under attack as one operational zone while the Royal Air Force increased the intensity of its attacks against the areas of Belgium and France in preparation for the invasion, was the psychological moment at which the German side should have consolidated the Zone of Interior, the occupied western territories, and the Balkans to form one homogeneous defense system, also so far as night fighter defense operations were concerned. This was the only course which could have created the possibility to move the night forces from area to area speedily and in a manner suitable to develop power concentrations commensurate with the current situation at any given time.

One result of the failure to take such measures was that

1510 only 36-40 night fighter aircraft were available for defense action in the zone of the Third Air Fleet when the Royal Air Force was particularly active in attacks against targets in the Belgium-France areas. At the same time the strong night fighter forces in the Home Air Defense Zone were by no means fully engaged and the 2 1/3 night fighter groups committed in Rumania to counter the mining operations carried out by weak forces of the Royal Air Force against Danube shipping represented a disproportionately large expenditure of forces.

If all areas had been under a central night fighter command, the necessary transfers of units could have been carried out speedily and whenever required.

The manner in which ~~the integration of~~ the single-engine night forces were integrated with the night fighter defense system of the Home Air Defense Zone is hard to understand from the viewpoint of organization. The appellation of "Wilde Sau" by which the operating system of these forces was described was more than justified, since the single-engine night fighters when in action were as unpredictable and uncontrollable as a herd of wild pigs.

The reason here is to be found in the mentality of the persons who exercised a determining influence:

Since the oral report submitted by General Kammhuber to

1511 the Commander in Chief of the Wehrmacht on the subject of the night fighter program and the heated controversy which had resulted, the Commander in Chief of the Luftwaffe, Reich Marshal Goering, had had little time for Kammhuber, and was therefore particularly susceptible to recommendations for an improvement of the night fighter situation which could be effectuated more speedily and at smaller cost, especially if such recommendations were brought forward with a great show of optimism.

Major Hajo Herrmann, as an exponent of the bomber forces, for which there were hardly likely to be any chances within the foreseeable future to play any important role in air warfare, considered single-engine night fighter operations as a promising field of activities for bomber pilots.

Obviously Reich Marshal Goering considered that this new idea could only develop without interference if the new night fighter arm thus to be created was not placed under command by General Kammhuber. This was the reason for the direct assignment of the single-engine night fighter units under Air Command Center, for the speedy build up of the 30th Fighter Division, and for the parallel existence of two completely different and separate night fighter organizations.

It is clearly obvious that an organizational system of

1512 this type could not possibly produce maximum cooperation between the twin-engine and the single-engine night fighter forces. Integration of the single-engine night fighter units with the existing fighter divisions would have been the best way to use them effectively in smooth cooperation with the other participants in the air defense mission.

It is always a bad sign in a command when logically necessary organizational measures fail to come about because of personal feelings.

This organization flaw was removed in part on 15 February 1944 by assignment of the 30th Fighter Division under the I Fighter Corps and completely remedied on 16 March 1944 by disbandment of the 30th Fighter Division Headquarters and assignment of the single-engine night fighter units under the already established fighter divisions. By then, however, the Royal Air Force had adapted its tactics completely to bad weather operations, and the time had passed in which there had been chances of success for single-engine night fighter forces in direct target night fighter defense operations.

The assignment of all night fighter forces under the Home Air Fleet in the Autumn of 1944, when the invasion forces in the west were approaching the frontiers of Germany and the Russian forces were at the frontiers of Hungary, for the first time established a complete pattern of centralized

1512 control for night fighter operations in a really large defense area. Through the five fighter divisions with their headquarters in Berlin, Stade, Deelen, Schleissheim, and Vienna, the I Fighter Corps directed all night fighter operations from its central headquarters, in all areas from the North Sea to the border of Switzerland and from the Baltic to the Yugoslav-Hungarian frontier. The experience gained with this system showed that the new organization insured the widest possible scope for defense tactics aiming at the development of con-

1513 centrations of power for the defense at the points of main effort in enemy attack operations. The limited operable strengths of units due to the shortage of fuel and to varying weather conditions could not at any time prevent the movement of planes manned by the best personnel from all divisional areas stationed within a radius depending on time requirements to the point where they could engage the enemy. In the case of enemy attacks against a number of targets simultaneously, it was possible to divide the fighter forces thus available in consonance with current requirements or to concentrate them against one of the enemy attack formations.

At a time when situation interpretations were particularly difficult it was of especial importance to make quick decisions and translate them immediately into operational orders for transmission to the various unit commands. This was possible

1513 only through one centrally responsible command headquarters, since the speed at which the situation could change prohibited any delays which could have occurred through the action of a number of headquarters co-responsible for the decision.

It can thus be established that the night fighter organization achieved the ideal pattern in 1944 and vindicated the soundness of the following maxim:

> The operating scope of the enemy air forces will determine the size of the overall air defense area in which the direction of air defense activities must be the responsibility of a centralized joint command for all participants and of central command posts for the individual arms and services of the air defense forces.

1514 2. NIGHT FIGHTER TACTICS AND TECHNIQUES. The initial system of night fighter operations, that of searchlight supported night fighter action introduced experimentally by the Luftwaffe in 1937, was based on experiences of World War I. With the navigational facilities and bomb aiming devices available in 1937, aircraft operating at night were just as dependent as they had been in World War I on conditions of good visibility for the execution of an air attack mission, and such conditions were also good for searchlight illumination activities.

The system adopted by the Luftwaffe was therefore commensurate with the conditions of the times.

In order to insure that both the antiaircraft artillery and the night fighter forces would be able to operate without interference, Air Field Manual LDv 16 required that the zone of night fighter operations must be forward of the zone of antiaircraft artillery fire. This circumstance and the short time-in-air capabilities of the Ar-68 and He-51 aircraft available at the time prohibited large-area operations and made the night fighter forces an arm restricted to the mission of direct target defense.

The period after 1937 was one of stagnation so far as development of the night fighter forces was concerned, since

1514 the Luftwaffe for reasons previously described in this study considered that the development of a special night fighter organization was not a currently acute requirement.

When the problem did become acute in 1940 the only course of action that was possible was to start at the point where development had stood at the beginning of the war. The only feature of progress was that the aircraft type selected for equipment of the night fighter units, the Me-110, insured the possibility of all-weather operations and a longer radius of action.

The first methods employed in 1940 corresponded precisely to the ruling views of 1937 on the necessity for cooperation with searchlights. After a few unsuccessful endeavors to extend the night fighter zone into the antiaircraft artillery fire zone, the principle was adopted of moving the night fighter zone together with the necessary searchlight units farther forward of the antiaircraft artillery fire zone in the direction of the enemy approach routes.

So far as combat tactics were concerned, experience showed that the time-honored fighter attack from the rear was the best method to shoot down an enemy plane lit up by searchlight. The fighter had the added advantage at night that he remained hidden from the enemy, who was dazzled by the brilliance of the searchlights.

1515 The advent of radar instruments for the detection of air targets introduced an entirely new era of development. The initial role of radar in night fighter operations was to detect at an early stage the probable sections of searchlight zones which enemy aircraft would cross, to track enemy aircraft in order to direct searchlight operations, and to provide data for the action order releasing night fighters to attack the enemy from their waiting positions above radar positions or visual light signal beacons. This developed into an extended searchlight-supported night fighter system known

1516 known as "illuminated" night fighter operations. In practice, success in this type of operations was too dependent on the smooth functioning of all factors involved:

a. The early detection and continuous tracking of the enemy target by radar instruments until searchlights could take over the target;

b. Adequately high altitudes of the enemy aircraft;

c. Good lighting conditions for the searchlights and an adequately long period during which the target could be held by the searchlight units;

d. Proper timing of the night fighter attack and proper synchronization of the searchlight illumination and the night fighter attack action.

It is obvious that it was possible only under favorable

1516 circumstances to meet all these requirements in combination. If conditions were unfavorable for searchlight operations the whole system could not be applied. If the searchlights failed to hold the target long enough, the time was inadequate for the night fighter approach and attack . If the enemy aircraft was too low down, the searchlights could not follow it with their beam for long enough.

It follows, therefore, that in the light of a sober and realistic appraisal of the possibilities under this system, no decisive results could be expected from its application.

The Night Fighter Division at an early stage recognized the possibilities which radar presented. A reorientation of the night fighter system from the searchlight-support methods to radar directed methods hinged upon the quality and number

1517 of radar instruments which could be made available to the night fighter command while at the same time meeting the requirements of other users: the antiaircraft artillery, the Navy, and the aircraft reporting services.

The radar system had the exceptionally important advantage that it could operate independently of weather conditions All that had to be done was to base the tracking of enemy aircraft and the direction of defending night fighters on radar target detection. Once the Wuerzburg-C radar instrument was capable of providing relatively precise data on

the latitude, distance, and lateral position of an enemy plane, so that the German night fighter could fly at the same altitude and had only to establish the exact distance and lateral position of its target, two new possibilities presented themselves:

a. A system using one Wuerzburg instrument to track the enemy plane and one Freya instrument to direct the night fighter;

b. A system using only 1 Wuerzburg instrument to track the enemy plane and direct the night fighter.

To make the use of the Freya instrument possible for such purposes, its locating precision was improved by a modifying instrument called the "AN Attachment." In spite of this, however, it remained less precise than the Wuerzburg instrument.

The next factor required in this new system was a plotting table on which it would be possible to register the position of the enemy and the night fighter planes currently and so translate this data into course and altitude orders to the night fighter that it could be directed in what might be called a "meeting mission" to within the close vicinity of the enemy plane, establish visual contact, and then attack.

After some experience in this field the ideal solution was found in the Seeburg plotting table, introduced for

general issue to the night fighter control positions in 1941.

The new method now developed and named the "Himmelbett" (Waiting Position) method was patterned after a British tactical system which, because of navigational difficulties, had to be restricted to clear moonlit nights enabling the night fighter to recognize the silhouette of his targets at distances up to 220 yards.

The plans worked out on these principles provided for the establishment of a network of such "Himmelbett" waiting positions throughout the outpost areas of the Home Air Defense Zone and insured continuous action against any enemy aircraft penetrating into German territory

a. by night fighter units in the outpost areas, and

b. by antiaircraft artillery in the area the enemy intended attacking. Such action was possible without the one component of air defense interfering with the operations of the other.

This organization concurrently produced another important advantage: it established complete and continuous aircraft reporting coveragefar superior to the system relying on the human faculties of vision and hearing.

The weak point in the"Himmelbett" waiting position system was that each radar position could direct only one night fighter at any given time to only one enemy target. In view

1518 of the British practice of operating in very loose formation during night attacks, however, British aircraft would cross the night fighter positions at intervals over a period of between one or two hours on their approach and home routes. This made it possible for a night fighter position to guide its night fighter plane, or the plane relieving it when necessary, against a number of enemy planes in succession. It was

1519 also possible to commit a number of night fighters simultaneously, each directed by a separate night fighter control position. This number depended on the number of fighter positions crossed, which in turn depended on the width and depth of the attacking enemy formation and on the organization of the night fighter control position system in width and depth.

For example, an enemy force penetrating over Holland on a frontage of 60 miles crossed over between nine and twelve night fighter control positions before reaching the German border. The maximum number of night fighters which could be committed in such a case was between nine and twelve, which, depending on the circumstances could attack a number of enemy aircraft in succession both during the approach and home route of the enemy units. In such a case it could be assumed that, on an average, the night fighters would succeed in shooting down between ten and fifteen enemy planes, because it was not

1519 always possible to guide each fighter to within visual contact with its target and because not every fighter achieving visual contact could be depended on to make a successful attack.

Results of this size could only be considered satisfactory as long as they represented an adequately large percentage of the number of enemy planes involved, namely at least 10 to 15 percent, a loss average which the enemy could not accept in the long run. This meant that the possibilities to inflict losses were inadequate if the attacking Royal Air Force formation comprised more than 100 planes. Defense conditions were even less favorable in defense areas such as Hamburg or Bremen, which were within the outer fringes of the night fighter control position system, so that attacking enemy forces had to cross a total of only between three and four such positions on the approach and home route together.

Realization of these weaknesses in 1941 led to attempts to resume concurrent antiaircraft artillery and night fighter

1520 action in the large defense areas and resulted in the development of "combined night fighter" tactics in the case of night fighter control positions within the defense zone of large cities.

By the end of 1941 all possibilities of the three variants of night fighter defense had been explored: the dark night fighter defense method in the sixteen night fighter control

1520 positions established along the coast from Sylt to the Schelde estuary; the illuminated night fighter method in the search-light belt extending from the Danish border to Aachen (as well as in the Berlin area); and the combined night fighter methods in the case of the Berlin positions.

The Night Fighter Command clearly realized that the results which could be achieved by these combined methods were inadequate because of the mounting size of the attacking enemy forces, and for this reason planned a large scale expansion of its defense system. The question arises, however, whether a proper estimate was formed in 1941 of the possibilities available to the enemy to increase the size and scope of their attacks in comparison with the time required on the German side to effectuate its organizational program for the expansion and reinforcement of the night fighter defense system.

The experience report by Air Command Center dated 1 August 1941 does state requirements appropriate to the occasion, but in one point it is weak, it lacks a realistic concept of existing possibilities to give substance to its demands.

A sober appraisal of the capacities of the armament industries, of the time required for the stated developments, and of the personnel requirements involved, must have revealed in 1941 that at least two or three years would pass before the network of night fighter control positions required in the Home Air Defense Zone and in the occupied western territories could

1521 be perfected. This must have been realized even without making allowances for the possibility of additional needs in personnel and materiel for the development of defenses in areas outside of the envisaged system, such as Italy, the Balkans, and the eastern territories, and without taking into account the possibility that the armament producing capacity might be disrupted by enemy action.

The question should have been formulated in 1941 as follows: To what extent is our night fighter organization and its systemfundamentally on the right way to becoming capable within the foreseeable future of repelling Royal Air Force attacks in the size of 1 000 bombers directed at a single or at a number of targets within Germany and of inflicting heavy losses on the attacking forces in the action? There can be no doubt that it would have paid off to test out such a case in map exercises. The outcome could only have been a realization that the chances of success for any system of controlled night fighter defense operations would be definitely subject to the restrictive factor of the number of possibilities which there could be to commit night fighters.in such action. In the case of an attack against the Ruhr region, this factor would have been 36 night fighter aircraft. These could have shot down 20-30 enemy planes and thus a total of 2-3 percent of an enemy force of 1000 bombers.

1521 Results as unsatisfactory as those just stated could never have justified the gigantic expenditures recommended for the development of the night fighter defense system. Therefore thought would have been devoted to the problem of how it might be possible to considerably increase the number of night fighters simultaneously in action against the enemy, or, in other words, in what way would it be possible to commit several hundred night fighters simultaneously against an attacking enemy force of 1000 bombers.

Those responsible for night fighter defenses admittedly properly understood this situation and accordingly had certain concepts of the courses which should have been adopted, as follows:

a. Measures to double the possibilities for commitment of night fighters from each night fighter control position through adoption of the Benito night fighter control system, and to make it possible to track two enemy aircraft at the same time with the same two Wuerzburg instruments;

b. A numerical increase of night fighter strengths, without which it would not have been possible to double the number committed;

c. Accelerated development of additional night fighter control positions in order to create new operational

1522 zones for night fighters in the rear;

d. Accelerated equipment of all night fighter control positions with instruments for the "Uhu" method of control in order to be able to direct the action of another, third, night fighter from each position;

e. Accelerated development of Panorama PPI and IFF instruments with an effective range of 90 miles in order to remove the difficulties resulting from the limited range of the Wuerzburg instruments. The limited range of the Wuerzburg instruments frequently caused the failure of promising operations, since track was lost of the enemy plane or of the German night fighter under control the moment the effective range was exceeded.

However, none of these stated requirements was possible of early realization. Therefore, any hopes which might have been entertained of improving the effectiveness of night fighter defense operations by such means within the foreseeable future must be considered as illusory.

This raises the question of whether any possibilities at all existed at the end of 1941 to develop a more effective system of night fighter defense. This question must be answered in the affirmative:

a. At the end of 1941 the Lichtenstein B/C aircarried radar search instrument was already in serial production,

1523 and had given satisfactory performances in use by the troops in the dark night fighting method. It had an effective search range of 4 400 yards and a dissociation coefficient of 50-80 meters.

Night fighters equipped with this instrument were definitely in the position to detect enemy planes within a penetration or departure area without receiving directions from the ground, and could do this while operating in what might becalled restricted roving missions, as was done later in the "night fighter pursuit" system with the improved SN-2 radar instrument. Information on the air situation could be transmitted to them by radio in narrative reports, and they could use radio and light beacons to navigate by.

b. It was a mistake not to respond immediately to the recommendation contained in the experience report by Air Command Center dated 1 August 1941 to use Me-109 and FW-190 aircraft in the "combined night fighter" method.

This form of direct target defense, introduced in 1943 with the single-engine night fighters, would have had far better prospects of success in 1941-42 than later, in 1943-44, since the Royal Air Force had not yet introduced its Pathfinder guided system of blind bombing, so that weather conditions at that time were not a restrictive

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factor. The aircraft required for the purpose could have been taken from the daytime fighter units stationed within Germany, and from replacement units and fighter schools, also stationed there, without any interference in the fighter production program . The necessary pilots could have been provided by the bomber and reconnaissance units not fully engaged.

In the way just described it would have been possible to effectuate the intention of reinforcing the night fighter defenses, something that could not be done with the twin-engine fighter units alone immediately because of the inadequate number of twin-engine fighter aircraft available.

Owing to retention of a too rigid system of controlled night fighter operations and a reinforcement program which took too long to effectuate, the night fighter defense system was not prepared against the surprise blows delivered by the Royal Air Force in the form of an attack by 1 000 bombers against Cologne on the night of 30-31 May 1942. An excellent program admittedly was in existence at the time to increase the effectiveness of the night fighter defenses, but no adequate means and/or methods of defense were available.

Reaction to the 1000-bomber attack again consisted of programs and stated requirements, but not in action. A

1524 particularly harmful factor was the fact that the Luftwaffe High Command refused to take the problem of night fighter defense seriously since it was still thought that the planned early resumption of the air offensive against Britain would prove a more efficacious way of contending with the air warfare conducted by the Royal Air Force at night than would the use of weapons of defense.

The disparity between what was acutely needed and the effectiveness of planning for the development and reinforcement of the night fighter defenses became clearly evident in the night fighter conference held on 1 September 1942. At that time the night fighter organization in the Berlin-Central Germany area was not yet completed and in fact was still in the initial stages of development, while the organization for Southern Germany was not even under discussion as yet. In view of the expected step up in the activities of the Royal

1525 Air Force in the autumn and winter of 1942-43 this knowledge should have resulted in a more serious appraisal of the air situation by the Luftwaffe High Command and in more speedy and more concrete measures to improve the night fighter defenses.

The result of the failure to take such steps became evident early in 1943 when the Royal Air Force extended its

1525 large-size attacks systematically to the central and southern areas of Germany. The situation which then developed in the southern areas could not be mastered by the one night fighter group plus a few units from schools committed there and supported by rail-carried radar stations serving as mobile night fighter control positions.

It should have been recognized at this juncture that the entire night fighter system was too rigid and inflexible and required too large expenditures in personnel and materiel, and that these factors made the pace at which it could be developed was too slow to keep pace with developments on the enemy side in respect to the expansion of the enemy zone of operations and the increasing size of the attacking enemy forces.

In the end it was not the command which produced new ideas to invigorate the night fighter defenses but the field forces and strangely enough, circles not immediately concerned with the subject of night fighter defense:

a. The recommendations submitted on 27 June 1943 by Major Hajo Herrmann to introduce uncontrolled direct target fighter operations by single-engine fighter units of normal types came from an experienced member of the bomber forces;

b. The idea of pursuit night fighter operations by twin-engine fighters controlled from the ground only for

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the purpose of guiding them to the main body of the enemy force came from Lieutenant Colonel von Lossberg, a General Staff Corps officer and an experienced bomber pilot, and was based on suggestions made by Oberstabsingenieur* Guenther of the Technological Office in the Reich Air Ministry on 29 July 1943.

The direct cause for the second recommendation above was the sudden collapse of the whole night fighter system and of the antiaircraft artillery defenses due to the complete elimination of the Wuerzburg radar instruments by the British use of tinfoil interference methods from 24 July 1943 on.

The recommendation by Major Hermann had the following advantages:

a. The number of night fighter aircraft available for commitment over the target area could be increased speedily through use of aircraft from the daytime fighter units manned by experienced personnel from the bomber forces;

b. Owing to their smaller size and greater speed single-seater fighter planes were more suitable than twin-engine night fighter aircraft for night fighter operations over the antiaircraft fire zone within the target area without serious interference with antiaircraft artillery operations. ;

*Technological expert with rank equivalent to major.

1526 c. If the single-engine night fighter units were stationed in the main defense areas of Hamburg, the Ruhr region, Berlin, and the Frankfurt basin region, no serious command problems would complicate measures to have them over the areas currently under attack at the proper time;

d. The use of experienced bomber pilot personnel, who had training in blind flying, provided adequate certainty that the single-engine units could operate at night even though supported by only few navigational aids.

The disadvantages inherent in the recommendation by Major Herrmann were as follows:

a. Bomber pilot personnel had no training in firing with rigidly mounted guns and would have to receive such training before they could be used to operate night fighter aircraft;

b. The single-engine aircraft had no navigational instruments. This precluded any possibility of their use in large-area operations, since a large part of their overall time-in-air capability (2.5 hours with their 300 liter reserve fuel tank) had to be deducted for their landing;

c. No suitable radar search instrument was available to equip single-seater fighters for night operations. Visual contact with enemy aircraft over the target area

1527 would depend entirely on the existence of one at least of the following conditions:

clear weather for illumination of the enemy aircraft by searchlights, or

in cloudy or hazy weather conditions in which the enemy planes would be silhouetted against a background lit up by fires caused in the attack.

At the time when a start was made at building up a single-engine night fighter arm in July 1943 occasions on which either one of these conditions existed were rare, since the Royal Air Force had already to a great extent adopted the tactics of blind bombing, supported by Path-finder operations, during conditions of bad weather over the target area;

d. From the outset the single-engine night fighter

1527 arm discounted the possibility of using the Benito method to guide individual aircraft to their target, since this system was tied up with the fighter divisions and the desire existed not to place them under the fighter divisions;

For navigational purposes the single-engine fighters had to rely exclusively on light signals, such as light beacons, routes marked by revolving searchlights, AA tracer shells of various colors and fired in various patterns, and a radio compass set to receive target messages

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from the radio beacon at the home base airfield.

In conditions of a high closed cloud ceiling, most of these navigational aids were useless for the pilots, since they were not visible from the air. In such cases the pilots had no reliable means of orientation on the routes to their currently assigned objectives;

e. Air intelligence had to be furnished to the units in narrative reports by ultra-shortwave radio transmission. The reports were based on the interpretations at air district command headquarters, which relied on the observations of the Reich Aircraft Reporting Services, already inadequate under the circumstances existing in 1943, and frequently differed from interpretations at the fighter divisions. These diverging interpretations of the air situation frequently resulted in a faulty direction of operations;

g. At a time when enemy action systematically and almost completely eliminated radio communications on the command frequencies it was foolhardy to expect that a single-engine fighter while airborne could receive the narrative air situation reports transmitted. In practice, once a single-engine fighter was off the ground, no possibility existed to direct its action in a manner appropriate to developments in the air situation. If, for

1529 example, the initial course of an enemy formation indicated that it would attack targets in the Berlin area and the defending single-engine night fighters took off with orders to intercept the force in the Berlin area, it was rarely possible to inform them if the enemy formation suddenly changed its course to attack the Ruhr region. As a result, the single-engine night fighters continued to fly around aimlessly in the Berlin area and added to the general confusion because there was no possibility to keep track of them.

In practice, single-engine night fighter operations in the autumn of 1943 showed that this system was superseded by current developments in air warfare just when it was in its initial stages. Two basic requirements for such operations were completely eliminated in the autumn of 1943 by a fundamental change in British tactics: possibilities to meet

a. British radio and radar interference operations prevented any clear interpretation of the current air situation;

b. British transition from an attack system based on the ground marking of targets to a system of blind bombing based on air markings enabled them to exploit bad weather conditions over the target area in their planning.

In addition to these complicating factors, a faulty selection and faulty training of the pilots for the newly

1529 established units deprived the single-engine night fighter arm of any chances of success it might have had:

a. Replacements for the arm were taken from the fighter schools, which specialized in turning out pilots with only the LF aviation qualification. The additional training which these pilots then received at the 180th Fighter School, Altenburg in the subject of blind flying with single-seater fighter aircraft could not under any circumstance compensate for the general lack of flight experience, such as the experience trainees in the ELF and Blind Flying Course II received.

b. Enlisted men trained as pilots could never meet the demands made on a single-engine night fighter pilot owing to the lack of mental qualifications.

The multiple activities of flying, navigating, observing, of judging correctly the meaning of the diverse friendly and enemy light signals, and of properly considered attack with a single-seater fighter plane at night called for a maximum of intellectual power which in turn required not only an elementary disciplining of the thought processes but natural intellectual capabilities of a high standard. Enthusiasm, courage, and combat morale, qualities which were present in an excellently high degree in the single-engine night fighter arm, could do nothing

1530 could do nothing to compensate for a lack in the above qualities.

Conditions being as they were the logical consequence was that events by the end of 1943 proved conclusively that single-engine fighter operations were uneconomical. The whole system was uneconomical not only in respect to the ratio between own planes lost and enemy planes downed and the ratio between general expenditures and enemy planes downed, but also because of their damaging effects on the daytime fighter forces. The planes of the daytime fighter forces were used and worn out in night operations, and the whole daytime fighter arm was included in process of declining performances.

It would have been a far sounder policy for the Luftwaffe High Command to have drawn the only possible logical conclusion and have acted accordingly, namely, to have given up the thought of single-engine night fighter operations and to have

1531 assigned everything already created for the purpose to the daytime fighter or the twin-engine night fighter forces.

That the system continued in operation with steady heavy losses into the spring of 1944 was again due to a personality factor, namely, the unquestioning confidence of the Commander in Chief of the Luftwaffe in Major Herrmann. This confidence was due to the fact that Herrmann came from the bomber arm, which had at all times evinced exemplary standards of

1531 combat morale, and because he was able again and again to propound new ideas to insure increased effectiveness.

Compared with the results obtained in the above system of single-engine night fighter operations, the night fighter pursuit system produced far better results in actual practice. The biggest advantage of this system was that it offered the opportunity to commit unrestricted numbers of night fighter planes against enemy mass penetrations, and that it released the individual night fighter from ground control, an inescapable prerequisite in the Himmelbett waiting position method. However, the pursuit method now introduced depended entirely on the possibility to furnish each night fighter plane a properly functioning air-carried radar search instrument.

Although already in serial production in 1943, the Lichtenstein B/C instrument was not being produced in large enough numbers to insure that all night fighter aircraft of the units committed in Home Air Defense could be equipped by the summer of 1943.

Since the improved Lichtenstein SN-2 instrument, with an effective range of 8 800 yards, went into production on 15 August 1943 with a limited monthly output of only 33, increased in October to 100, the chances of success in the newly introduced pursuit system depended initially on the

1532 performances of limited numbers of planes available with Lichtenstein B/C or Lichtenstein SN-2 equipment.

The success achieved in night fighter prusuit operations proved the soundness of the new system. In the early stages individual fighters brought down as many as seven enemy planes in one operation.

The success achieved with the new system in the autumn of 1943 might have been even greater if the division of the command organization into three separate operational zones on 15 October 1943 had not created difficulties which complicated the concentration of all available pursuit night fighters whenever needed for operations against enemy forces.

Another reaction on the German side to the British use of tinfoil on 24 July 1943 was a return to fighter defense over the target currently under attack. In these operations the fighters, including the twin-engine units not yet equipped with aircraftied radar search instruments, were able to take advantage of the light conditions caused by the antiaircraft artillery searchlights and by conflagrations due to bombing. Owing to the problem of dividing the zone of action between the night fighters and the antiaircraft artillery over the target area the soundness of this method remained very problematical.

a. The difficulties here were due to the following

1532 causes:

a. The imposition of fire restrictions on the antiaircraft artillery was made contingent upon the actual presence of a specified minimum number of night fighters over the target area at the beginning of the enemy attack;

b. It was not possible to keep accurate track of the movements of the night fighters committed in action;

c. The decision to restrict antiaircraft artillery fire had to be taken already shortly before the enemy attack began if the necessary orders were to reach the antiaircraft batteries and the night fighter units in time. This meant that the decision had to be taken at a time when it was by no means certain, because of the highly diversified British maneuvers of deception, whether the approaching unit would actually attack the target it seemed to be approaching.

Events proved time and again that it was impossible to devise a pattern for antiaircraft artillery fire restrictions which would give both the antiaircraft artillery and the night fighters uninterrupted opportunities for action within their assigned zones over the target area. Either the defending night fighters came under just as severe fire at all altitudes as the enemy because the antiaircraft batteries had not received proper instructions, or the enemy found fire-free

1533 zones because the antiaircraft artillery had orders to withhold fire in zones in which the number of night fighters present was inadequate.

At a time when the effectiveness of the antiaircraft batteries was seriously curtailed anyhow because of interference with their electrical fire control equipment, it would have been sounder to issue a basic order restricting antiaircraft fire when weather conditions were favorable for the mass commitment of night fighters, and to make the removal of the basic restriction contingent upon whether or not enemy action and German countermeasures were such that an adequate number of night fighters could be assumed to be over the target area at the proper time. Once measures to protect the electrical fire control equipment of the antiaircraft artillery against

1534 interference reached a stage where the batteries could again deliver effective fire, it would have been wise to again change the night fighter system over target areas, by establishing completely separate zones of action for the two components of night air defense which would have allowed each arm unrestricted possibilities for action within its zone.

The results achieved by the night fighter forces achieved a peak in the spring of 1944. By that time the most serious difficulties encountered in interpreting the air situation had been mastered, and the bulk of the night fighters had

1534 interference-proof aircarried Lichtenstein SN-2 radar search equipment.

The biggest single success achieved by the night fighter arm, which was on the night of 30-31 March 1944 when defending night fighters shot down 100 4-engine bombers out of a Royal Air Force formation attacking Nuremburg, showed that the German night fighter arm at this time was on the right road with its tactics and in the technological field. This operation can be considered as a triumph of the night fighter pursuit system.

A new technique introduced in the attack methods of night fighters contributed largely to the increasing success achieved. This was the introduction of obliquely mounted weapons.

The idea came from the troops and resulted from the experience that an enemy plane could be sighted best from below when it stood out clearly silhouetted against a clear sky while the night fighter remained concealed against the dark background below.

To enable the pilot to fire from such a position, two 20- or 30-mm guns were mounted behind the pilot cockpit with an elevation of 30 degrees and adjusted for short-range fire (approximately 25 yards). A reflector sighting device enabled the pilot to take aim and fire obliquely upward.

The success achieved with the new technique was astonish-

1535 astonishing. From below the fighter was able to approach undetected to within a few yards of his opponent, and at such a short range every round fired was a hit. Usually one short burst of fire was sufficient to set the enemy plane on fire or otherwise bring it down.

In their constant improvement of their interference and deceptive techniques the British consistently directed their efforts at the nerve center of the whole German night fighter defense system, at the facilities for the procurement of air intelligence. No matter how perfect a system might be in its tactics and techniques, it would necessarily be useless if the movements of the enemy could not be determined continuously with an adequate degree of accuracy.

As pointed out by the Commanding General, 3d Fighter Division, at the 5 September 1944 conference, interpretation of the air situation at that time depended entirely on the the detection of enemy aircarried radio and radar instruments by German air reconnaissance units and the Radio Intercept service, and on reports based on oral detection from the air observation posts on the ground. Consequently, unfailing detection of approaching enemy forces was at all times a doubtful matter.

Because of the extent of British interference measures

1535 to disrupt all German command radio communications only particularly experienced aircarried radio operators were able to receive situation reports and command messages once they left the ground. Frequently it was only a matter of trained instinct and of a correct interpretation of lighting effects visible against the dark sky which enabled night fighters, without directions from the ground control stations, to find the enemy formation and thus their targets.

In this situation the idea developed of committing the night fighters in group-size units led by the most experienced night fighter pilot available. The technological side of the problem was considered solved by the possibility that the lead plane could give out direction signals which would enable the rest of the unit to maintain contact and follow it. In theory this form of operations appeared suitable in every respect to lead even inexperienced night fighters in strong units to the enemy. This new system was never really put into effect, however, because the whole system of night fighter pursuit operations was paralyzed in October 1944 by complete elimination of the SN-2 radar search instruments through enemy interference.

From then on the chances of success in night fighter operations depended in each case on the current degree of interference with the SN-2 instruments and became largely a

1536 matter of especially highly qualified personnel who, through their own natural gifts and abilities, had mastered the art of finding the enemy.

Once again conditions were such that fighter operations over the target area held out some prospects of success. Opportunities here, however, declined as the enemy reduced the time spent over the target in attack and at the same time frequently succeeded in concealing their intentions by the simultaneous dispatch of Mosquito and other 4-engine bomber forces against secondary targets.

The German Command did little to exploit the possibilities of long-range night fighter operations, and the few attempts in this field were made with inappropriate means. In operations of this type too slow aircraft lacking aircarried radar search equipment could secure only chance successes, and their use was bound to prove, uneconomical because of the effectiveness of the British night fighter defense system, which made use of single-seater fighter and Mosquito type aircraft.

The following experience can be deduced and the following lessons learned from the evolution of German night fighter tactics and techniques:

a. The combat tactics and techniques of a fighter defense system will assume a form dictated by the combat tactics of the attacking enemy;

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b. In the case of enemy tactics in which individual planes attack in loose formation, the appropriate tactics for the defender are those of the ground-controlled commitment of night fighter aircraft;

c. In the case of attack by concentrated enemy forces against one or several targets, the defense method holding out the best prospects of success for the defense is that of directing the night fighters into the enemy formation, where they will operate in roving missions, at the earliest possible stage.

The commitment of long-range night fighters against the enemy forces during their take-off and landing maneuvers can play a decisive role in preventing execution of the enemy operation in accordance with plans;

d. In all planning for technological developments for the night fighter defense forces the fundamental principle must be borne in mind that foresight and precautionary measures against the eventuality of developments on the enemy side are the only way to avert periods of paralyzation of the defense system. A modern night fighter defense organization therefore should not be ruled by the idea of defense action alone, but should also familiarize itself with developments in the field of attack operations as dictated by tactics and technology;

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e. The dynamic interplay of action and reaction between the attacking and defending side prohibits the retention of any specific system by either side for any length of time. The governing factor in planning tactical and technical measures of defense should be the thought of future possibilities open to the attacker rather than the thought of present and past events.

If the defending side concentrates its attention too restrictedly on the present, every countermeasure taken will be rendered obsolete by new developments on the enemy side before it can be applied.

f. In the field of night fighter operations the only possibility to seize the initiative is by means of long-range operations against the bases of the enemy bomber forces, since such action will dictate the counteraction of the enemy.

1539 3. Night Fighter Training. Pre-war programs of the Luftwaffe made no provisions for training in night fighter operations. Night fighting was considered merely an extension of daytime fighter operations, requiring only the ability to handle a plane at night within a prescribed area in close proximity to the take-off airfield. This presented no special difficulties since night flying with the Ar-68 and He-51 aircraft in use up to 1938 required no greater degree of ability on the part of the pilot than those required in night flight exercises with training aircraft of the B category.

Combined with searchlight support as they were in the initial experimental stages, night fighter operations in 1937 presupposed favorable weather conditions, and in the restricted areas involved it was possible to rely on a few optical markings for navigation.

The situation was different when a start was made at the systematic development of a night fighter organization in the summer of 1940.

To begin with, the new night fighter arm was able to ~~draw on the~~ draw on units from the daytime twin-engine fighter forces, most of which had been transferred to it. The personnel in these units had received thorough training in blind flying and a complete course of training in fighter operations, and had gained combat experience as fighters.

1539 One noticeable feature here is that no special training establishment was provided for night fighter operations at the time when the first night fighter units were organized. This although there were already 5 1/3 night fighter groups in operation by the end of 1940, all of which required replacements, and although plans already existed for the activation of more such units. Personnel requirements were met by the transfer of volunteer flight personnel from all branches of the flying forces to the night fighter units, where they received instruction in the specific features of night fighter operations.

Possibly, the arrangement was due to the fact that the whole night fighter arm was still too much in the experimental stages to permit the establishment of specific training directives. Whatever the causes may have been, the arrangement had the disadvantage that the night fighter arm had no resources of its own to draw on in the matter of personnel replacements.

After a very long delay the 1st Night Fighter School was finally formed from Fighter School Schleissheim on 4 July 1941.

With full justification the Night Fighter Division demanded that this school should be assigned under its di-

1540 direct command, since this was the only possible way to guarantee proper coordination between front line experience and training activities in this entirely new field of endeavor. After some contention orders were finally given to assign the new school under the Commander of Single- and Twin-Engine Fighter Schools,* with headquarters at Munich. This was definitely an unsound solution of the problem, since night fighter activities at this juncture had already entered almost completely new technological fields, and since the highly diversified tactical and technical features specific to the new arm were still protected by very strict secrecy classifications. Lacking a clear concept of the methods employed in night fighter operations those responsible for training activities could not under any circumstances render services suited to the intended purpose.

The result of this fundamentally wrong decision was that, at the night fighter conference held at Headquarters of the Commander in Chief of the Luftwaffe on 1 September 1942, the Commanding General, XII(Night Fighter) Air Corps, had just cause for a complaint about the quantitatively and qualitatively inadequate performances of the night fighter school and to request that it should be assigned directly under his command.

* Hoeheres Kommando der Jagd- und Zerstoererschulen.

1541 Once again this request was rejected, so that the training of night fighter personnel continued as part of the overall training program for flight personnel under the Chief of the Training Division, Luftwaffe General Staff, and under the Commander of Single- and Twin-Engine Fighter Schools

This arrangement may have had certain advantages from the organizational point of view. So far as the quality of the personnel was concerned, however, it had definite disadvantages, since it denied the XII (Night Fighter) Air Corps any possibility to influence the selection of personnel and prevented any functionally expert influence on the training program. Under these circumstances front line units showed very little inclination to release experienced personnel as instructors for the night fighter school.

It was only a later circumstance, under which the instructor personnel at the night fighter school were required to participate in actual combat missions, that established

1542 real live contact between the front and the school.

It is possible that clearly stated specifications requiring that a large percentage of pilots for the new arm must be officer personnel might have served to improve the general quality. Such a requirement could easily have been justified in view of the high standards of intellect required in night fighter pilots.