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G E R M A N A I R D E F E N S E

1933 - 1945

Volume I

1933 - 21 March 1941.

BY Generalmajor a.D. Walter GRABMANN.

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1933-1945

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By Generalmajor a.D. Walter GRABMANN.

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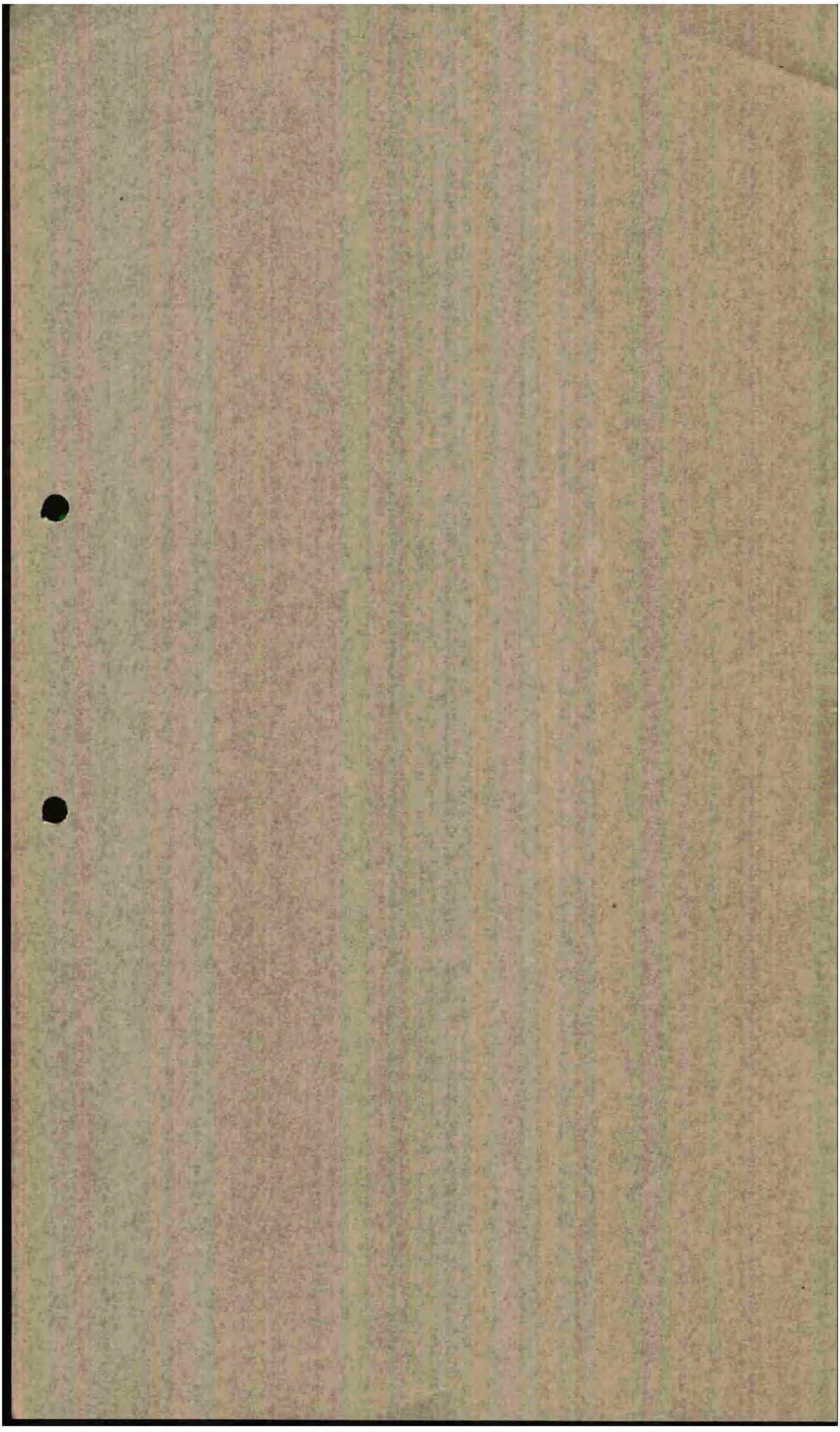

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GERMAN AIR DEFENSE

1933-1945

VOLUME IV

27 January 1944 to End of World War II

by

Generalmajor a.D. Walter Grabmann

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G E R M A N A I R D E F E N S E

1933-1945

PART II

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

by

Generalmajor a.D. Walter Grabmann
German Air Force

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PREFACE

The study presented here under the title GERMAN AIR DEFENSE IN 1933-45 represents a first endeavor to portray the historical development of the German air defenses and the experience gained as well as the lessons to be learned therefrom. It cannot be considered a complete treatment of the subject and can only serve as a working basis for an improved study.

In compiling the study it was found necessary to exclude treatment of those fields of endeavor for which no adequate and historically authentic sources were available at the time of writing. For this reason the author has been unable to adhere to his original outline. Another reason for some of the obvious imperfections, namely, a certain lack of uniformity is that, while the author was in the midst of his studies, the close out of the AIR FORCE PROJECT compelled him to abridge and combine his treatment of certain fields originally intended for treatment in separate parts. Also because of the lack of time it has been impossible to complete the Appendix Volume in the desired form and scope.

Because of these circumstances the study has been arranged in two main parts, as follows:

PART I, as its title, THE HISTORY OF GERMAN AIR DEFENSE -- 1933-45 suggests, comprises a description of pre-war and war-time developments, including what was happening on the enemy side and the defensive countermeasures adopted by the German side.

It has been essential to cover all theaters of operations, since all events on all fronts produced interrelated repercussions and since the only possible way to find a continuous thread running through all basic problems of air defense is by means of an empirically developed overall picture.

PART II states as concisely as possible the experiences gained in the German air defense effort and the lessons to be learned from that experience.

Here, the author has striven particularly to point up the impact of the laws of causality, namely, the interrelations between cause and effect as they became evident.

The author is convinced that any hypothetical conjectures of "What would have happened if....." are valueless in an effort to establish objective findings from historical happenings, since any statement of how an enemy might have reacted if certain measures had been taken could be based only on conjecture.

It has seemed necessary to state this conviction here, since writers of belletristic literature frequently conjecture unrealistic hypotheses concerning a different course the war would have taken if the German command had not made this or that error. To quote the philosopher Spinoza: "What happened irrevocably had to happen." In this sense the historian can have only one mission: to reveal dispassionately the unavoidable results of prior causes, in order to insure that increating new causes the persons responsible will realize from experience the remorseless workings of the laws of causality.

Appreciation is due here to Field Marshal Kesselring and General (General der Fliegar) Deichmann for assistance and advice on circumstances prior to and during the initial years of the war, and to General (General der Flackartillerie) von Renz for guidance in the problems of antiaircraft artillery.

The author is also deeply indebted to the late Major General (Generalleutnant) Beppo Schmidt, to whom he was closely tied with bonds of friendship developed through mutual experience during the most critical period of the German air defense system in the past war. In three years of close post-war collaboration in the compilation of Studies 158-160 this personal friendship resulted in frequent, intensive, and fruitful discussions on all problems with the subject of air defense.

s/ Walter Grabmann
Generalmajor a. D.

Steinebach/Woerthsee, June 1957.

PART I

GERMAN AIR DEFENSE

1933-1945

FIRST VOLUME

CHAPTER I

1933-1 September 1939 .

WEAPONS AND OTHER MEANS OF AIR DEFENSE AND PROTECTION PRIOR TO 1933.

On 5 May 1933 the Reich Defense Ministry ordered the establishment of a Reich Ministry for Aviation in place of the Reich Aviation Commission, in existence since February 1933. This transferred the responsibility for all matters concerning the Luftwaffe from the Reich Defense Minister to a separate agency, thenew Ministry for Aviation.

The moment of this change can be considered as the hour which gave birth to the new German Air Force, the Luftwaffe, as an independent branch of the armed forces. In order to characterize this initial point, a brief survey now follows of the stage reached in the development of the air force within the organizational framework of Germany's 100 000-man army of the post-World War I era.

From 1928 on a separate branch designated Branch T 2 V 1 had existed within the Army Troops Office. Under Colonel Wilberg, one of the best known air commanders of World War I, the branch as one of its missions was responsible for research to establish the tactical requirements governing

the technical specifications in aircraft development.

On the basis of the research done by the branch the conclusion was reached that, in the event of war, German armament production capacities would permit the development of only four basic types of aircraft:

a plane suitable for tactical reconnaissance operations,

a plane suitable for strategic reconnaissance operations,

a single-seater fighter and

a twin-engine bomber.

1. Source 1.

Since the Reichswehr (Joint Armed Forces) General Staff had disapproved the development of a bomber, the development of a twin-engine bomber could only be carried out inoffi-
cially, for which reason the plane under development for the purpose was designated as a twin-engine reconnaissance plane. 2.

The reasons for the concept upon which the tactical requirements stated above were based are obvious:

Lacking an organically developed air force (which was prohibited by the 1919 Treaty of Versailles) it appeared that the air components most urgently required in a war could be:

an air reconnaissance arm to provide data on which the Army command could base its strategic and tactical decisions;

fighter aircraft to provide air defense;

medium-range bombers, which, by reason of their limited range and carrying capacity alone would be predestined for employment in support of the operations of the Army.

On the basis of these stated tactical requirements the duly instructed aircraft manufacturers by the end of 1932 had designed and completed the following types:

the firm of Heinkel the He-46 as a close reconnaissance and fighter plane; and the He-45 as a strategic reconnaissance plane;

the firm of Arado the Ar-64 and Ar65 as figher planes;

the firm of Dornier the Do-11 as a twin engine bomber.[3]

The Ar-64, powered by an BH-22 radial engine, and the Ar-65, with its BMW-VI vertical engine could stay in the air 75 minutes at the most and had an average speed of 150 miles. The consequent restricted striking range of these planes was the governing factor in the areal delimitation of fighter operations within the scope of air defense.[4]

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2. Soruce 2.

3. Ibid.

4. Soruce 3.

The viewpoint most generally accepted within the Reich Ministry of Defense concerning the role of fighter aircraft as a weapon of air defense was based largely on the experience gained in World War I, in which fighters had been employed almost exclusively as an arm of the army command for purposes of air defense within the operational zones of the Army. This was only natural since at this juncture the fighter forces of all major powers consisted of single-seater planes with a small range, so that their use in areall reatricted operations to prevent air attacks against regions of particularly vital importance in war was a recognized feature of particular importance. This was so in spite of the fact that the revolutionizing theories of the Italian Air Force General, Douhet, whose work AIR WARFARE in 1938 had been published in German in 1929, were already a subject of international discussion.

Similarly to the fighter plane, the development of the antiaircraft gun as an air defense weapon was an outcome of World War I.

The articles of the 1919 Treaty of Versailles prohibiting German possession of air defense weapons also included antiaircraft artillery, with the following exceptions:

1. The Navy was permitted a few antiaircraft guns for

its seaborne units and for coastal fortifications;

2. A few permanently emplaced guns suitable for air defense purposes were allowed to remain in the fortress of Koenigsberg in Eastern Prussia;

3. The Reichswehr was authorized to maintain one battery of 72.2-mm tank guns for each of its seven regiments. However, these antiaircraft guns had to be so altered that they could only fire with an elevation of 40 degrees. All batteries were stripped of the special equipment, such as range finders, required for antiaircraft fire; they therefore would have been useless for actual air defense operations, but had some value for training purposes;

4. To replace worn out equipment, it was permissible to procure 1 88-mm antiaircraft gun each second year, and one 105-mm antiaircraft gun each fifth year for the fortress of Koenigsberg in Eastern Prussia, and 1 76.2-mm tank gun for the Reichswehr.

The naval units and the fortress of Koenigsberg thus, prior to 1933, provided the dual basis for all development and testing activities in connection with the antiaircraft artillery arm.

Development activities were controlled by Artillery Inspectorate 4 of the Reich Defense Ministry.

The ruling views on the subject of the mission of antiaircraft artillery and on that of the antiaircraft guns to be developed for the purpose in early 1933 were as follows:

1. Missions: The protection of all installations of vital military importanceand of troops in the field against air attack by means of

action to prevent hostile air reconnaissance activities;

action to prevent hostile use of spotting planes to support adjusting fire by enemy artillery;

action to repel hostile air attacks;

action to support friendly air forces in the execution of their assigned missions.

The objective in all antiaircraft artullery operations was the destruction of enemy aircraft. In addition, through both its actual destructive effects and through its impact on morale, the antiaircraft artillery was to hamper hostile air forces in the execution of their missions or compel them to desist from those missions.

2. Types and Technical Performances of Hostile Aircraft to be Taken into Account in the Development of Defense Weapons.

a. Ground support aircraft designed for low altitude attacks at altitudes between 160 and 700 feet; speed

150-180 miles; heavy and light types, including planes protected by armor plating.

b. Reconnaissance aircraft:

Operating altitudes between 1600 and 16 000 feet for tactical reconnaissance, and between 10 000 and 23000 feet for strategic reconnaissance; Speed 170 miles; as single-plane targets.

c. Artillery spotting planes:

Operating altitudes between 2 600 and 10 000 feet; speed 150 miles; as single-plane targets.

d. Daylight bombers:

Operating altitudes 16 000 and 23 000 feet and in some cases lower; speed 150 miles; operating in close formation.

e. Night bombers:

Operating altitude between 1 650 and 13 000 feet; speed 135 miles; operating singly and in small units.

f. Fighters:

To be attacked as targets for antiaircraft artillery fire only under favorable target conditions and when carrying out low-level attacks or operating in close formation.

3. Suitable Weapons for Antiaircraft Fire.

a. Against planes engaging in low-level attacks:

Small arms under proper fire control.

Submachine guns with antiaircraft sights.

Special weapons still to be developed, including:

Light, 13mm to 20-mm antiaircraft machine guns, designed as equipment for light antiaircraft units and as supplementary equipment for all other antiaircraft, infantry, cavalry, engineer, and supply units. To be suitable for use against air and ground targets; effective range up to 2 200 yards; muzzle velocity 2 600-3 300 feet/second; firing sequence 300-500 rounds per minute; self-detonating ammunition with fuzes set between 5 and 8 seconds; ammunition in clips of 25-30 rounds; ready to fire from marching column within

5 to 10 seconds; lateral field of traverse 360 degrees; angle of elevation minus 20 to plus 90 degrees; aiming speed adequate against aircraft flying at speeds between 80 and 250 miles. Ammunition specifications: adequate blast effect against all parts of aircraft (highly sensitized detonator); armor piercing fragmentation for use against armor plated parts of planes; tracer ammunition. Maximum total weight of weapon 450 pounds.

Medium antiaircraft gun, 37-mm caliber. This weapons is intended to take its place between the light antiaircraft machine gun and the heavy type of antiaircraft gun. It must also be suitable for use against low-flying aircraft. Effective range adequate to destroy at distances between 50 and 3 000 yards; Time of trajectory flight 7 seconds for 3 000 yards; rate of fire 150 rounds per minute. Ammunition: shrapneltype shell with highly sensitized detonator and self-fragmentation at 4 400 yards; tracer ammunition. Organization in batteries of each 3 2-gun platoons.

Heavy antiaircraft gun, as the main weapon for home and field air defense; effective range 4 400 yards horizontal fire, 7 700 to 8 800 yards according angle of elevation; Time of trajectory flight for maximum range not more than 25 seconds; muzzle velocity 880-990 yards/second; minimum

caliber 88-mm for mobile operations, larger calibers for guns permanently emplaced or mounted on railcars. (The development of these larger calibers is not an urgent matter since mobile guns exclusively are required for home and field air defense); Fire control by automatic computer but with possibility for direct fire; rate of fire 15-20 rounds per minute; aiming speed 8 degrees per second; organization in 4-gun batteries. Ammunition: high-explosive shellwith time fuze up to 30 seconds; Mobility: capable of all-terrain travel, road speed 25 miles.

Fire Control Equipment.

a. For medium antiaircraft artillery a central fire director with remote transmission is required. The gun positions and the fire director must be separately located.

b. For heavy caliber antiaircraft aryillery the fire director must be capable of tracking a target, also when the direction and altitude changes, without interference by weather conditions. The fire director apparatus must be located at least 550 yarsd from the gun positions.

For field antiaircraft artillerly remote transmission is not required.

Alternate Fire Control Equipment. This equipment must be designed to replace the fire director apparatus if it

should become unserviceable. It must be simple, precise, and require only few servicing personnel. Remote transmission must be provided.

Searchlights and Sound Locators. Operating range 7.5 miles. Searchlights must have maximum brilliance, with a floodlight of 6 degrees.

Operating range of sound locators 16 miles.

The searchlights to be controlled by light transmitting night binoculars.

Direction to be transmitted from sound locators to searchlights by electrical means with automatic compensation for sound lag and weather influences.

Sound locators must also be suitable for use as fire directing apparatus when firing by sound ranging. Mobility as specified for heavy antiaircraft artillery, above.

Later developments must provide for the tracking of aircraft without vision, using infrared or other rays for the purpose, since instrument flying will become an increasingly important factor in the future.

Other Means of Defense.

Barrage balloons and barrage kites. Operating altitudes up to 16 500 feet.

Barrage rockets. Effective range up to 23 000 feet. With time fuze and self fragmentation.

Rocket propelled parachutes and barrage curtain cables.

Training Equipment.

Control apparatus for the operation of range finding equipment.

Control equipment to register detonation points precisely.

Guns and fire control and fire directing apparatus.

Remote control, unmanned, target aircraft.

Development Priorities.

a. Urgent. 88-mm antiaircraft guns (preliminary or temporary solution); 20-mm antiaircraft guns and 37-mm medium antiaircraft guns; Searchlights, ray locators, and sound locators; barrage rockets; fire directing apparatus; instruments for firing with visual observation.

b. Important. Barrage balloons.

c. Less Urgent. Remote control antiaircraft projectiles.[5]

Whereas a separate branch staffed with experienced former air officers existed within the Army Ordnance Office with the specific missions of developing aircraft, antiaircraft artillery from the outset had been regarded as an integral part of the Army.

This is evident from the fact that, when the Reich Air Ministry was established on 5 May 1933, the existing antiaircraft units, at the time organic to the various artillery regiments, were not assigned to the newly established Luftwaffe, but remained under the command of the various corps area command headquarters.[6]

The views which existed at the time on the use of antiaircraft artillery units are revealed by the bulletin AIR DEFENSE FORCES AND THEIR EMPLOYMENT AGAINST AIRCRAFT (Fliegerabwehrformationen und ihr Einsatz zur Fliegerabwehr), intended as a hypothetical guide in the execution of Army map maneuvers. According to this bulletin the intention was to assign

1 antiaircraft battalion to each army division, the battalion to consist of two batteries of each four 88-mm truck-mounted guns, one battery of four truck-mounted 76.2-mm guns, one battery of six 37-mm truck-mounted guns with a truck-mounted

. . . . . antiaircraft ranging section,

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5. Sources 3 and 183.

6. Source 5.

a light artillery type motorized supply transport company, and possibly an antiaircraft searchlight platoon.

1 antiaircraft regiment to each army corps, the regiment to consist of two antiaircraft battalions of the same composition as the divisional antiaircraft battalion just described, and 1 antiaircraft machinegun battalion of three 24-gun antiaircraft machinegun companies, and

railway antiaircraft artillery, with large caliber guns (105-mm) and highly mobile, for the protection of vitally important installations, besides

permanently emplaced antiaircraft guns according to requirements. In addition to

heavy 100-200-cm searchlights and 60-cm field-type searchlights, plus sound locators for night operations.[7]

From the concept of the structure of an antiaircraft artillery arm as just described, and which was still the ruling concept in 1933, it is evident that the antiaircraft artillery forces designed for the mission of air defense were restricted to the operational zones of the Army rather than intended for the far flung mission of defending targets in the homeland. This concept is explained by the fact that in 1933 no clearly defined ideas existed on the subject of the conduct of strategic air warfare with bombers operating far inside

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7. Source 6.

the zone of interior.

It was known that the nations bordering Germany had available only insignificant numbers of medium range bombers which could hardly be considered up to date. In the event of war, it could therefore be assumed for all practical purposes that only the areas near the frontiers or in the vicinity of the front would be exposed to the threat of air attack, so that the mission of air defense would be a responsibility of the appropriate army commands within the zones of army operations. It was also taken into consideration that all antiaircraft artillery units were fully motorized, which made their speedy movement possible in order to develop areas of concentrated defense.

The aircraft reporting service, employed already in World War I as an auxiliary of the air defense system, could not be reestablished because of the prohibitions under the Treaty of Versailles, so that its development could only commence after signature of the Paris Agreement of 21 May 1926. This agreement permitted the reestablishment of the aircraft reporting service together with the introduction of measures of passive air defense. Pursuant to this permission an Air Service Section was established within the Reich Air Ministry on 10 February 1927, which in 1928 issued orders for the organization of the Aircraft reporting Service.[8]

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8. Source 7.

Direction of the new Aircraft Reporting Service was in the hands of the Air Raid Precaution Officers of the various corps area command headquarters, under whose instructions the Reich Ministry for Post and Telegraph Services was required to build up an aircraft reporting network which met the stated tactical and technical requirements of the service.

Responsibility for the selection and training of the necessary personnel was delegated to the Ministry of Interior in each State, which in turn employed personnel from the rural and state police for the purpose in addition to members of the various patriotic unions, who worked in an honorary capacity.

In practice, development of an aircraft reporting service commenced in Eastern Prussia in 1929 , and in October the service was set in function publicly in the Koenigsberg/ Eastern Prussia region for the first time in connection

with a maneuver by the active and passive air defense system.

In line with the experience gained in this maneuver and based on the Belgian aircraft reporting regulations plus experience gained in World War I, the first German aircraft reporting regulation was issued and orders were given to train personnel for the necessary air observation posts and air observation centers. By 1933 makeshift aircraft reporting services were established and the necessary personnel trained within the command areas of all corps area command headquarters. The control of the entire system was a responsibility of the Air Defense Office within the Reich Defense Ministry.

On 15 May 1933 the Air Defense Office was withdrawn from Army control and placed under the Reich Minister for Aviation. This placed the entire organization of the Aircraft Reporting Service under the command of the Luftwaffe.[9]

Preparation for measures of passive air raid protection was a responsibility shared by a number of authorities prior to 1933.

1. Civil Air Defense. Up to February 1933 Civil Air Defense was a responsibility of the Reich Minister for the Interior, who gave instructions to the various State Ministers for the Interior.

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9. Source 8.

In February 1933 this responsibility was transferred to the newly appointed Reich Commissioner for Aviation, from whose office the Reich Air Ministry was created on 5 May 1933. However, the clearcut definition of civil air defense as a mission of the Federal Government was only established with promulgation of the Reich Air Defense Law (Reichsluftschutzgesetz) of 26 June 1935.

2. Troops Air Defense. From the inception of the Reichsheer, Germany's post-World War I army of 100 000, the utmost importance had been attached in training and tactical regulations to the subject of organic troop air defenses.

In all field exercises and maneuvers the umpires paid particular attention to proper camouflage against air observation.

In order to create conditions as close as possible to the actual conditions of modern warfare exercises and maneuvers frequently included participation by aircraft of the various amateur and commercial aviation schools, the air police, and from 1931 on the "advertising" squadrons activated specifically for this purpose at Staaken and Fuerth/Bavaria.

What was required from the troops in such exercises was that they should conceal themselves as effectively as possible, by means of camouflage, against air observation,

and that, if attacked by low flying aircraft, they were to defend themselves by means of controlled fire by all small arms and automatic weapons.

While resting or on the march, troop units were required by regulations to maintain a number of machine guns constantly under alert to repel low altitude air attacks.[10]

3. Smoke Screening. The restrictions imposed by the 1919 Treaty of Versailles on the use of smoke screening for air defense were not as severe as those relating to other means of combat.

However, the fact that Germany was not allowed to have an air forces of any type initially restricted smoke screening operations to facilities used on the ground. Later, however, a makeshift solution was found in the use of privately owned aircraft equipped with smoke-screening apparatus for the spraying of insecticides over forests and cultivated areas.

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10. Source 3.

Such operations made it possible to accumulate valuable experience on this method of smoke screening.

Even prior to 1933 various government authorities together with industrial firms, such as Minimax GmbH and Total KG, that were interested in the subject had carried out large-scale experiments with smoke-screening apparatus.

In 1929 the Reich Government and the local Prussian State Government participated in experiments designed to smoke screen the large electric power station of Friedland, Eastern Prussia, in line with wartime requirements.

In the same year an exercise was conducted in which the land-based aircraft and seaplane base of Travemuende was covered with a smoke screen which concealed the target area completely against air observation.

In principle, the technical angle of the smoke-screening problem thus was solved already prior to 1933. However, the activation of the first smoke screening battalion, a motorized unit, for mobile tactical employment only took place in 1936-7.[11]

4. Air Barrage Facilities. Prior to 1933 no concrete results had been obtained to meet the requirements for the development of barrage equipment as formulated in the previously discuseed program of development set up by the

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11. Source 9.

Reich Defense Ministry on 6 December 1932.[12]

5. Dummy Installations. Voluminous pampflets were available, published by the Reich Air Ministry, on the construction of dummy installations. The fortress command at Pillau had carried out extensive tests in the concealment of above-surface fortress installations.

6. Naval Air Defense. Prior to 1933 the German Navy was in a singular position within the framework of the overall structure of the German armed forces.

As stated previously above, the development of antiaircraft artillery was a prerogative of the Navy, which had pioneered this field.

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12. Source 10.

The naval antiaircraft artillery units, which were intended for the defense of the various naval bases, were not controlled by the locally responsible corps area command headquarters but by the naval base commands and naval fortress commands concerned.[13]

This circumstance is indicative of the view that, in accordance with their special nature, the naval defense areas had to be considered as a homogeneous whole.

Ships armed with antiaircraft guns and the antiaircraft artillery units of the naval bases ashore could only achieve maximum effects if they were under a uniform fire control. This could not have been insured if the naval air defense forces had been under separate controls, those afloat under the control of naval authorities and those ashore under army commands.

In the development of naval aircraft the Navy, prior to 1933, also continued to apply the traditional practises of World War I and proceeded on its own. As in the case of the Army, the naval air arm included tactical and strategic planes, one fighter type, and several types of multi-purpose aircraft models.

Of the lessons learned in World War I, one continued to play a dominating role, namely, that naval aviation required aviation and nautical qualifications. This line of

13. Source 8.

thought is evident in the fact that naval air pilots were given training in seamanship before their training in aviation commenced.

Thus, when the new German Air Force was established in 1933 a few naval air units were in existence, including one naval fighter squadron, which was equipped with Type HD-38 planes and was based at Warnemuende. Up to 1935 these units remained under the Navy High Command.[14]

GERMAN AIR DEFENSES PRIOR TO 1933

REVIEW

In summarizing, the German air defense situation in May 1933, the time when the Luftwaffe was established as a separate branch of the German armed forces, can be stated as follows:

1. The Luftwaffe assumed responsibility for the conduct of air defense in the following fields:

The control of fighter forces, excluding naval fighter units;

The control of the aircraft reporting system;

Passive air raid protection;

all within the zone of interior.

In the coastal areas of the North and Baltic Seas air defense was a responsibility of the Navy, which had its own organic fighter and antiaircraft artillery forces for these

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14. Sources 11 and 12.

purposes.

2. Air defense by means of antiaircraft artillery fire within German territory, excluding the coastal areas, was controlled by the Army.

3. The basic views valid on the purpose and the employment of the means available for air defense emanated, with only unimportant changes and innovations, from the experience gained in World War I.

In spite of what has been said above, the withdrawal of certain air defense weapons from Army control and their transfer under the command of an independent air force were the first step toward the modern concept of concentrating all

14. Sources 11 and 12.

air defense forces under one single command authority in order to meet the just requirements of all concerned, of whom the Army, with its need for protection of its operations, was only one.

As a logical sequence to this concept, the antiaircraft artillery forces, initially in secret, were also withdrawn from army control on 1 April 1934and placed under the tactical and operational control of the Reich Minister for Aviation.

To complete the picture it must be stated here that the whole Luftwaffe as it existed in 1933 was not known to the public in its true character but under a number of guises, some of them exceedingly curious. This concealment had some formal justification but on the whole failed to achieve the desired purpose.

One instance is quoted here to illustrate what is meant: The first bomber school established at the Lager Lechfeld airfield, was designated the as the High Altitude Operations Center of the German Air Weather Service (Hoehenflugzentrale des Deutschen Flugwetterdienstes), but even the rankest layman would have realized the full truth if he had watched the lively activities at the airfield for only five minutes.[15]

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15. Source 3.

1933-1935

Organization and Forces

The 1933-1935 period in every respect can be considered as a period of growth for the new German air force. It is a period in which this growth took place not only in the personnel and materiel field, but also in the development of intellectual concepts.

In most of the states adjoining Germany the air forces was an integral part of the army. In contrast, the air component of the German armed forces was, in a certain sense, breaking new ground as a separate and independent branch of the military establishment. Comparisons could not be made with the British Royal Air Force, since the conditions for Britain as an island power and as the center of an empire extending throughout the world differed considerably from those for Germany as a continental power in the heart of Europe and surrounded by other sovereign states.

Another potent factor was the fact that it was in this period that Italian General Douhet exercised a very strong influence on the concepts of air power.

As far back as in 1932 Major Wimmer, then in the Army Ordnance Office, and Lieutenant Colonel Felmy, at the time Chief of Staff in the Air Force Branch of the Army Troops Office, had taken

up the idea of strategic air warfare conducted with the heaviest possible types of bombers at extremely long ranges. Their thoughts on the matter had produced the requirement for the development of a 4-engine bomber. At the time they were unable to press through their plans in this respect, since the situation brought about by the seizure of power by the National Socialist Party on 30 January 1933 had put a stop to all planning and development for the time being.

The intellectual concepts of the Luftwaffe received their first decisive impetus in the autumn of 1933 with the transfer of Colonel Wever, GSC, from the Army General Staff to the Luftwaffe as Chief of the Luftwaffe Command Office and later Chief of the Luftwaffe General Staff. With this appointment an officer appeared on the scene and came into action who had been deeply impressed by the theories of Douhet and Rougeron and who, in addition, was pronouncedly gifted with creative intellectual powers.

In a personal discussion with Lieutenant Colonel Wimmer, who meanwhile had been assigned as Chief of the Technical Office in the Reich Air Ministry, Colonel Wever took up Lieutenant Colonel Wimmers ideas concerning the creation of a fleet of super-heavy, 4-engine bombers as propounded by Douhet, and gave orders to issue instructions for the development of a 4-engine plane suitable

for the purpose.[16]

The above fact can be considered as a milestone in the evolution of intellectual concepts concerning the importance of the ideas of air attack and air defense insofar as it already indicated the development of a train of thought aiming at solving the problem of air defense primarily through the destruction of the hostile bomber forces at their home bases by means of attacks carried out by a strong force of bombers.

Nevertheless, there is no possibility to ascertain that Douhet's theories concerning a strategic air force with decided emphasis on bomber elements had already in the 1933-1935 period become the generally accepted concept of the Luftwaffe.

Within the Luftwaffe General Staff there were still numerous adherents of the theories, which had been tested and found sound in World War I, that the primary mission of an air force was to support the operations of the army both in offensive and defensive action.[17] The arguments of these circles received strong support from the fact that the super bomber envisaged by Douhet, a bomber which could penetrate deeply into hostile territory, was far beyond the technological capabilities as they existed in the early nineteen-thirties.

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16. Source 2.
17. Source 13.

In the winter of 1934-35 the plans for the 4-engine bomber, already under development, were brought to the attention of General Goering in an oral report on planning for technological development by Major Freiherr von Richthofen, at the time Chief of Branch 2, Technical Office. General Goering raised no objections, but it was obvious that he did not favor the idea.

In the spring of 1935 Goering inspected the Junkers factory at Dessau and was shown into the model hall, in which a full size mock-up of the 4-engine bomber under development, complete with cockpit and fuselage, had been constructed. Replying to his astonished question as to the purpose of the mock-up, Colonel Wimmer, Chief of the Technical Office of the Reich Aviation Ministry, again explained to him the strategic ideas previously propounded to him at the report in the winter of 1934-35. Goering quite obviously had completely forgotten the matter. He was extremely annoyed and reserved his decision on the matter of the 4-engine bomber.[18]

It would seem only natural to assume that Goering, one of the prominent fighter pilots of World War I and the last commander of the famous Richthofen wing, would have been particularly inclined to favor the build-up of the fighter arm. This was by no means the case, however. Owing to the heavy demands on his time

because of the numerous other offices he held in the political field--a logical development in view of the necessity to consolidate the position of the new Government--he exerted no influence on the details of planning for the build-up of the Luftwaffe.

He could afford to leave this work to his subordinate, Under Secretary of State Milch and the experts in the Luftwaffe General Staff. This was particularly the case in view of the excellent Chief of the Luftwaffe General Staff he had in the person of General Wever, of whom General von Blomberg, at the time Reich Minister of War, is alleged to have said as follows: "He (Wever) is one of our best and I am only releasing him to give you (Goering) a sign of my friendly feeling for your future Luftwaffe...."[19]

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18. Source 2.

19. Source 14.

It was thus primarily Under Secretary of State Milch and General Wever who, in the 1933-35 period, provided the intellectual impulse in laying the groundwork for the new air force. In any event they already determined the direction of developments in that it was due to their influence that main emphasis was placed on the bomber arm in the establishment of training units.

The following establishments commenced functioning in the spring of 1934:

1 air reconnaissance school in Braunschweig to train crews for tactical and strategic air reconnaissance units;

1 fighter pilot school at Schleissheim;

2 bomber aviation schools at Lechfeld and Fassberg.[20]

In another field a decisive step towards the clarification of air defense concepts was the transfer, on 1 April 1934, of the antiaircraft artillery arm from tactical control by the various corps area commands and their assignment to the Reich Minister for Aviation. Initially, this transfer was concealed, and until 1 April 1935 the activation, training, and equipment of antiaircraft artillery units remained a responsibility of the Artillery Inspectorate within the Reich Defense Ministry.[21]

However, the above measure reveals a concept in which the

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20. Source 3.

21. Source 8.

those concerned were beginning to consider the antiaircraft artillery arm, and particularly heavy caliber units, as a defense weapon of an empirical nature.

Since the Luftwaffe, in contrast with the Army, was not restricted in its operational movements by geographical delimitations, the Luftwaffe was able to assign antiaircraft artillery units in any area as the current situation required.

Another factor which may have played a role in the transfer of the antiaircraft artillery arm to the Luftwaffe was that the very concept of a strong bomber force designed to destroy the offensive air forces of an enemy in the event of war logically produced the requirement of special protection of friendly bomber bases against the event of similar intentions planned by the enemy. The only way to guarantee the availability of such defenses was, naturally, to enable the Luftwaffe to organize the defense system with its own means.

It is possible that the problem discussed above became evident at an early stage as the result of an actual event, and that the questions then raised brought about the train of thought discussed:

On 25 October 1933 the Reich Minister for Defense drew attention to the possibility that sanctions might be imposed against

Germany because of her resignation from membership in the League of Nations on 14 October 1933. In the directive he issued on the subject Item 3 readsas followe:

> Without regard for the prospects of military success, the Reich Government is determined to offer local armed resistance to any hostile action.

Item 5 of the directive assigned the following mission to the Luftwaffe:

> Defense in the air over Berlin and the industrial region of Central Germany, with main emphasis on Berlin.[22]

The only units available to the Luftwaffe for defensive action at the time were the following:

1. One fighter group, equipped with Ar-65 aircraft, still in the process of activation at Doeberitz;

2. One fighter training school at Schleissheim, where it would have been possible to activate one to two improvized tactical squadrons, using the Ar-64 and Ar-65 aircraft available for training purposes. The instructor crews were from the Reichswehr (Germany's 100 000-man army) and from the German Commercial Aviation School, and had redeived fighter pilot training at Lipezk, Russia, and in Italy;

3. A serviceable aircraft reporting system; and

4. The authority to order passive ARP measures.

22. Source 15.

It is obvious that the weakness of the position in which the Luftwaffe found itself became drastically evident when the balance was drawn showing the means available to it for the execution of its assigned mission, and it is highly improbable that as ambitious and dynamic a person as Goering accepted these circumstances lightly.

Since personnel and materiel considerations excluded the possibility to accelerate the organization of fighter units, and since any such efforts at acceleration could not have produced immediately realizable results, the logical deduction from this situation was the demand that the already existing antiaircraft artillery forces should be placed under Luftwaffe control.

n The First Solution of the Air Defense Problem.

In examining the question of what principles of air defense motivated the German air command in 1933-35, and in what form these principles found expression in planning, the extraordinary fact becomes evident that it was not the concept which dictated

the nature of the means to be used but, conversely, the means which dictated the nature of the concept. The reason for this was the urgent desire to "have something ready" as speedily as po possible, both for training purposes and for use as "emergency units."

In the field of aviation it was possible in 1933 to submit the conclusions drawn from the requirements formulated in previous years.

In the case of fighter units this meant the Ar-64 and Ar-65 models and a parallel development by the Heinkel Works, the He-51, an improved version of the He-49 and also a double-decker plane with an average speed of 136 miles and a maximum time-in-air capacity of 75 minutes. The He-51 was better in appearance and slightly faster than the Ar-65 and was also powered by the water-cooled BMW VI engine.

The Technical Office of the Reich Aviation Ministry therefore had no choice but to have these models produced as speedily and in a large numbers as possible. Being slightly better than the other models available, the He-51 was given preference for allocation to tactical units, whereas the Ar-65 was used primarily for training purposes, since it was a little easier to handle.

Because the capacities of the Heinkel and Arado factories

were inadequate to produce the required numbers of aircraft, the Technical Office arranged for the production of their models under license by other factories which had no suitable models to offer. Thus, besides the Heinkel factory at Warnemuende, the Fieseler Works in Cassel, the Arado Works at Erla/Leipzig, and the Orschersleben aircraft factory manufactured He-51 planes under license.[23]

A fighter plane which, after the requirements for take-off, climbing, combat action, and landing had been deducted had a maximum striking range of only 90 miles could only be considered as a weapon for local air defense.

Speaking in practical terms: a fighter group based on airfields at Doeberitz could not operate farther than a line extending from Schwerin through Braunschweig, Leipzig, and Goerlitz, and when operating at this line had to land there, since its fuel supply would have made a return to its base at Doeberitz impossible. A fighter group based in southern Germany on airfields around Munich could not participate in defense action if the industrial regions of Central Germany had come under attack from east or west.

For these reasons there was no possibility to concentrate fighter units during an action to form a point of main defense effort at any point farther than 90 miles from their bases.

The above circumstances clearly reveal a decided weakness in the field of offensive air defense. This weakness could not be remedied through the activation of an appropriately large number of fighter units, because only a small cadre of trained fighter pilots and only a limited number of fighter planes were available in 1933.

One or two years would necessarily pass before the training program initiated in 1933-34 at the only existing fighter school at Schleissheim and the output of He-51 and Ar-65 aircraft could produce results which would provide personnel and materiel enough to activate new fighter units in any appreciable number. The same applied in the field of air technical personnel, who

first had to be trained in a special aero-technicological school.

Since the antiaircraft artillery of the Army consisted of only a few units distributed widely throughout Germany, and since these units had only a very small combat value because they had been split up to form new units, it seems only logical thatthe Luftwaffe Command during the first phase of its build up decided to force the pace in the activation of bomber units.

The purpose of this measure was to counter any threat of military intervention by foreign powers in the developments within Germany, such as that revealed already in the directive by the Reich Defense Minister of 25 October 1933, with the threat inherent in the fact that a German bomber arm in existence would be in the position from the start to carry the war into enemy territory.[24] Fear of an offensive weapon of this kind was to prevent foreign powers from exploiting the military superiority they still had in 1933-34.

Moreconfidence thus was placed in the repelling effect of the threat an offensive weapon would constitute than in the effectiveness of a demonstration of strong defensive strength, and the risks involved in neglecting the defensive components in favor of the offensive weapons was accepted.

It was from such trains of thought that the concept of

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24. Source 15.

a "risky airforce" (Risiko-Luftwaffe), as it was called in the 1933-1933-35 period, took rise.[25]

The Luftwaffe as it existed then actually was a risk, since the first bomber units activated were equipped with the well known Ju-52 planes, a model used as a standard type by the German Lufthansa Airways on commercial air routes, but which under no circumstances could be considered modern and whose sole modifications to adapt it for military purposes were the addition of two machine-gun cockpits above and below the body, which made it possible to repel fighter attacks.

While the above developments were taking place, leading circles in the Luftwaffe Command were endeavoring to establish clear lines for d velopment of the intellectual concepts of air warfare and to formulate the ruling principles in a written service regulation, which later became known as Field Manual 16: The Conduct of Air Operations (Luftwaffe Druckvorschrift 16 "Luftkriegführung").

It was 1935, however, before the regulation could be put into final shape in the Luftwaffe General Staff, and 1936 before it could be distributed to the troops, classified as secret, for use in instruction on the strategic and tactical principles of air warfare.[26]

Development of Air Signal Communication Services.

So far as the aircraft reporting system was concerned, the

main feature of the 1933-35 period was the continued expansion of the service, both in respect to personnel and materiel.

With the establishment of the various Luftwaffe Administrative Area Headquarters on 1 April 1934, the aircraft reporting officers on the staffs of these headquarters took over the functions formerly handles by the air raid protection officers of the various Army corps area command headquarters.[27]

Under the Luftwaffe administrative area headquarters courses were conducted in which the air observation detachment commanders received training lasting six days. These personnel then proceeded to conduct semiannual training courses for voluntary air observation personnel, supplemented by an annual field

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27. Source 8.

exercises, in some cases acting under supervision by rural or State police authorities, in other cases acting independently.[28]

On the whole it can be stated that in the 1933-35 period further progress was made in the development of the aircraft reporting service toward the desired target of providing a complete aircraft reporting network covering the entire area of Germany which, in the event of war, could be taken over immediately and put into operation by properly trained personnel.

In the special naval defense areas measures were introduced to insure extremely close cooperation between Luftwaffe Administrative Area Headquarters VI, Kiel, and the naval command authorities.[29]

THE MISSION OF AIR RAID PROTECTION

Responsibility for the mission of airdraid protection in the passive sense had been transferred to the Reich Minister for Aviation on 1 April 1934.

The mission was subdivided into two fields that of troop air raid protection and that of civil air raid protection.

The main objectives here were to provide for

1. Gas defense and decontamination measures.

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28. Source 6.

29. Source 8.

2. Fire fighting measures.

3. Camouflage.

4. Air raid warning services.

5. Blackout measures.

The build-up period of 1933-35 was characterized more by planning and the initial organizational steps, however, than by any concrete results achieved.

However, definite views had been developed on the subject within the Luftwaffe Command:

1. In selecting terrain for projected airfields, the greatest possible attention was to be paid to circumstances which woul favor camouflage against air observation.

2. For all buildings to be erected, the plan was to provide a light concrete roof cover to prevent penetration by incendiary bombs.

3. Use was to be made of the experience and service regulations of the former Reichswehr in the organization of troop gas defenses.[30]

Adequate experience was available from pre-1933 times on the use of smoke as a means of temporary concealment, but it was only at a later juncture that the information thus available on the subject was translated into action through the activation of the first Luftwaffe smoke screening unit.

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30. Source 3.

REVIEW

In summarizing, the situation in the field of German air defenses in the spring of 1935 chn be stated briefly as follows:

1. Lacking adequate air defense forces in the form of fighte and antiaircraft artillery units, the German Air Command considered the speedy organization of bomber forces as the most effective measure to prevent hostile air attacks or military conflict of any kind.

This can be considered as the "offensive solution" of the defense problem.

2. The emphasis placed on the allocation of armament potentials, both in personnel and in material, for the tarining and establishment of bomber forces took place at the expense of the fighter forces.

Apart from the region defended by the naval fighter squadron based at Warnemuende, the only area within Germany which was protected by fighter forces, was that around Berlin. Here the mission was a responsibility of the only existing fighter group, organized between 1933 and 1935, designated Fighter Wing Richthofen, stationed at Doeberitz, with an authorized strength of 30 aircraft, and equipped with Type Ar-65 planes.

Lacking a more suitable and better fighter model, it was found necessary to give orders for the manufacture of large

numbers of the existing Type Ar-65 and He-51 models.

It was thus evident that the short tim which German fighters could remain airborne and their small margin of speed over the bomber types employed at the time in the countries bordxring Germany represented a serious handicap.

However, this disadvantage could be accepted, because the foreign powers also had no modern fighter types and because it would be possible,if the situation required , to reinforce the defenses in threatened areas by concentrating foghter units there, stripping areas not under threat for this purpose.

3. Nothing could be done by the Luftwaffe during this period to expand the antiaircraft artillery forces, since the few antiaircraft artillery units developed by the Army and in existence at the time remained under the Army Artillery Inspectorate and only a secret order existed that they were to be transferred to control, effective 1 April 1934, in the event of the employment in actual combat.

4. The aircraft reporting system had been expanded and intensified, and training had improved.

5. Air raid protection measures were chiefly still in the planning stage and the principles involved were still being developed. Clear cut lines of command had been established in regard to the responsibility for measures in this field

since the transfer of the mission of air raid protection to the Luftwaffe administrative area commands.

6. So far as the overall concepts of the Luftwaffe on the subject of air warfare were concerned, a clear line of thought had crystallized, which was formulated in a service regulation the "Conduct of Air Operations," and which in the time to come became basic doctrine.

GERMAN AIR DEFENSES IN 1935-36

Military Sovreignty and General Conscription

The 16 March 1935 can probably be considered as the most important milestone in the history of the newly established German military forces.

It was on this day that Hitler, as Reich Chancellor of Germany, declared Germany's sovreignty in all defense matters, thereby removing the last fetters imposed by the 1919 Treaty of Versailles with the exception of the provision prohibiting the maintenance of German military forces on the banks of the Rhine River.

At the same time the German Parliament, the Reichstag, passed the law establishing general conscription in Germany.

For the Luftwaffe this meant the removal of concealment insofar as the existing air units now could be described in public as air groups. Secrecy was still maintained, however, on the subject of to which branch of the service they belonged organically. In written communications the arm to which a unit belonged was d signated by a prearranged numbering system for the various units.[31]

TRANSFER OF THE ANTIAIRCRAFT ARTILLERY FORCES TO THE LUFTWAFFE

All antiaircraft artillery forces, hitherto still under the Army Artillery Inspectorate with the secret arrangement that they would pass under command by the Reich Minister for

Aviation in the event of actual combat were now transferred officially and in every respect to command by the Luftwaffe, and all personnel in antiaircraft artillery units changed their army uniforms for Luftwaffe uniforms.[32]

Only the naval antiaircraft artillery units stationed within the command area of Luftwaffe Administrative Command VI, Kiel, remained under naval command and were responsible for the mission of air defense in the coastal areas.[33]

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31. Source 18.
32. Source 19.
33. Source 19.

THE SERVICE MANUAL
CONDUCT OF AIR OPERATIONS
(Luftkriegfuehrung)

The build-up period of 1933-35 had contributed to the development of an intellectually matured concept of the future missions of an air force, and of the manner in which those missions would be executed.

The result was the initial version of the field manual THE CONDUCT OF AIR OPERATIONS (Luftkriegfuehrung), published later as Luftwaffe Field Manual 16 (Luftwaffe Druckvorschrift 16), which in its essential points was the work of Colonel Wilberg, Chief, Air Defense Branch, Reich Defense Ministry, prior to 1933. The compilation of the manual was influenced decisively by General Wever, Chief of the Luftwaffe Command Office.[34]

The manual was organized in the following chapters:

A. Introduction.

I. Missions.

II. Command.

III. Reconnaissance.

IV. Operations.

V. The Execution of Operations.

After establishing in Paragraph 1 that the Luftwaffe included air forces (bomber, reconnaissance, and fighter forces),

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34. Source 17.

antiaircraft artillery forces, and the air signal corps, the

INTRODUCTION continues in Paragraph 2 as follows:

> Starting with the opening of a war the air forces will carry the war into enemy territory. Their attack will strike the military potential of the enemy and the hostile nation's will to resist at the very source.

This formulation pleves in the foreground the offensive nature of an air force as an instrument of warfare with which to strike at the very roots of the military power of an enemy.

One remarkable feature here is th fighter forces, specified in Paragraph 1 as part of the air forces, are included in this offensive mission, and thus were not considered strictly as a weapon of air defense.

Paragraph 2 continues:

> The antiaircraft artillery forces will provide direct protection for friendly territories. In combination with the fighter forces they are of imminent importance for the the defense of the Homeland.

A study of this formulation reveals that the antiaircraft artillery forces were considered as the arm chiefly responsible for the air defense mission.

From the formulation "In combination with the fighter forces...." it can be deduced that in any circumstances elements of the

of the fighter arm were intended for assignment to defense missions. From this it can be established that the fighter arm was considered both as a weapon of attack and as a means of defense. This finding is confirmed by the fact that in training the subjects of low-level flight and low-altitude attack were just as much the daily bread of fighter pilots as was the subject of air combat at high altitudes, a subject field which will be dealt with in greater detail later in this study.

n The definition of concepts continues to define the air signal corps as the service responsible for signal communications and for the functioning of the radio intercept service; the aircraft reporting service as the all-important instrument for command and combat in air defense, for the timely functioning of the air raid warning system; and the civil air defense system as a supplement to air defense to alleviate the results of hostile air attack and their effects on the nation and the nation's various installations.

Paragraph 3 of the INTRODUCTION from the very outset stipulates flexibility in the application of the provisions of the manual in adaptation to new technological developments and the changing conditions they would constantly introduce in the conduct of air operations.

This illustrates strikingly the ceaseless interplay of forces in the struggle between the means of attack and the means of defense for superiority. However, stress is laid on the fact that, beyond all influences of technology, the combat quality of the troops employed is the most importantly decisive factor.

This concept is in line with the old Prussian military traditions, and in the paragraphs which follow, the INTRODUCTION goes into more detail on the ethical standards required in the military personnel of the Luftwaffe.

In the whole formulation of Luftwaffe concepts an important position is given to the soldierly qualities of morale, heroism, selfsacrifice, and comradeship. Here, particular

stress is on the mutual homogeneity of all elements of the Luftwaffe and of the Luftwaffe with the other branches of the armed forces as a whole. Everything is placed under the common denominator of comradeship, at all times considered the foremost virtue of the German soldier in general.

One task in the present study will be to show how seriously combat morale can be affected by technological factors, and how even the very best training program can fail to produce the desired results if the command fails at least to keep abreast of the enemy in the technological development of the weapons placed in the hands of its soldiers.

In the passages dealing with missions in the manual (Chapter I) the view is evidently prevalent that the decisive value of air power in war resides in the ability to conduct strategic warfare against the hostile sources of power with the object of bringing about the collapse of the enemy military forces. This sentiment goes so far that the following is expressed clearly in Paragraph 16 of the chapter:

> The friendly military establishment and the homeland are threatened constantly by the enemy air forces. Under no circumstances can this threat be countered adequately by defensive action within the homeland.
>
> The constant air threat to the homeland makes the

employment of bomber forces against the hostile air forces from the very outbreak of a war a categoric necessity.

Here the great importance becomes evident which the Luftwaffe Command attached to its offensive air forces in efforts to find a solution to the defense problem. Reich Marshal Goering, Commander in Chief of the Luftwaffe emphatically declared his adherence to these basic views.[35]

A logical sequence of a concept such as that just described is to place main emphasis in the field of air defense weapons on the antiaircraft artillery arm, which would be reinforced by fighter forces only in particularly vital areas of defense.

Paragraph 20 deals with what is described as the air mission of next importance, that of supporting the combat operations of the Army and the Navy

In the case of operations which could have a decisively important impact within the conduct of the overall war.

This formulation in itself reveals a departure from the views stemming from World War I practices, in which this type of operations was considered the primary mission of air power.

In Paragraph 24 emphasis again is on the offensive idea as the prime principle. "In addition" the necessity for military defense measures and measures of civil protection are stated. The relations between these two requirements are established

35. Source 20.

as follows:

> Attack, defense, and protection are interrelated. Activities in all three fields must be controlled by one single authority in accordance with uniform principles.

The centralized command thus prescribed to control both the attack and the defending forces provides in optimum form for the flexible application of the field manual. In the light of what has thus been said, it could be stated that action against hostile air forces, and particularly the enemy bomber arm, was possible as defense through attack against the bombers' bases and as attack from the defensive, by means of air defense action.

Paragraph 24 contains the requirement that

> The vulnerability of the homeland to air attack must be reduced, the resistance of the Nation to air attack must be increased

and thereby states a comprehensive and clarifying directive governing the measures to be taken for the development of the air raid protection system.

From what has been said so far concerning the basic concepts ruling in the Luftwaffe Command in 1935 on the problem of air defense, the following can be stated here:

1. The concept of the decisive importance of air power as a weapon for strategic attack against the hostile armed

forces and their sources of power was dominant.

2. Next in order of importance came the tactical use of air power in support of vitally important operations of the Army and the Navy.

Primarily, the solution of the air defense problem was embodied in the views of the success which could be achieved through strategic operations of friendly air forces against the hostile air forces and their ground organization. The forces to be used in such attacks included elements of the fighter arm. Protection against air attack in the defense areas of the homeland was primarily a mission of the antiaircraft artillery.

The aircraft reporting system, the air raid warning system, and passive air raid protection were auxiliary means of home air defense. Elements of the fighter arm were assigned the mission of supporting the antiaircraft artillery in the defense of particularly vital defense areas.

TANGIBLE FEATURES OF THE INTELLECTUAL CONCEPT VISIBLE IN THE DEVELOPMENT OF THE VARIOUS AIR UNITS

In implementing the concepts just set forth it was logical that the build up of the Luftwaffe was emphasized in two directions:

1. That of creating bomber forces and

2. That of increasing the number of antiaircraft artillery units currently in existence.

It is obvious that a slower pace was set for an increase in the strength of the fighter arm.

Although it must be taken into account that the manufacturing capacities of the aircraft industry would, under any circumstances, have made it impossible to strengthen the bomber and the fighter arm concurrently, it was the intellectual concepts of the nature of air warfare which determined the issue and caused the decision to exploit manufacturing capacities primarily to build up a strong bomber arm.

To state the case in concrete figures: The armament

program for 1935 provided for the production of fighters and bombers in a ratio of 1 to 3, and this ratio does not make allowance for the production of a new type of bomber, the dive bomber, which is not even included in the 1:3 ratio.

This matter calls for a more detailed discussion here, since it is of incisive importance in an examination of the problem of air defense for the following reason: For the first dive-bomber units established in the summer of 1935, the necessary personnel were taken from those allocated to the fighter arm. The equipment for the units with He-50 planes was carriedout at the expense of the allocations originally provided to manufacture He-51 and Ar-65 planes with which newly activatedfighter units were to have been equipped. 36.

In 1933 Goering had sent Ernst Udet, themost famous fighter pilot of World War I still alive at the time, who was still hesitating about his decision whether to join the new Luftwaffe or not, to the USA to look around for ideas and aircraft types which might be useful to the Luftwaffe.

As a aero acrobat of world fame, Udet was afforded the opportunity in the USA to fly a Curtiss Hawk,a single-seater plane with an extremely strong power unit and strongly enough built to allow diving at fastest speeds.

Apart from the new possibilities for aero acrobatics,

Udet envisaged a new method of bombing, dive-bombing, by means of which bombs could be placed on their target with a precision hitherto unattainable.

The speed at which such planes would dive for the bomb release could be expected to be so great that antiaircraft artillery would stand a small chance against them.

Along with two aircraft of this type Udet brought his new idea back to Germany, where he demonstrated the performances of the aircraft to Goering.

Against resistance offered by his Technical Office, Goering accepted the ideas of Udet, and in 1936 these ideas were even the deciding factor which influenced Goering to appoint Udet

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36. Source 21.

as Chief of the Luftwaffe Technical Office. Already in 1935 Udet's idea resulted in the organization of an experimental squadron of dive-bombers. The squadron was equipped with He-50 planes and in June of the same year it was expanded to form a group. The pilots for this group were taken from the classes for fighter pilots which closed on 15 June 1935 at Schleissheim.[37]

The technical personnel required for the new group were also taken from trainees at the air technical school at Juterbog intended for the fighter arm.

The reason for this interference in the fighter program was the fact that the He-50 plane, developed in 1932 by Heinkel as a dive-bomber for Japan was the only available type which was robust enough for almost vertical diving. Since the He-50 was a single-seater and was more in the nature of a fighter plane, activation of the new dive-bomber group perforce took place at the expense of the fighter arm.

The result of these circumstances was that it was not possible to plan the activation of more than one new fighter group, the second group of Fighter Wing Richthofen, for 1935.

Up to Spring 1936 these two groups of Fighter Wing Richthofen and one naval fighter squadron at Kiel were thus the only fighter forces available for air defense in Germany. However,

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37. Source 3.

the naval fighter squadron also was removed from naval control and transferred to the Luftwaffe in the spring of 1935.

In each Luftwaffe Administrative Area Command the reconnaissance, bomber, and fighter units within the command area were under combined command by the Senior Air Commander. This command organization corresponded logically with the views previously quoted from the field manual THE CONDUCT OF AIR OPERATIONS that the fighter arm was an integral part of the air forces and was designed for employment in operational warfare together with bomber and reconnaissance units as well as for defense missions in combination with antiaircraft artillery.

It was only in March 1936 that the reoccupation of the Rhineland by German military forces produced unplanned but decisively important impulses promoting the development of the fighter arm, as will be seen from the important measures of improvization taken at the time.[30]

DEVELOPMENT OF THE ANTIAIRCRAFT ARTILLERY ARM

The measure placing the antiaircraft artillery units of the Army under Luftwaffe control had given rise to severe criticism in wide circles.

However, the arguments against the measure were more of a traditional and emotional nature arising from the fact that the arm as such had grown from the Army's tank gun batteries

and that the officers commanding these units were all army officers of World War I.

Nevertheless, the realization soon prevailed that the measure was a wise one in the interests of all concerned, since the only possibility for the former army officers to develop

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38. Sources 3, 8, 11, 18, 22, 23.

a proper understanding of the implications of modern air warfare, and thereby of the capabilities of their weapons in action to repel air attacks, was as members of the Luftwaffe.

Furthermore a modernly developed air force was in a far better position to develop suitable defense weapons in accordance with the doctrines of modern air warfare.

It would be very wrong to assume that the compilers of THE CONDUCT OF AIR OPERATIONS in their passages on the problems of air defense failed to realize the necessity to assume that the enemy in the use of their offensive air forces also would proceed along lines similar to those they themselves considered up-to-date and likely to produce success.

The Army was fully occupied with the expansion and modernization it itself was undergoing, since everything was on a wei much larger scale, both in respect to personnel and materiel, than was the case with the Luftwaffe. It is therefore likely that the antiaircraft artillery arm would have suffered in respect to the scope and speed achieved in the activation of new units.

In contrast, the integration of the antiaircraft artillery arm in the Luftwaffe as a separate arm enabled the arm to benefit under the ambitious program of development which would have been possible only under a personality such as Goering,

who was not only Commander in Chief of the Luftwaffe but also a powerful man in the State and in the National Socialist Party.

By March 1935, however, the Army had done valuable preliminary work; using the cadres taken from the tank gun batteries it had organized modernly equipped antiaircraft artillery units in nine organizations designated for purposes of concealment as supply-train battalions (Nachschubabteilungen). On 1 April 1935 following antiaircraft artillery units, still under their cover designation were in existence:

Supply-Train Battalion	Koenigsberg,	Eastern Prussia
" "	Seerappen,	" "
" "	Stettin	
" "	Berlin/Lankwitz	
" "	Berlin/Doeberitz	
" "	Dresden	
" "	Ludwigsburg	
" "	Hanover	
" "	Fuerth,	Bavaria
" "	Wurzen.	

On 1 November 1935 these units were redesignated as antiaircraft artillery battalions.

In the autumn of 1935 the Luftwaffe already had 15 heavy and 3 light antiaircraft artillery battalions available, all

of them fully motorized. Plansprovided for measures to double this number of units with personnel coming from the second draft in the autumn of 1936.[39]

In the autumn of 1935 the development of air barrage facilities became a matter of acute current interest.

On the basis of the preliminary work done and the experience available in Branch 8 (Branch for Optical, Survey, Meteorological, Artillery Fire Control, andMap Printing Equipment), Development and Testing Group, Army Ordnance, Branch 10 of the same office by October 1935 had organized the initial test materiel in the form balloons, buoyant gas, balloon winches, anchors, and other appliances, and had organized the required industrial installations. This work was carried out under the supervision of a former airship officer, who also conducted the first tests at the Army Ordnance Office installations near Seelow in the winter of 1935-36.

General Wever, at the time at the head of the Luftwaffe Command Office gave instructions for the preparation of a memorandum on the use of barrage facilities for air defense purposes. The study was submitted on 29 March 1936.

The results obtained in the tests carried out with the experimental materiel convinced General Wever of the usefulness of these means of air defense and he immediately ordered continuation of the work of development andimprovement.

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39. Sources, 24, 183.

By the summer of 1936 Branch 10 of the Army Ordnance Office had the installations almost completed at Saalow as a training and experimental station for the air barrage troops, and then, on 8 July 1936 came an order from the Reich Air Ministry prohibiting the flying of balloons at Saalow. The reason given was that the testing grounds at Saalow were athwart the direct route of air travel from Berlin to Munich, and that the tests carried out endangered important official planes using this route.

This prohibition had a seriously hampering effect on the continued development of the air barrage troops right up to 1938.[40]

Field Manual THE CONDUCT OF AIR OPERATIONS counts air barrage facilities among the defense weapons of the antiaircraft artillery arm and in Paragraph 266 contains the directive that barrages should be established outside of the probable target area of attacking planes and that, if necessary, they were to be given special protection.

General Wever had done much to promote the development of these means of air defense, and after his death on 3 June 1936 the impetus which had promoted this development apparently was lost. After two years of discussions between the Luftwaffe Command, the troop commands, and the appropriate technical personnel, concerning the nature, scope, and employment of this type of

40. Source 10.

air defense weapon, work to continue its development was only resumed in 1936.

DEVELOPMENT OF THE AIRCRAFT REPORTING SYSTEM

Development of the aircraft reporting service had made continuing progress in 1935-36.

In place of the semi-annual training courses hitherto conducted for the chiefs of air observation detachments, a large course for chiefs of observation detachments and of air raid warning centers was conducted at the newly established Reich Air Protection Institute in Berlin, which lasted from 11-16 February 1935.

During this course an officer of the Luftwaffe Signal Corps read a paper and explained the plan to establish motorized

aircraft reporting companies organic to the Luftwaffe Signal Corps, as a field or troops aircraft reporting service, in addition to the existing Reich aircraft reporting service.

The mission of these units was to be, in the event of war, to enter enemy territory with the combat troops and establish an aircraft reporting service there for integration with the system existing within Germany.

In the autumn of 1935 measures were introduced to grant Luftwaffe reserve officer status to the leading personnel in the aircraft reporting service, most of them World War I officer personnel, who hitherto had worked on an honorary basis. Prior to implementation of the measure, these personnel were to participate in field exercises.

In accordance with local conditions these field exercises were conducted within the Luftwaffe Administrative Area Commands at the posts of antiaircraft artillery, air signal corps, and air units, following which the personnel involved were given reserve officer status in the antiaircraft artillery or air signal arm.

In each Luftwaffe Administrative Area Command Headquarters the aircraft reporting staff section was expanded to a branch. In major air defense areas these branches established subsections as aircraft reporting staff sections (Stabsoffiziere Flum).

These subsections commenced functioning in the summer of 1936, their first act being to call up all voluntary air observation personnel within their several areas for reserve personnel exercises, after which they were given a short term of military training and aircraft reporting instruction, were issued military uniform and, after the exercises were awarded reserve status in the Luftwaffe and at the same time given appropriate military ranks.

Further training for the commanders of aircraft reporting detachments from then on was handled by the aircraft reporting subsections.

Further large-scale Luftwaffen exercises were then conducted to check cooperation between the aircraft reporting service and the fighter and antiaircraft artillery forces in practice.[41]

On the whole the Luftwaffe Command realized the high importance of a well organized aircraft reporting service and promoted the development of the service energetically.

Development of the Air Raid Precaution System

Governmental responsibility in the field of air raid precaution services was established in the Reich Air Raid Protection Law (Reichsluftschutzgesetz) of 26 June 1935.[42]

It remained a responsibility of the Reich Minister for Aviation to issue directives for measures of passive air raid protection to the Ministries of Interior of the various States for the civil air raid protection service and to the various units concerned for troops

troops air raid protection.

An institution was established, the Reich Institution for Air Raid Protection (Reichsanstalt fuer Luftschutz), which dealt with all problems of passive air raid protection and also gave practical instruction on the various subjects involved in special courses.

In the field of camouflage and concealment serious efforts were still made to establish installations of the Luftwaffe in regions where they would be hard to find through air observation.

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41. Source 7.

42. Source 9.

This was particularly so in the case of ammunition depots. However, it was clear that there was no possibility to keep the peacetime garrisons of the air units a complete secret or to conceal them by means of camouflage, so that it had to be assumed that their locations would become known to foreign powers.

These considerations, coupled with tactical reasons, resulted in basically new methods of concealment to be adopted in the event of war, the establishment of tactical bases.[43]

Great importance was attached to this measure. In line with the German concept of concentrated surprise attacks against hostile air forces and their ground organization in the event of war, the safest method to counter adoption of the same tactics by an enemy appeared to be the movement, in the event of war, of the threatened air units from their internationally known bases to tactical bases in localities kept a strict secret.

In this way, if the enemy should act in a amnner similar to the German concept, his first attacks directed against the peacetime ground organization would strike empty airfields and the german units in the prepared tactical bases would remain intact to carry out the prepplanned strategic operations.

For these reasons the tactical bases consisted practically of only take-off and landing strips on natural terrain prepared for the purpose through removal of any vegetation and, if

43. Source 25.

necessary, through drainage and general levelling operations.

Whenever possible the erection of permanent installations at such tactical bases was avoided. When unavoidable, the installations were camouflaged as farm buildings. All preparations were made for the immediate connection with signal communications networks.

The equipment of all air units for actual combat employment was such that they were independent to a large extent of permanent installations.

The program initiated in 1935 provided for a number of these tactical bases for each bomber unit, and for field landing strips for fighter and reconnaissance units. In most cases the units themselves were assigned the responsibility for the reconnoitering of suitable sites. The purpose here, both for bomber and fighter forces, was to create the possibility for a concentration of units from all parts of Germany at particularly threatened points.[44]

Material progress was made in 1935-36 in the field of smoke screening for the purpose of concealing particularly important targets.

In cooperation with the Reich Institute for Air Raid Protection the first motorized smoke screening unit was established for tactical field missions.

The unit was established as part of the Technical Auxiliary

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44. Source 3.

Service just being organized and initially comprised 4 smoke-screening platoons, each with 4 trucks equipped for smoke screening of the barrel type. The method used was that of chemical spraying, and the apparatus could be serviced on the trucks or on the ground.[45]

SUMMARY

In summarizing developments towards the implementation of the concepts established in 1935 concerning measures of air defense it can be satted as follows:

1. In the build up of air forces, planning still provided for main emphasis on the bomber arm. The introduction of dive bombing further slowed down development of the fighter arm.

2. The antiaircraft artillery, as the arm designed to carry the main burden in air defense was about doubled in strength in 1936.

3. Energetic measures to further develop the Reich aircraft reporting services continued, and the service was given a military organization of the militia type. For mobile action a beginning was made at establishing regular motorized aircraft reporting companies, as part of the troops aircraft reporting service; this insured that, in the event of war, territories entered by German forces could be linked up promptly with the system in the Zone of Interior

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45. Source 37.

4. In all fields of passive air defense considerable progress was made in consequence of a clear realization of the significance of the subject.

Withthe establishment of a Reich Institute for Air Defense an agency was created which brought about the centralization of the intellectual, creative forces in all problems connected with air defense.

The factor which led to a sudden impetus in the development of the hitherto neglected fighter arm was of a Political nature: The occupation of the Rhineland by German forces.

OCCUPATION OF THE RHINELAND BY GERMAN FORCES IN 1936

The orders issued by the Commander in Chief of the Wehrmacht on 2 March 1936 concerning the occupation of the Rhineland specified as follows:

1. The occupation of the Rhineland will be carried out as a peaceful action involving the transfer of units to their future garrisons there.

2. Only in the event of hostile infringements of the border of an offensive nature will action be taken in line with the assembly and combat directives.

The Reich Minister for Aviation and Commander in Chief of the Luftwaffe will transfer one fighter wing to Cologne and one to the Koblenz area, besides transferring antiaircraft

artillery elements to stations within or near those cities along the lower and middle reaches of the Rhine River in which important bridges were located.

In the realization that, if the Western Powers applied military sanctions against Germany involving operations all along the Rhine, the operable air defense weapons currently available in the form of fighters and antiaircraft artillery would be inadequate to meet the threat, the fighter arm was viewed as far more important than had been the case formerly.

It was the only field in which the available forces could be reinforced quickly by pressing every available plane and every trained fighter pilot into service. The only source from which such planes and such pilots could be taken was the fighter school at Schleissheim.

To the complete surprise of all concerned, the fighter school was closed in the early days of March. The instructor crews and advanced trainees plus all serviceable aircraft of the Ar-65 and He51 types were used to reinforce Fighter Wing Richthofe. In this way 1 fighter and 1 dive-bomber group were formed. The latter received the official designation of 1st Group, 165th Dive-Bomber Group and was assigned to Kitzingen as its garrison. However, on 7 March 1936 two of its squadrons were moved to Frankfurt and one to Mannheim, where the group was to operate as a fighter group in defense of the middle reaches of the Rhine.

46. Sources 26, 515.

The other group was designated as the 1st Group, 134th Fighter Wing; two of its squadrons were moved to the Cologne airfield and the other squadron to the Duesseldorf airfield.[47]

The Commander of Fighter Group Doeberitz, Lieutenant Colonel von Doering, received instructions to organize the 134th Fighter Wing, with a strength of three groups immediately with the mission of defending the Rhein-Ruhr region. Within three months the wing was established.

At the same time the fighter defenses in the Berlin-Central Germany area were reinforced by an additional fighter group based at Bernburg.

The remarkable feature about the events just described is that the fighter units moved into the Rhineland areas had more of an apparent than real combat value. Many of the aircraft coming from training installations had no weapons or lacked the necessary ammunition belts. These units therefore would have been unable to counter any serious air threat.[48]

FIGHTER-BOMBER RATIOS IN 1936

In spite of this sudden expansion of the fighter arm, achieved at the expense of the only existing school for fighter pilots, the ratio of bombers to fighters in 1936 remained clearly in favor of the bomber arm, including fighter bombers.

On 1 June 1936 the following units existed:

Bomber units: 5 wings with 15 groups

Dive-bomber units: 1 wing with 3 groups

Fighter units : 2 wings with 7 groups.

The ratio of bombers to fighters was thus almost 1:3.[48a]

OPERATIONS IN SPAIN IN 1936

However, something more was to happen in 1936 that was to have a decisive influence on the shaping of air defense principles and planning in general and on the development of the fighter and antiaircraft artillery arms in particular:

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48. Source 3.

48a. Sources 18, 23.

the dispatch of forces of the Luftwaffe to support General Franco in the Spanish Civil War.

These operations opened in the summer of 1936 with the dispatch of a unit of Ju-52s, armed and equipped as bombers, for the air-transport of Moroccan troops for General Franco from Northern Africa to the Spanish mainland. The force thus dispatched also included a few He-51 fighters and 20-mm antiaircraft artillery guns to protect the transport units.

This forex was followed in November of the same year by a provisionally organized fighter group, equipped with Ju 88 planes and a battery of 88-mm antiaircraft guns. The fighter group was designated the J-88 Fighter Group and the antiaircraft artillery forces were organized in a nine-gun battalion designated the F-88 Battalion[49]

The influence which these operations were to have on the ruling views and plans in the subject of air defense will be treated in greater detail later in this study.[49]

COMMAND ORGANIZATION IN THE AIR DEFENSE SYSTEM

In an examination of the problem of the existing views concerning the command system and the chains of command in the air defense forces in 1935, the following thoughts are found established, in their first version, in the manual on the conduct of air operations. Paragraph 73 of that manual prescribes as follows:

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49. Sources 18, 27.

As a rule the Commander in Chief of the Luftwaffe will assign responsibility for the conduct of offensive air operations and air reconnaissance to field commanders of the Luftwaffe, who at the same time will direct defensive operations within their command zones.

For the execution of major offensive operations these field commanders will be assigned higher level unit commanders, for the execution of defense missions regional antiaircraft artillery commanders.

The term "field commanders of the Luftwaffe" (Kommandierende Generale der Luftwaffe) must be understood here to mean air district commanders. Paragraph 246 of the manual sets forth:

The local field commander of the Luftwaffe is responsible for the defense of his command zone.

Paragraph 247 continues:

Pursuant to directives from the Commander in Chief of the Luftwaffe and with due regard to the current situation, he will regulate the chains of command and direct coordination of the efforts of the defensive forces (antiaircraft artillery and fighter units), the aircraft reporting services, and the air raid warning services, as well as civil air defense services allocated to him.

As previously explained above, the creation of a uniform

top level command within each air district for attack and defense, made possible the flexible employment of the fighter arm for either purpose as the current situation required.

The fact that the fighter forces, as an integral part of the air forces, were placed under senior air unit commanders implied however, that the fighter and antiaircraft artillery forces in the execution of air defense missions were directed by two different command headquarters, the senior air unit commanders and the senior antiaircraft artillery commanders of the various air districts. Coordination of their efforts was only possible at

the next higher level of command, the air district commands. The same applies to the operations of the aircraft reporting and air raid warning services as well as those of the civil air defense organization, which were controlled directly by the air district commands.

The views held in 1935 concerning the proper chains of command for fighter and antiaircraft artillery forces assigned for missions of air defense within the zones of operations of the Army still differed widely from later views.

In its first version the manual THE CONDUCT OF AIR OPERATIONS states expressly that such forces as a rule must be placed under Army control. This provision is contained in Paragraph 130 of the manual.

Paragraph 131 goes even farther, stating that fighter forces intended to render direct support in attack and defense operations of the Army as a rule should be also placed under Army command.

Paragraph 132 even provides for the release of relatively large forces of the Luftwaffe to the Army when necessary by placing senior regional air and antiaircraft artillery commanders with their headquarters and forces under the Commander in Chief of the Army or under a field army.

It is evident that such views were still an expression of the views held in World War I in that the operational zones of

the Army were still considered as the Army's exclusive domain, while air operations would take place almost exclusively in the front areas.

It was only in later amendments to the manual that a clear line of thought was established in that forces of the Luftwaffe were to remain under the Commander in Chief of the Luftwaffe no matter in what type of operations they were employed.

These changes will be treated in greater detail later in the present study.[50]

The essential condition for successful operations of the forces of air defense was a clear interpretation of the current air situation.

To achieve this end the manual states the following views and directives:

In Section III, dealing with the subject of reconnaissance the manual prescribes

Air reconnaissance

Aircraft reporting services

Radio and telephone intercept services

Interchange of intelligence information.

Paragraph 82 prescribes that the result obtained by all of these means of intelligence will be processed at the aircraft reporting centers at air district headquarters to give a clear

50. Source 28.

picture of the current air situation.

Paragraph 92 also draws attention to the possibility of intensifying air observation over friendly territories through the employment of air observation planes for the purpose, something that was done later in the war, ans attained some degree of importance.

Paragraph 100 mentions the highly important mission of the radio intercept services for the compilation of a clear picture of the current air situation for use both in the conduct of strategid air warfare and for air defense purposes, as the manual puts it

> By monitoring enemy radio communications for....approach and return routes of enemy bomber forces....

In summarizing it can be said that as early as in 1935 the Luftwaffe Command held very up-to-date views on all means required and possible for the gathering of intelligence information for the compilation of the air situation report.

The "electric eye" which was later to replace the imperfect human vision with such decisive results was in the initial stages of development in 1935. However, it was not the Luftwaffe but the Navy which took the initiative in this field by instructing the firm of GEMA already in the early 1930s to develop an instrument of this type specifically for naval purposes.[51]

51. Source 22.

The radio intercept service was a branch under the Chief Signal Officer in the Office of the Commander in Chief of the Luftwaffe, designed initially to transmit to all interested headquarters all results obtained by its field agencies after they had been checked in the central processing station in the Office of the Commander in Chief of the Luftwaffe.

The time lag which necessarily resulted under this system limited the value of the organization as an agency for the procurement of intelligence information to be used in compiling the current air situation so seriously that it was no direct support in air defense until the system was changed in 1943 as a result of the critical situation then existing.

It can thus be stated here that, in practical implementation, the clear concepts which existed in this field failed to materialize through organization of the theories involved.

THE MISSION OF AIR DEFENSE AS DEFINED BY THE MANUAL "THE CONDUCT OF AIR OPERATIONS"[52]

Section VI of the manual established the views ruling in the Luftwaffe Command on the targets to be achieved in the mission of air defense.

Paragraph 105 points out that even in the event of purposefully conducted strategic air warfare against the hostile offensive air forces it is to be assumed that hostile air attack will still

have to be taken into account and that therefore, besides the mission of air warfare over enemy territory there would also be a concurrent mission of combat, by antiaircraft artillery and fighter units, against enemy forces over German territory.

The basic concept is clearly revealed in Paragraph 155, as follows:

> The organization of the defense evolves logically from the principles for the attack.

Accordingly, the nature and scope of protection described as necessary for targets in the various paragraphs of this chapter are characterized by a connection with the envisaged targets of German strategic air warfare. These are listed in the following order of importance:

Sources of electricity and other power

Industrial areas

Port installations and cargo vessels

Electric power stations

Railroads and other communication channels

Military replacement centers.

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52. Sources 3, 29.

In this connection much space is devoted in the chapter to the problems involved in the protection of large residential center and the vitally important installations for military production connected with them and emphasis is placed on the significance of civil air defense measures extending even as far as the evacuation of particularly endangered residential centers.

It is noteworthy that, even in spite of the high appraisal of the repelling effects of antiaircraft artillery fire in 1935, Paragraph 180 contains the following passages:

> Within loading and unloading areas the troops must as far as possible protect themselves.
>
> If an area is particularly endangered its defense by fighter forces appears to be indicated.

From this it is obvious that the flexibility of the fighter arm, which was far superior to that of the antiaircraft artillery forces, was recognized clearly as an advantage for defensive missions of limited duration.

THE EXECUTION OF AIR DEFENSE MISSIONS ACCORDING TO THE MANUAL ON THE CONDUCT OF AIR OPERATIONS

Section IV of the manual on the conduct of air operations gives information on the views of the Luftwaffe Command as to the manner in which air defense missions should be executed.

Paragraph 248 points out that it is not possible to provide complete protection for the entire area involved, and that

also in the field of air defense the principle of power concentratio is applicable. Wherever these considerations make active defense by fighter and antiaircraft artillery forces impossible, particular significance attaches to the measures of passive air defense.

Paragraph 249 formulates the principle that large sized contiguous areas requiring protection must be considered as homogeneous air defense areas.

Paragraph 250 states the requirement that in such areas the assigned fighter and antiaircraft artillery forces must be placed under a unified command.

This requirement was put into effect only at a later juncture, however, when on 1 August 1938 the Air District Command were given command authority not only over the antiaircraft artillery but also over the fighter forces assigned to their areas. At the same time the establishment of Air Defense Area Commandants provided a unified command to control the operations of fighter and antiaircraft artillery forces, a measure which did not prove satisfactory, as will be shown later in the present study.[53]

The same paragraph in dealing with the fighter arm emphasizes that fighter units must be allowed the greatest possible measure of independence. This independence must find expression in the form of missions assigned "without restricting the unnecessaryil or rigidly defining their areas of operations."

53. Source 8.

This regulation assigned to the fighter forces full responsibility for operations within the scope of the general missions assigned them by the air region commands or, from 1 August 1938 on, by the Air District Commands.

As a rule the missions thus assigned contained merely the requirement to prevent enemy air attacks and reconnaissance within a specified area.

It was thus a responsibility of the fighter unit concerned to make all preparations necessaryfor an appraisal of the current air situation and for the direction of its own operations.

These views stemmed from the very sound realization that, in view of the short time-in-air capacities of fighters, only the unit commander who was fully familiar with the pecularities of his own unit could achieve the most effective results in its operations.

Here it was the mission of the superior headquarters to furnish the ffghter unit concerned a clear cut mission when the situation was unclear or when a number of enemy air forces were reported approaching.

Paragraph 253 reveals that as far back as in 1935-36 very definits views existed on the employment of the fighter arm to also prevent enemy air forces from penetrating at night.

According to what is said in the paragraph specific areas were to be defined as night fighter areas, in order to prevent

night fighter and antiaircraft artillery forces from interfering with each others operations.

In such areas special searchlight units were to be emplaced to support night fighter action.

This shows the intention to insure that the antiaircraft guns were not be limited in their action within their zones of effective fire, and calls for a system in which the night-fighter zone would be forward of the antiaircraft artillery zone.

Combat directives are described in great detail for an air defense area in Paragraphs 258-280.

Paragraph 259 again stresses the necessity to concentrate and firmly control air defense units at important defense targets to form air defense groupments, consisting only of antiaircraft

units or, in the case of composite air defense groups, of anti-aircraft artillery and fighter units.

This was intended to insure a uniform interpretation of the air situationwhich would enable a single controlling agency to decide on the combat action to be taken and to issue the necessary orders implementing such decision.

Paragraph 260, however, provides for the necessary flexibility required in air defense:

> The larger andmore composite the assigned air defense forces are, and the wider the area in which they are committed, the more it will become necessary to direct their operations through mission assignment rather than through direct orders. The significance of the mission assignment or directive is that it states the purpose to be achieved in an action but leaves it to the unit commander assigned the mission to decide on the timing, nature, and scope of the action to be taken.

Paragraph 265 formulates the target of air defense operations concisely and clearly:

> Forces will be so committed that an enemy force can be intercepted even before reaching the air defense area and after entering it as well as during his bombing attack can be kept under attack.
>
> When the target area is far in the friendly rear fighter [illegible]

forces will be permanently stationed or temporarily concentrated far forward of the area to be protected.

If the air defense area is close to enemy territory, the difficulties of fighter defense will increase in proportion to the speed of the enemy. In such cases fighters usually will only be able to intercept the enemy over the target area and must be so based that that they can engage the enemy from favorable initial positions.

It is obvious that the problematical issued raised in the last sentence above were due to the vulnerable geographical location of the industrial regions of western Germany.

If an enemy bomber force were to approach at high altitudes it would be difficult for fighters to reach favorable combat altitudes flying towards the enemy.

Another factor was the short time available for an interpretation of the situation, for operational decisions, and for the take off of the inteceptors. This time was acutely short because of the small depth of the forward reporting area west of the Rhine River. and would never have sufficed to enable the fighters to intercept the enemy before arrival over the air defense areas of western Germany, the Ruhr region and the regions of Frankfurt and Mannheim. It was considered that this risk could be accepted providing the fighters could attack "from a favorable initial

position! This means that they must be able to attack in closed formation and with the sun in their rear.

This regulation thus serves to prevent an overhasty and scattered commitment of forces which might result from the desire even in areas near the front to meet the requirement of combating the enemy with fighter forces before the enemy could reach the air defense areas, without allowing the fighters thus committed time to first gain favorable positions.

Paragraph 266 formulates specific principles governing the effectiveness of antiaircraft artillery operations.

Regarding the selection of firing positions for the antiaircraft artillery the requirement is stated that the enemy must be subjected to fire before reaching the bomb run zone, meaning the area between the moment of bomb release and the target, and that defensive fire must be maintained throughout the bombing run even down to the lowest altitudes.

In such operations searchlight units had the mission of lighting up the enemy at night in order to facilitate accurate antiaircraft fire as well as night fighter defensive action.

Air barrages were to be established outside of the bombing run zones.

For integrated fighter-antiaircraft artillery action the necessity is again stressed to insure that each arm is assigned

ist separate area of operations.at night.

The reason for this requirement was the difficulty to differentiate between hostile and friendly aircraft at night. During daylight the difference in size already made an accurate determination of hostile or friendly aircraft easily possible, but at night identification was problematical when the antiaircraft artillery units had to rely exclusively on their sound locators because of unfavorable conditions for searchlight operations.

Another reason was that, in order to obtain results at all, the antiaircraft guns had to go into action the moment a plane was lit up by searchlights, leaving no time to determine whether the plane was a friendly or a hostile unit, which was more difficult at night, even with the aid of searchlights, than during daylight.

Paragraph 207 reiterates the necessity to allow the fighter unit commander as much freedom of action as possible in order to avoid loss of time in the commitment of fighters, since success or failure hinged upon minutes.

However, it is pointed out that this did not apply to the rigid restriction of foghter forces to the area they were assigned to defend. This restriction is stated as a categorical requirement and implies nothing more nor less than that fighter units were to take no action whatever against enemy units which were

not an immediate threat to the areas they were to defend.

This illustrates very clearly the concept of direct and specific target defense. The important point here is not merely to shoot down enemy bombers no matter where they can be intercepted, but to be prepared under any circumstances for an attack against the enemy bomber force if it threatened the target to be defended.

It was only realized during the war by both contending sides that the first requirement in air defense was to seize upon every possible opportunity to inflict such heavy losses on the enemy that in the long run the losses thus suffered proved out of proportion to the results which might be obtained.

Paragraph 273 contains instructions for cooperation between fighter and antiaircraft artillery forces.

The view is expressed that

> As a rule, simultaneous action by antiaircraft artillery and fighter forces against one and the same attacking enemy force will not be possible because of the danger of damage by friendly antiaircraft fire to which the friendly fighters would be exposed.

The instructions go on to state that coordinated action must be so arranged that the fighter forces will intercept the enemy force before it reaches the zone of antiaircraft artillery fire.

Here again the purpose of this method is to inhibit dispersal of the enemy formation and thus insure favorable conditions for effective antiaircraft artillery fire.

This view obviously is deduced from the principles of the German Command for bombing tactics, namely that a bomber force under fighter attack must go into close formation to increase the defensive fire power of its mounted weapons.

That fighter attacks are more likely to result in the dispersal of an attacking bomber force was only discovered later through practical experience.

Paragraph 273 continues that it must be left for the commander of the fighter unit to decide whether to continue his ation against an enemy force, once that action has started, even after entering the zone of effective antiaircraft fire, or to leave further action to the antiaircraft artillery in order, as set forth in Paragraphs 274 and 275, to resume the fighter action after the enemy force again leaves the antiaircraft fire zone or to cut off its retreat.

It was expected that particularly favorable conditions for fighter action would result because of the assumption that the effects of antiaircraft fire would scatter the enemy force.

This is characteristic of the view current at the time that a bomber force could reduce the effectiveness of antiaircraft fire through dispersal and of fighter attack through going into close formation.

Here again, so far as antiaircraft fire was concerned, it was only the actual experiencedgained by the Allies during the war that led to a diametrically opposed view.[54]

Paragraph 276 points out with particular emphasis the difficulties involved in cooperation between fighter and antiaircraft artillery forces at night. It is stressed once again that a clearly defined separation of their zones of action as a rule will be necessary.

Paragraph 276 states as a special mission of air defense the absolute necessity to extinguish before dark any fires which may be caused in daylight air attacks in order not to make orientation toeasy for night attacks.

In summarizing it can be said that the views held in 1935-36 on the mission of air defense and its execution were, in general, consistent with the requirements of modern air warfare.

The instructions on the subject contained in the manual on the conduct of air operations are both clear and flexible and in every way appropriate to be understood by the troops as an intellectual concept and accepted by them as a guide for their thought and action

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54. Source 30.

This was all the more important in view of the fact that the Luftwaffe in 1935 commenced training its own officer candidates in its air war colleges, where the manual THE CONDUCT OF AIR OPERATIONS was used a the foundation for basic tarining and instruction.

The concepts propounded in the manual became the starting point for other manuals and regulations issued by the Luftwaffe regulating all fields of endeavor in air warfare.

For the next few years the regulations contained in the manual remained, without any basic changes as the governing principles.

The few fundamental changes which were introduce were in direct connection with changes in the whole structure of the Luftwaffe.

With the directive of 20 March 1937 establishing the Wehrmacht Operations Staff, a joint operations staff for all three branches of the military services, revised versions of certain paragraph were published, as follows ;

Paragraph 73 was adapted to the requirements of the organizational change of 1 August 1938, when the mission of air defense was assigned to the Air District Commander, who was given command ofer the fighter forces within his command zone and, in particularly important air defense areas, over the senior antiaircraft artillery commander in order to insure uniform command of the antiaircraft artillery forces in the areas involved.

Paragraph 121 in its new version restricts the scope of

command control by the Army over the Luftwaffe units allocated to it. According to the new text, the forces envisaged for assignment were

> Reconnaissance and antiaircraft artillery units, aircraft reporting companies, and if the situation in ground operations required and the overall military situation permitted, fighter units.

To insure proper use of these forces, however, the same paragraph stipulates that they will be under the command authority of the tactical air support commanders attached to headquarters of field armies or army groups and of the Luftwaffe General with the Commander in Chief of the Army. Besides exercising command control as commanders of the units involved, these officers at the same time were to act as advisors to the respective army headquarters on the tactical use of these Luftwaffe units.

The assignment of these tactical air support commands under army headquarters was, however, only for tactical purposes. In every other respect they remained under the control of their parent units.

Paragraph 122 delimits the authority and responsibilities of the Army in matters of air defense within the zones of operations of the Army insofar as the appropriate army commands were now responsible only for the protection of the troops within their command zones (including allocated Luftwaffe units), and the

supply and other logistical installations and facilities in their rear areas.

Particular stress is on the importance of these rear areas as the foremost security lines for air defense of the entire Reich territories.

On the other hand, responsibility for the protection of all Luftwaffe units and installations of vital military importance is assigned to the Commander in Chief of the Luftwaffe even in the zones of operations of the Army if these Luftwaffe units and installations are not of direct significance for the Army.

Paragraph 123 lays down emphatically that all elements of the aircraft reporting services within the operational zones of the Army are to remain assigned to the appropriate air district commands.

Paragraph 124 establishes the possibility for the Commander in Chief of the Luftwaffe to employ in air defense missions and to secure air superiority over the areas of combat on the ground any air units stationed within or near the Army zones of operations for the conduct of strategic warfare.

This is a sign of the views which had been prevalent formerly on the dual use of the fighter arm--for attack and for defense missions, but more specifically formulated than had been the case before. One noticeable feature here is that such units in no case are to be placed under army command through the tactical air support commands attached to army or army group headquarters.

Paragraph 125 generally clarifies views on the operations of the Luftwaffe in direct support of Army operations to the effect that such operations are provided for only during battles of decisive importance on the ground and only on orders from the Commander in Chief of the Luftwaffe.

Paragraphs 127 and 128 in the revised version once again set out precisely the basic concepts on the missions of the Luftwaffe

The paragraphs express very clearly that commitment of Luftwaffe forces in direct support of the Army is only a subsidiary mission to be undertaken in exceptional circumstances, and that the conduct of strategic air warfare is the primary purpose of air power, in which the choice for the right timing of such stra-

strategic operations against long-range objectives will decide their impact on the operations of the Army on the ground.

This also applies largely to the operations of the defensive forces in the form of fighter and antiaircraft artillery units.

To secure the conduct of strategic air warfare by the bomber arm, the commitment of fighters and antiaircraft artillery is necessary to protect the bomber forces in the air and in their bases.

These concepts already reveal a tendency, particularly so far as the fighter arm is concerned, to change its character as a weapon of defense more to that of a weapon of offense. [55]

LESSONS LEARNED FROM OPERATIONS IN SPAIN

The experience gained in the employment of Luftwaffe units in the Spanish Civil War had an important influence on this change in the mission of defensive forces as compared with the concepts of 1935, which had been to a large extent the outcome of the practices and views of World War I.

The circumstances involved will now be discussed.

The first contingent of air forces dispatched to support General Franco at his request in July 1936 had the exclusive mission of making it possible to transport from Spanish Morocco to the Spanish mainland the troops stationed there, who were loyal to Franco since seaborne transportation appeared impossible after the bulk of the Spanish naval forces had gone over to the opposing side.

55. Sources 28, 288.

The force thus dispatched consisted of twenty Ju-52 aircraft, unarmed, transport units, manned by civilian pilots. However, officers from the bomber arm were included as co-pilots, and an officer from the bomber was in command of the entire force.

Six armed fighter planes of the He-51 type and twenty 20-mm antiaircraft guns were included to provide protection for the transport planes.

This was the first combat mission assigned fighter and antiaircraft artillery units in the operational sense. Initially, the mission assigned was strictly a defensive one, meaning that the forces were not to seek combat but exclusively to prevent and repel attacks against the transport planes.

The transportation movements were carried out according to plans and without interference by air attack. The only interference and it was serious, was by fire from the antaircraft guns of the Red Spanish warships during the crossing from Tetuan to Sevilla. As a countermeasure the commander of the transport force reequipped his Ju-52 units to carry bombs and one morning attacked the Spanish Red armored cruiser Jaime I with 250 kilogram, or 550-pound bombs. The cruiser was struck by two of these bombs from an altitude of 1 650 feet and disappeared from the area of the Straits of Gibraltar It was the first bombing action of the new Luftwaffe in actual combat which produced noticeable effects.

This event had a most significant impact on German sentiments concerning the participation of German soldiers and the delivery of German weapons in the Spanish Civil War. Without it, German assistance might have ended with completion of the transport mission, in which 13 523 Morocan military personnel and roughly 600 000 pounds of materiel were flown into Spain, and after the Spanish Air Force, which had taken over the Ju-52 planes as bombers and the He-51 as fighters, failed to achieve any success. As it was, the commander of the German contingent was authorized to commit the air and antiaircraft artillery units, with his own German personnel, in combat missions.

Within a few days the He-51 fighter squadron shot down its first six enemy aircraft.[56] At this time the only fighters opposing them were Curtiss double-decker planes. The He-51 was easily superior to these in technical performances, but victory was usually due to the quality of the German personnel.

By November 1936 the fighter squadron was brought up to its full strength of fifteen aircraft. As required these were employed in low-altitude attacks against troops, or in escort missions protecting the Ju-52 bomber squadron. Because of the vast numerical superiority of the Red fighters,

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56. Source 31.

however, the situation became increasingly difficult and resulted in the loss of a number of excellent German officers from the fighter arm.

Efforts were first made to remedy the situation by increasing the numerical strength of the German force, and on 3 November 1936 t the Luftwaffe dispatched a complete group of He-51 fighters to Spain.[57]

By that time, however, the Reds had received a new fighter type from Russia. This was the Rata plane, modelled on the American Boeing fighter, a transition from the old double-decker type and with a retractable undercarriage. The flight properties of

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56. Source 31.

57. Source 32.

these new fighters were so far superior to those of the German He-51 that even the high quality of the German pilots could not compensate for the resultant disadvantages.

Difficulties increased steadily for the German fighters, and the Italian fighter group supporting Franco also found that its fiat double-decker model was no match for the new Red Rata model, so that it also was unable to relieve the situation.

In this air situation the Ju-52 bomber force also found itself in difficult circumstances. The protection afforded by escorting He-51 and Fiat units was inadequate, and this limited the opportunities for bombing operations considerably. The reputation of the Luftwaffe was seriously compromised even though the use of the He-51 fighters, no longer suitable for air combat, in low-level attacks against ground targets at the front still produced successful results which received due recognition.[58]

This critical situation confirmed what the German Air Command had already realized, namely, that

1. The He-51 and Ar-68 aircraft in service in the German front line fighter forces no longer met the requirements of modern air warfare.

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58. Source 33.

2. operational air warfare with bombers was impossible against an enemy with superiority in fighters. Alone, bombers with technical performances such as those of the Ju-52 model and armed with a few machine gunswere unable to carry on air warfare consonant with the theories expounded in the manual THE CONDUCT OF AIR OPERATIONS.

3. Against strong enemy fighter defenses bomber forces were unable to execute their offensive missions during daylight without protection by friendly fighters.

The experience thus gained contributed largely towards the steps taken to e pedite the serial production of modern types of aircraft for the Luftwaffe.

So far as fighters were concerned, it was the Bf-109 and the He-112, a model designed by Heinkel, which held out promise of considerable progress. Since Messerschmidt was ahead of Heinkel in the development of his model, the decision madx was in favor of the Bf-109.[59]

As early as in March 1937 two squadrons of the fighter group in Spain were reequipped with Bf-109 aircraft.[60]

The introduction of these new fighters resulted in immediate superiority over the Red fighter forces equipped with Curtiss and Rata planes. While the squadron still equipped with He-51 planes

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59. Source 34.

60. Sources 35, 36.

remained committed in low-altitude attack missions against ground targets the B-109 squadrons provided escort protection for the bombing forces besides achieving outstanding success in roving missions against the Red fighters.

In the spring of 1937 the bomber group in Spain also received modern aircraft of the He-111 type, so that it was in Spain that the modern form of air warfare was first waged, with fast medium sized bombers attacking under escort by up-to-date fighters far superior to the enemy fighters opposing them.

The nature of the whole Spanish Civil War was such, however, th that these operations nevertheless could not be described as strategic warfare in the sense propounded in 1936 in the manual on the conduct of air operations. The bombing attacks in Spain served primarily to break enemy resistance in the front areas and were thus classical examples of direct air support for the ground forces.

Nevertheless, the experience gained in these operations had a significant influence on basic German ideas concerning the missions and use of the fighter arm: it provided confirmation of indications already to be found in the manual on the conduct of air operations concerning the dual mission of the fighter arm in both offensive and defensive operations.

However, it was clear that the Bf-109, because of its short time-in-air capabilities of 45 minutes was not suitable to escort

bombing forces on strategic missions carrying them far inside enemy territory.

This realization gave added impulse to the development of the Bf-110 "heavy" twin-engine fighter for use as a pursuit plane and for escort purposes, with technical performances equal to those of the strategic bombers and the equivalent penetration range, as required by tye Luftwaffe General Staff as far back as in 1935 as a logical consequence of the ruling concepts of air warfare.[61]

Of the first influences which the experience gained by German air forces operating in Spain in 1936-37 on the German principles of air defense and planning the following can thus be said:

1. The German Air Command realized that the problem of air superiority was not primarily one of numerical strength but of the quality of the personnel and weapons in the arm.

2. Experience showed that the weapons fire of bomber aircraft was inadequate to defend it against faster enemy fighters , so that it required protection by friendly fighters when engaged in bombing missions over enemy territory during daylight.

3. The German Air Command realized that its fighter units, still equipped with He-51 and Ar-68 aircraft could only fulfill

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61. Source 25.

their part of the mission of air defense against the outdated bomber types still in use by the enemy.

For use in strategic air warfare the German fighter arm with its current equipment was unsuitable.

4. These realizations gave renewed impetus to the development of the modern types of fighter aircraft, the Bf-109 for air defense, and the Bf-110 for strategic missions, since it was clear that even a strong bomber arm could not operate with protection by modern fighters, without which the whole concept of strategic bombing would be endangered.

For the antiaircraft artillery arm German participation in the Spanish Civil War also brought decisively important realizations and at an early stage influenced the existing views on the value and combat capabilities of this weapon.

Simultaneously with the authorization to employ the Ju-52 bomber force and the He-51 fighter squadron in combat missions came the authorization, at the end of August 1936, to commit the antiaircraft artillery units in Spain, with a strength of twenty 20-mm guns, in active air defense. In Franco's northward drive, however, a new mission was soon to develop for the antiaircraft artillery.

Elements of the antiaircraft artillery force accompanied the National Spanish forces in their drive, their mission being to provide protection for the ground forces against air attack. Even during the advance already, numerous opportunities arose to commit the antiaircraft guns directly in ground combat against enemy pockets of resistance. The high velocity of fire and the excellent accuracy of fire by these guns earned the antiaircraft artillery arm its first laurels in action supporting the infantry advance.[62]

At the time when a heavy battery of 88-mm guns arrived to reinforce the antiaircraft unit in Spain, in September 1936,[63] a strong superiority of Red air power was already making itself felt during fighting in Madrid. Although at a disadvantage because of the fact that 50 percent of its personnel were untrained Spaniards, the newly arrived battery immediately took up the battle against the Martin bombers and Potez aircraft newly introduced by the Red side. The first successful operations of the battery, in which a number of Red aircraft were shot down, relieved the situation for the Nationalist side appreciably. Very soon the Red bombers found themselves compelled to do their bombing from the high altitude of 13 000 feet, and it was not long before attacking bombers turned tail and disappeared, when German antiaircraft artillery were on the scene, after the first few rounds had been fired.[64]

62. Source 38. 63. Source 39. 64. Source 40.

This proved clearly the effectiveness of the 88-mm antiaircraft gun as an air defense weapon, but at the same time it became clear in these operations that one battery was not enough, even on such a narrow frontage as was the case in the battles around Madrid, to appreciably reduce the threat of air attacks in any one sector.

The excellent results achieved by the antiaircraft artillery units had the result that as part of the general reinforcement in November 1936, the number of guns was also increased considerably. A complete new battalion of four 88-mm and two light 20-mm batteries was received and consolidated with the antiaircraft forces already in Spain to form Battalion F-88.[65]

Two heavy batteries were left behind to protect the air base at Sevilla, three heavy and two light batteries went into positions before Madrid.

Within a few weeks Red air superiority in the front areas and in the rear of the Nationalist forces was broken. No longer fully occupied with their air defense mission the batteries from then on were able to participate in a steadily increasing measure in ground combat, proving themselves an exceedingly effective weapon in support of infantry attacks against enemy pockets of resistance and particularly against tanks, which were appearing in increasing numbers on the Red side. Itwas found that the 88-mm gun, although developed for high angle fire from its mount,

65/ Source 41.

was also extremely accurate in flat trajectory fire and, because of its high muzzle velocity exceedingly useful against tanks owing to its high armor piercing quality and because it could be employed for such purposes without any changes to its mount.

It was in the winter of 1936-37 , when the situation was very critical for the National Spanish side, that the German antiaircraft distinguished itself particularly in both air defense and in ground combat.

This naturally could not fail to influence the intentions of the German Air Command concerning the capabilities of these weapons within the overall scope of the conduct of the war, a subject which will be reported on later in this study.

Another point which must be mentioned here is that the troops aircraft reporting service also gained valuable experience in operations in the Spanish Civil War.

The air signal battalion dispatched to Spain in November 1936 under the designation LN-88 included a motorized aircraft reporting company.[66]

This company was committed at the front in those sectors where a forward reporting or warning area was necessary for protection of the airfields on which air units of the Luftwaffe detachment in Spain, which had meanwhile been given the official designation of Condor Legion, were stationed.

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66. Source 41.

Owing to the very few wire communications lines available, particularly important experience was gained on operations relying exclusively on radio reporting. This experience confirmed the facts realized as far back as in 1935 that the existence of motorized aircraft reporting units organic to the Air Signal Corps were an indispensable requirement in times of war. This was so because the proper functioning of a reporting network relying only on radio reporting hinged upon the availability of regular personnel with thorough training and in constant practice in the technicalities of radio communications.

PLANS FOR THE BUILD UP OF AIR POWER IN 1936-37

The impact of the lessons learned in 1935-36 on Luftwaffe planning for the continued build up is obvious:

1. Plans provided for measures to double fighter strengths, just as was the case with the bomber arm, so that on 1 April 1937 the ratio of fighter to bomber groups was no longer 1:3 but 1:2.[67]

2. With recruits from the third draft, in October 1937, the antiaircraft artillery forces were to be doubled and another training regiment was to be established.

The capabilities of antiaircraft artillery in ground combat, as revealed in the Spanish Civil War, and the realization that the use of searchlights in concentrations of a

67. Source 23.

number of batteries held out better prospects of success in antiaircraft action furthermore led to the separation of the 150-cm searchlight batteries from the antiaircraft artillery battalions and their consolidation in searchlight battalions organic to antiaircraft artillery regiments.[66]

It can thus be seen that in planning for 1937 the fighter and antiaircraft artillery forces were placed on an equal footing with the bomber arm, which hitherto had been given particular emphasis.

GERMAN AIR DEFENSES IN 1937-38

Missions and Organization of the Air Defense Forces

By 1937 the doctrines of modern air warfare as established in the field manual THE CONDUCT OF AIR OPERATIONS had become the generally accepted concept in command circles of the Luftwaffe.

The basic views at the time are clearly illustrated by the trains of thought expounded by General Wilhelm Mayer, former Chief of the Operations Branch of the Luftwaffe High Command, in a study prepared in the autumn of 1937[69], from which the following passages are quoted:

> The missions of the Luftwaffe thus fall within the scope of this overall conduct of the war. They are of a defensive nature: Protection of the territories of Germany, including German forces operating on the ground, against air attack. They are therefore tied up with the following missions: Combat against the hostile air forces in enemy territory and disruption of the enemy conduct of operations and the logistical installations and facilities of the enemy. These latter tasks also can be described as the strategic missions of air power. Main emphasis is on them.
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> Concurrently, the Luftwaffe will assign elements to

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9. Source 42.

serve the Army and the Navy by providing direct tactical support in order to enable these branches of the armed forces to accomplish their missions.

Protection of German territories against air attack is primarily through direct defense by fighter forces and antiaircraft artillery, and indirectly through action by bomber forces....

A soundly organized and quickly functioning aircraft reporting service is of particular significance in the employment of fighter forces and effective antiaircraft artillery action.....

Just as the Army and the Navy not only engage in armed combat but also endeavor to keep losses to a minimum by means of protective cover and camouflage, special measures must be taken in the battle against an enemy air force to protect the population, factories, and other installations. The facilities for this purpose include

the air raid warning system to warn factory personnel and the population in general,

the security and auxiliary services, to prepare and put into effect the necessary technical measures,

organized self-protection for individual houses and apartments, and

the factory (passive) air defense system to protect the various factories and other installations.

These measures are consolidated in the inclusive designation 'Civil Air Defense.'

All of these measures are also a responsibility of the Reich Minister for Aviation and Commander in Chief of the Luftwaffe."

The ruling views of 1937 specifically on the subject of the air defense missions of the fighter and antiaircraft artillery arms is illustrated by a pamphlet entitled "Guide for Instruction on the Subject of Tactics in Air Service Schools" (Leitfaden fuer den Unterricht in der Taktik an den Luftkriegsschulen)[70] from which the following is quoted:

....

IV. Fighters.

Light Fighters. According to their missions, the fighter forces are organized in heavy and light fighter units.

The light fighter units stationed within or close to the zones of operations attack hostile bomber formations before they cross the front lines or after, and interfere with the operations of hostile reconnaissance aircraft and hostile fighter units over the zones of operations of the

Army and over coastal air defense areas.

In connection with decisively important combat operations of the Army they can be committed in low-level attacks against ground targets....

Light fighter units committed in locally restricted air defense missions in close cooperation with the antiaircraft artillery will prevent attacks by hostile units against the installations they are assigned to protect.

Generally speaking, antiaircraft artillery forces will be given priority of action within the zones of effective antiaircraft fire from the ground. However, if a fighter unit is engaged in a successful attack, the attack will be carried out to the end no matter what the circumstances might be. In such cases the antiaircraft artillery will direct fire only at hostile elements not under fighter attack.

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70. Source 43.