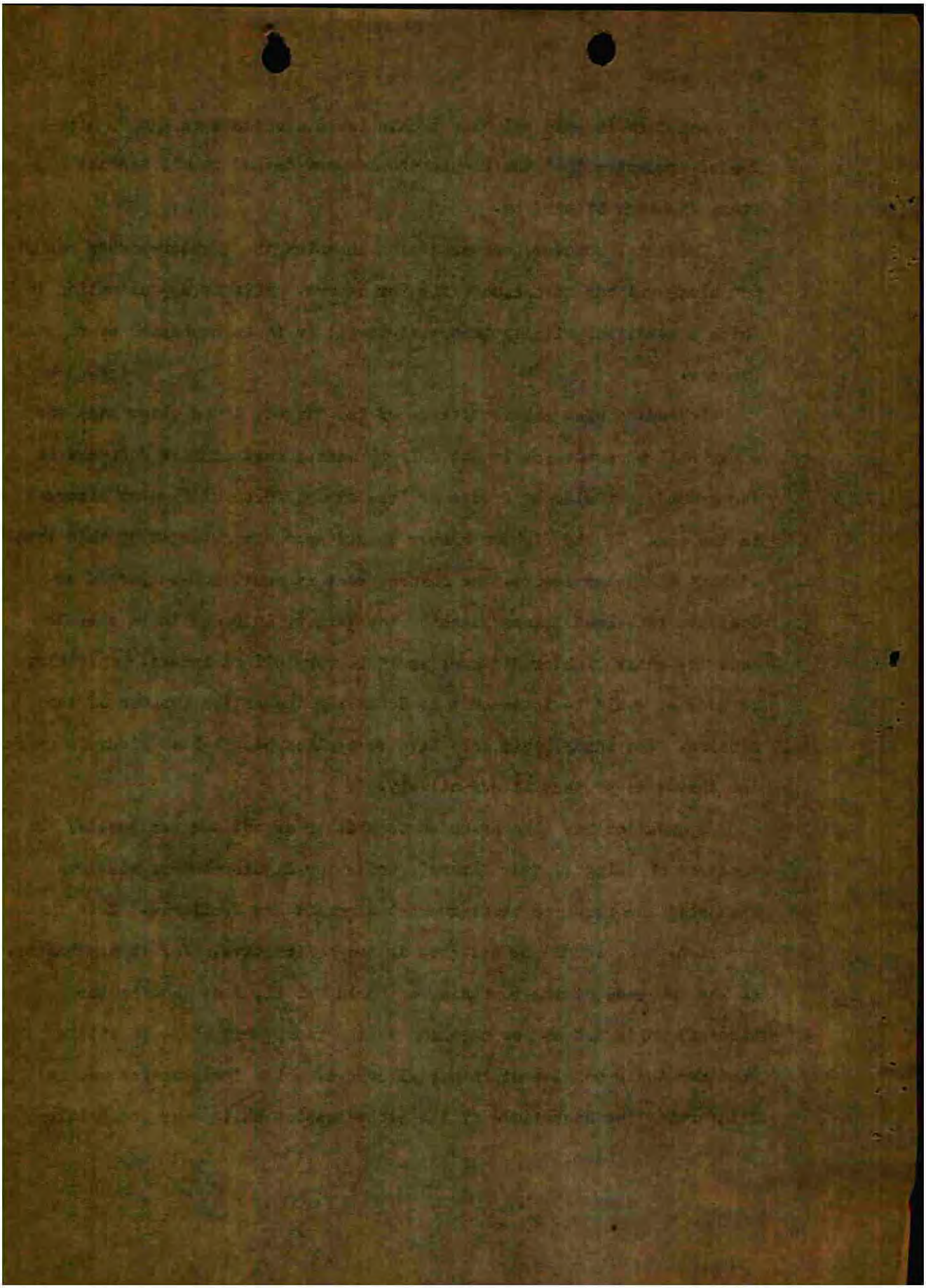
And this is precisely the incalculable advantage in the fighter-bomber concept - that the fighter-bomber can defend itself against enemy fighters if need be.

There is, however, one situation in which the fighter-bomber cannot get along without an adequate fighter escort. This is any situation in which a specific, vitally important target is to be bombarded by fighter-bombers.

Depending upon the importance of the target, it is clear that the enemy will have covered it not only by massed antiaircraft defenses on the ground, but also by a more or less strong force of fighter aircraft in the air. If the fighter-bomber should approach a target of this type without a fighter escort, the chances that it would not be forced to dump its bomb-load before reaching the target, in order to be able to meet the enemy fighter defense, would be very slight indeed. And this, of course, would be tantamount to defeating the entire purpose of the mission. The enemy would only have to station his fighter aircraft over the target to protect it effectively.

A question may also arise as to whether or not one can justify the practice of using fighter aircraft units for fighter-bomber missions even when the required close-support aircraft are available. This question, too, should be answered in the affirmative. For it may happen, as was the case at the beginning of World War II, that the fighter aircraft units are so far superior to the enemy that there is little need for their commitment in aerial combat, while their assistance in reinforcing the operations of the close-support units over the battle-



field would be of great value. In a case such as this it would be ridiculous to refuse, for reasons of principle, to employ the fighters as fighter-bombers.

5. The Development of the Fighter-Bomber, its Airborne Armament and Equipment.

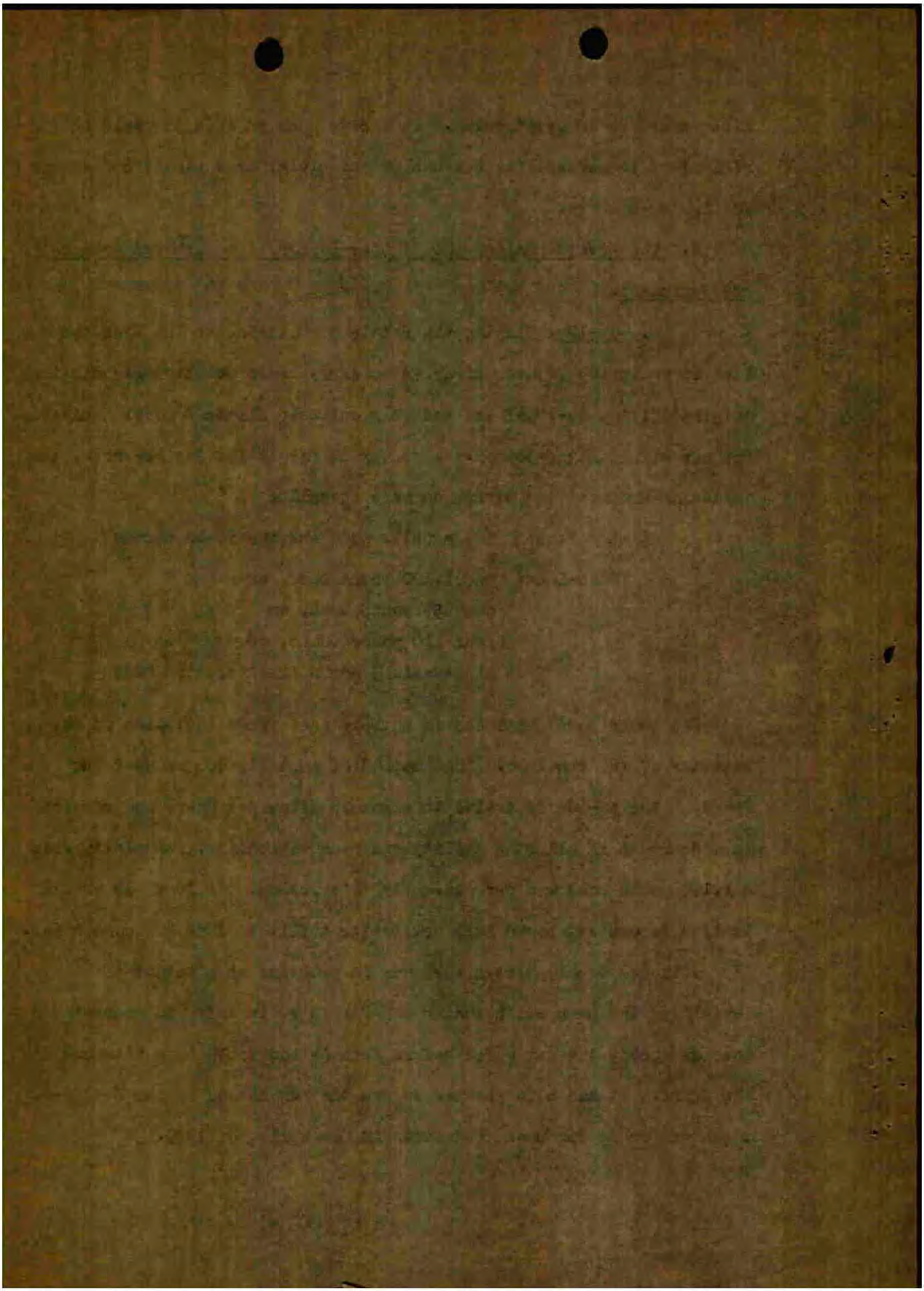
a. Me-109. During the Battle of Britain, at the time the idea of equipping fighter aircraft to carry bombs on strategic missions originated, the Me-109-E was the only suitable aircraft model available for use as a fighter-bomber. In order to fit it for its new role, the following armament and equipment were installed:

Armament: two machine-guns and two 20-mm cannon

Bomb-Load: one 1,100 pound bomb, or
one 550 pound bomb, or
four 110 pound bombs, or
ninety-six 5 pound fragmentation bombs

The bombs were suspended in bomb-release racks installed on the exterior of the fuselage. This method of installation reduced the speed of the Me-109 by twelve to eighteen miles per hour, and resulted in a decrease in climbing ability and maneuverability, especially when a 1,100 pound bomb was carried. For this reason, the load was usually limited to one 250 pound bomb or, better still, to four 50 pound bombs.

Although developmental work was in progress on a method of installing the bomb racks inside the fuselage, in order to prevent the loss of speed, the war ended before this method could be put to use at the front. It had been planned to use the new method in the Me-109-G, which was ready for mass production in the spring of 1943.



The Me-109 could be converted from a standard fighter to a fighter-bomber within forty-five minutes by experienced personnel.

b. FW-190. The FW-190 was actually more suitable as a fighter-bomber than the Me-109. However, it was not until 1943 that it became available for use as such in any great number.

Whereas one 1,100 pound bomb was the biggest load the Me-109 could be expected to carry, taking into account the resultant loss in performance, the FW-190 was able to carry a bomb of this size with practically no decrease in performance due to the fact that its engine was considerably more powerful.

The armament and bomb-load for the FW-190 were the same as for the Me-109.

With the exception of the so-called "smoke-throwers" (which were taken over by the Army) (210-mm), neither the Me-109 nor the FW-190 was ever equipped with airborne rockets for use against ground targets. By the time the war ended, developmental work in this direction was in progress, but had not reached the stage of practical application.

c. Me-110. As long as the Me-110 is viewed as a fighter aircraft, it must also be considered a fighter-bomber, and in fact it was employed as such during the Battle of Britain.

As a twin-engine, twin-seater day fighter, the Me-110 was naturally better suited to carrying a bomb-load than the smaller single-seater, single-engine fighters. It was capable of carrying two 1,100 pound bombs, or a pay-load of 2,200 pounds. If it had been a match for the enemy fighters after dropping its bombs, it would have been an

excellent fighter-bomber. Unfortunately, however, it was not a match for the enemy - it was too slow, too cumbersome, and too poor in climbing ability to hold its own against the enemy single-seater fighters.

It was, however, a very useful machine for employment as a pure fighter against enemy bomber aircraft, even against four-engine bombers, as its commitment in night fighter operations proved. By contrast, in daytime commitment as a fighter escort for our own bombers or as a fighter-bomber entrusted with the bombardment of ground targets, the Me-110 was far too vulnerable to attack from enemy day fighters. Because of its vulnerability it was withdrawn from operations over England in the fall of 1940 and was assigned to the night fighter forces, where it became the standard night fighter aircraft type.

d. Me-210 and Me-410. Since the history of both of these aircraft models is particularly enlightening in connection with the failure of Germany's air armament program, I have included as Appendix 4 the copy of a report by Colonel Greffrath, (Retired). This report, which has been assembled from documents on file in the Karlsruhe Document Collection, reveals with frightening clarity the confusion and incompetence existing on the part of top-level Luftwaffe leaders in developing a clear concept of their goals and in providing appropriate guidance for the air armament industry. This only goes to prove that a leader who is uncertain of what he wants and what is expected of him cannot be capable of effective leadership.

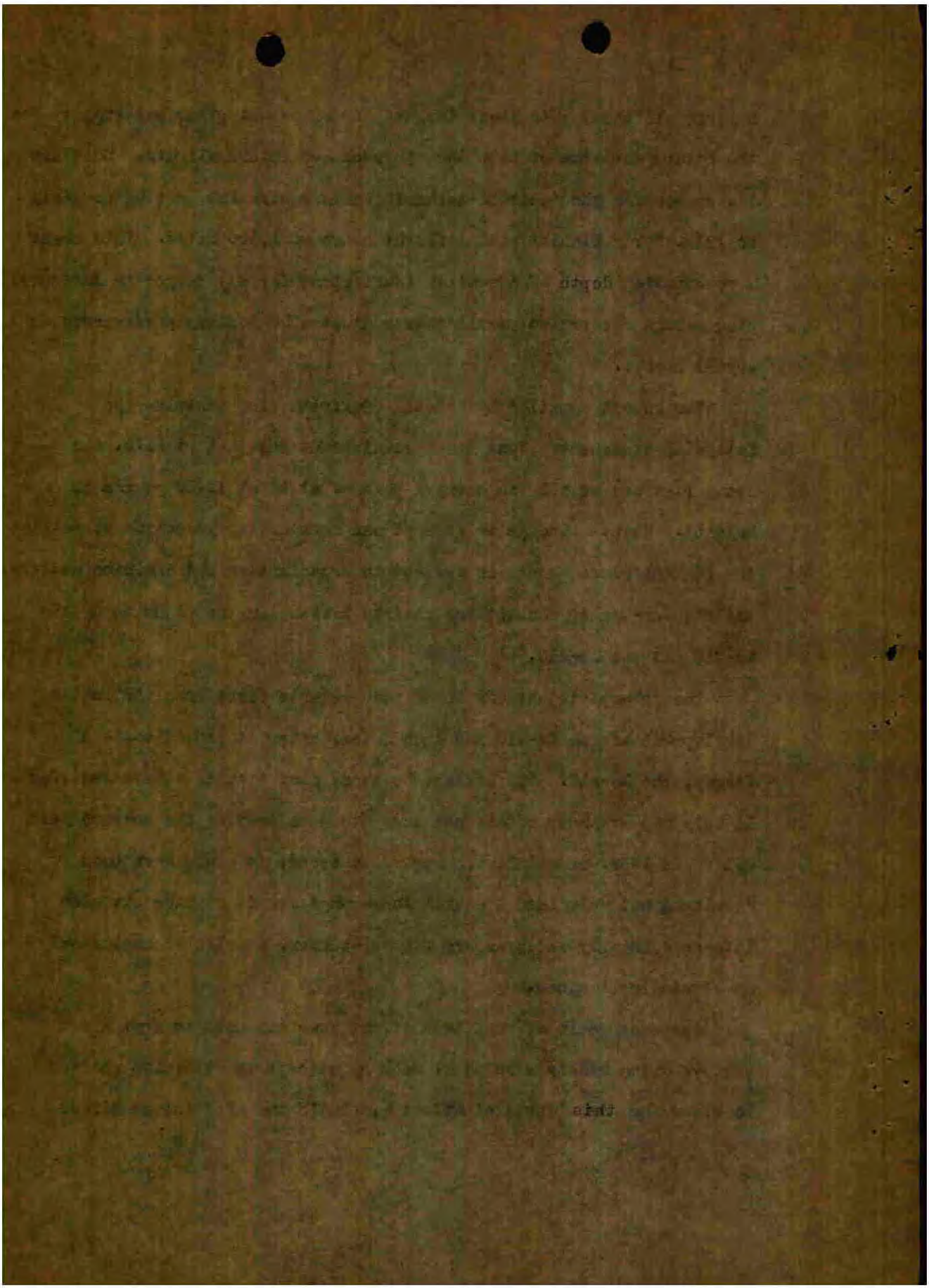
The Me-210 and Me-410 were designed to fill the need for a heavy fighter aircraft which would be capable of accompanying the German

bombers all the way to their targets and of assuring air superiority for the entire duration of both the approach and return flights. This was the reason for the tactical-technological requirement, set up as early as 1938, for a fighter with a flight range of 1,500 miles. This meant a penetration depth of 625 miles (sufficient for any target in England), plus enough reserve to permit thirty minutes of maximum performance in aerial combat.

The report compiled by Colonel Greffrath also contains the following statement: "One other requirement was that it (i.e. the heavy fighter) be able to carry a bomb of at least 1,100 pounds in weight". Thus, although no attempt was made during peacetime to develop the logical consequences in respect to organization and training matters, the fighter-bomber concept was clearly present in the planning of the Me-210 and the Me-410.

The attempt to satisfy these requirements first resulted in the development of the Me-210 and then later, after it proved to be a fiasco, the Me-410. The latter, however, also proved to be unsatisfactory. If only one of these models had come close to meeting the requirements set up in 1938, especially in regard to speed, it could have been developed not only into a useful long-range escort fighter but also into an eminently satisfactory fighter-bomber, capable of employment on strategic missions.

Instead, years of fruitless effort were expended in trying to improve these models - we shall make no attempt to determine who was to blame for this waste of effort -, and in the meantime we missed



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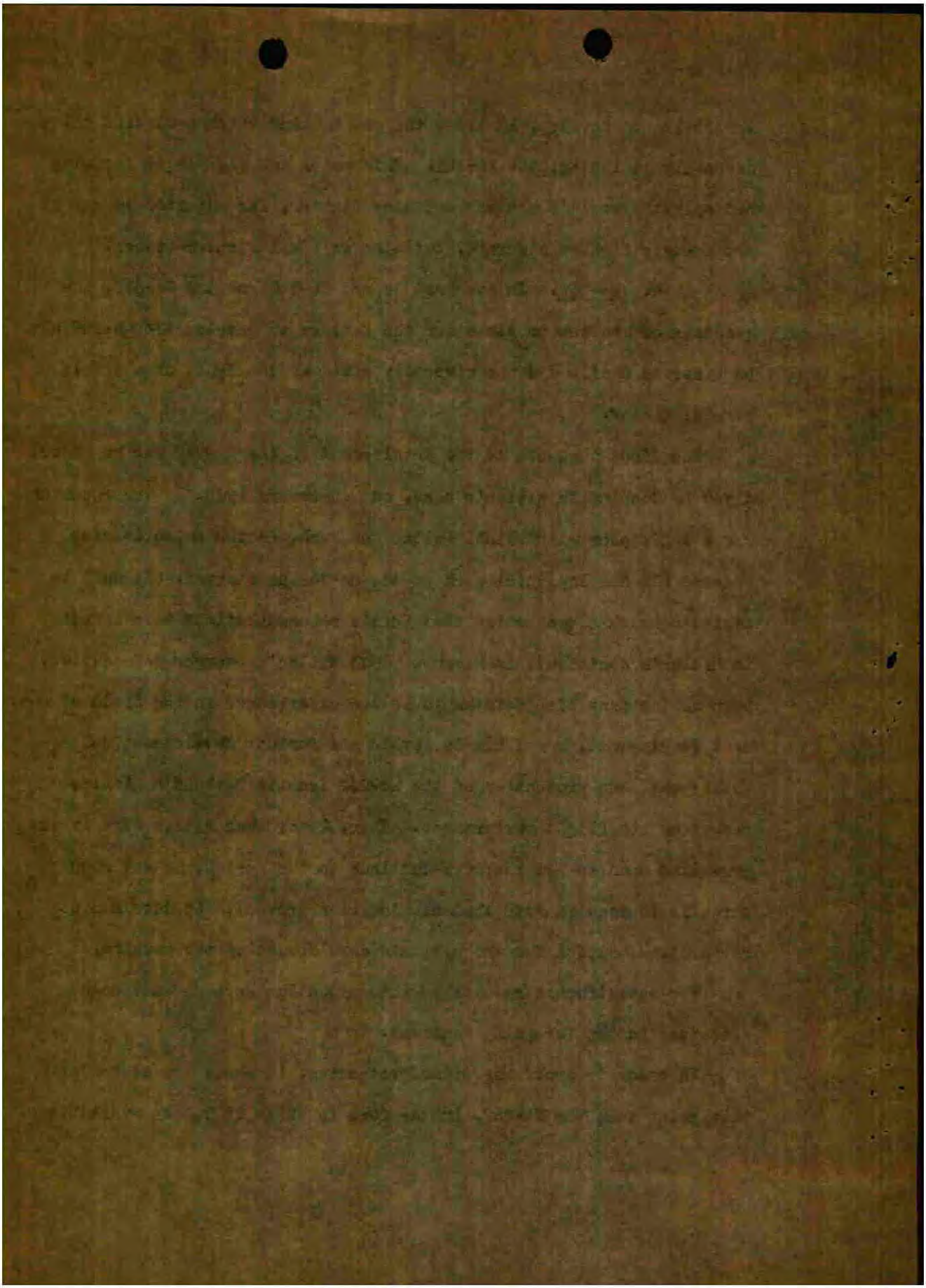
the chance to develop, in time, the one machine which possessed all the necessary qualities, the Me-262. This model was capable of becoming not only the world's fastest and best fighter, far superior to any of the enemy's fighter aircraft, but also an ideal fighter-bomber.

e. Me-262. In contrast to the Me-210 and the Me-410, the question of who was to blame for the failure to develop the Me-262 can be answered easily and unequivocally - it was the fault of a single person, Hitler.

The first obstacle to the development of the Me-262 was an order, given by Goering in Hitler's name, on 7 February 1940.[34] The occasion was a conference with Milch, Keitel and Funk, during which Goering ordered all developmental work on the Me-262 be stopped, (it must be admitted in this connection that Udet's recommendations were a factor in Hitler's decision); in December 1943 Hitler's exaggerated caution, born of the many disappointments he had experienced in the field of equipment development, moved him to forbid the further development and subsequent mass production of the Me-262 despite Galland's glowing report on its flight performance. Then, later when Hitler finally was prevailed upon to let the work continue on the Me-262, he set such unrealistic requirements that his decision proved to be detrimental rather than helpful for the ultimate development of the machine.

The catastrophic results of this situation have already been described in the foregoing sections.

In order to avoid any misunderstanding, it should be stated at this point that the Me-262, in the form in which it became available

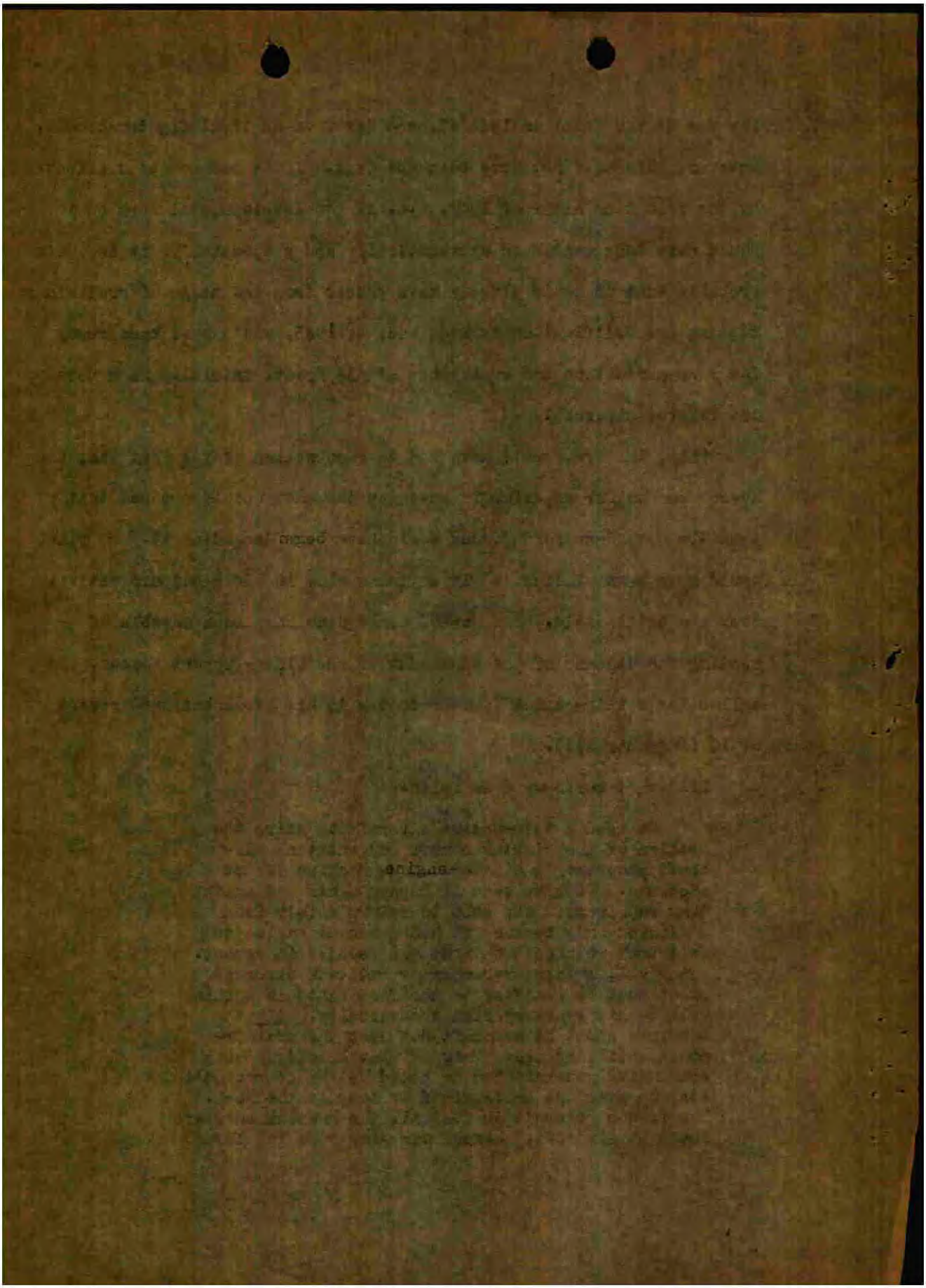


for use at the front in 1944/45, was far from an ideal fighter-bomber. However, this need not have been the case. If it had not been affected by the cessation order of 1940, i.e. if the developmental work on it could have been continued systematically and purposefully, it is quite probable that it would already have passed from the stage of preliminary testing and modification by 1942 and, by 1943, would have been ready for mass production and employment at the front, initially as a pure jet fighter aircraft.

This, in turn, would have led to recognition of the fact that the Me-262 was so far superior to anything the enemy could produce that even the ground-support forces would have began demanding it. No pilot would have been willing to fly anything else in close-support activity over the battlefield. The Me-262 would also have been capable of meeting the demands of the Commander of the Close-Support Forces, who called for a twin-engine fighter-bomber in his aforementioned report of 10 September 1943.

His exact words were as follows:[35]

> We need a twin-engine aircraft to solve the problem of the fighter-bomber and antitank aircraft program: a single-engine machine is not adequate. We have seen it happen again and again that an aircraft was able to return safely from a mission only because it had a second engine to fall back on when the first was damaged in combat. After all, a fighter-bomber or antitank aircraft pilot must be resigned to the fact that his machine will be hit by enemy fire occasionally. <u>All</u> the Russians shoot at aircraft not just the antiaircraft artillery men. This is what I told an Army commanding general when he asked me why we couldn't stay up over the battlefield as long as the IL-2. The reason we can't is that all the Russian soldiers shoot at aircraft, whereas our Army runs for cover

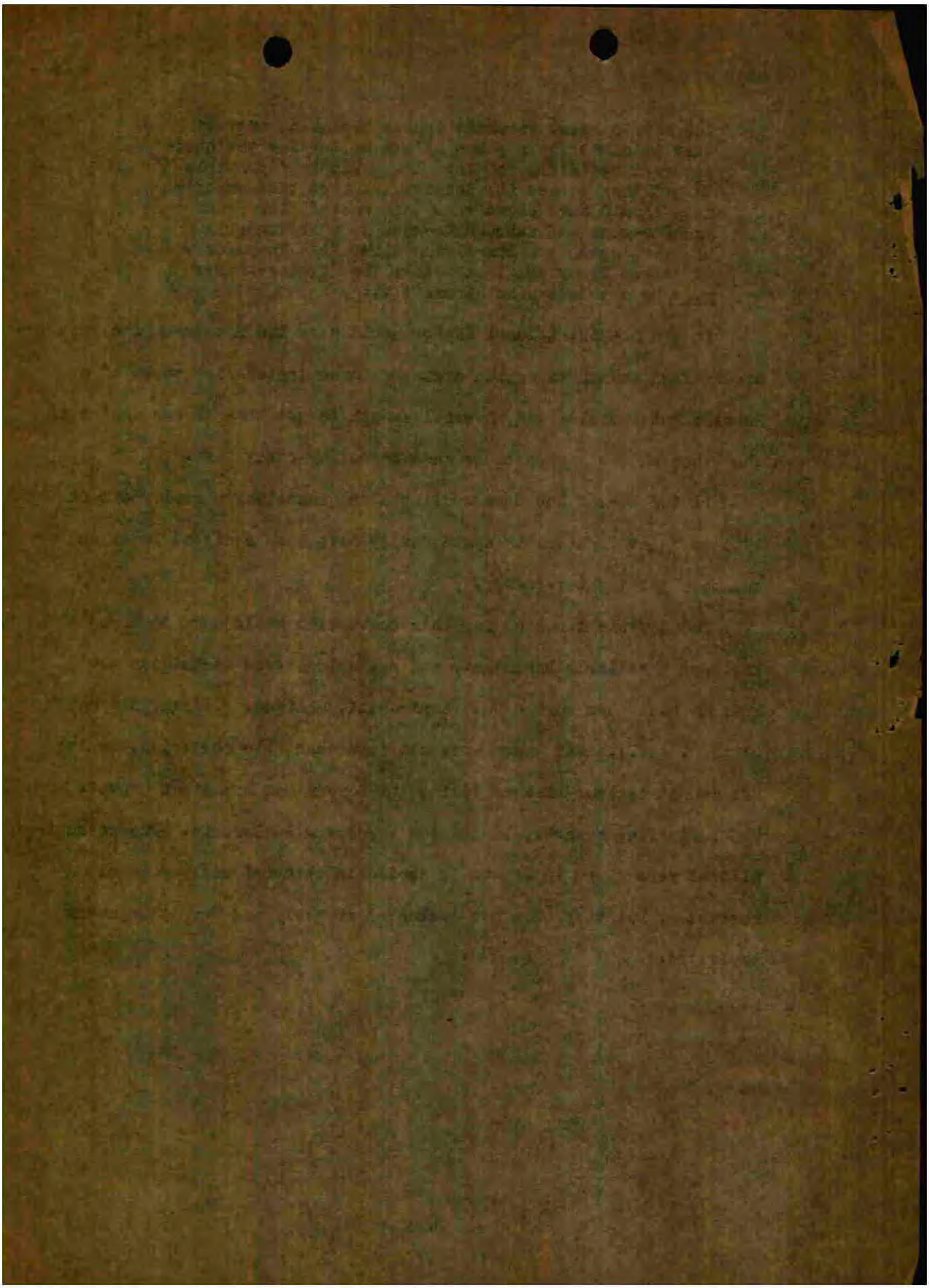


> the minute enemy aircraft appear overhead, muttering that it's not their job - it's a matter for the anti-aircraft artillery people. It is simply impossible to get them to see it, despite the fact that experience should have shown them that massed fire from machine-guns and submachine-guns is quite capable of bringing down a low-flying aircraft. Therefore, to return to my original point, the fighter-bomber must be a twin-engine aircraft....

In the Me-262, Colonel Kupfer would have had a twin-engine fighter-bomber fast enough to outrun even the concentrated fire power of a Russian battlefield, and powerful enough to get back on one engine if the other should happen to be knocked out by enemy fire.

If the Me-262 had been available in quantity for employment in 1943 as a jet fighter, it could easily have been equipped later on for use as a jet fighter-bomber.

The equipment needed for this conversion would have to have included a reliable bombsight, and suitable attack techniques would have to have been worked out (horizontal, oblique, gliding, diving attacks, etc.). But these were not insurmountable obstacles, as the use of jet fighter-bombers during the Korean War has since proved. The Luftwaffe, however, lacked the necessary leadership. The potentialities were there in Germany's available materiel and personnel resources, but they were not evaluated properly and were thus never exploited.



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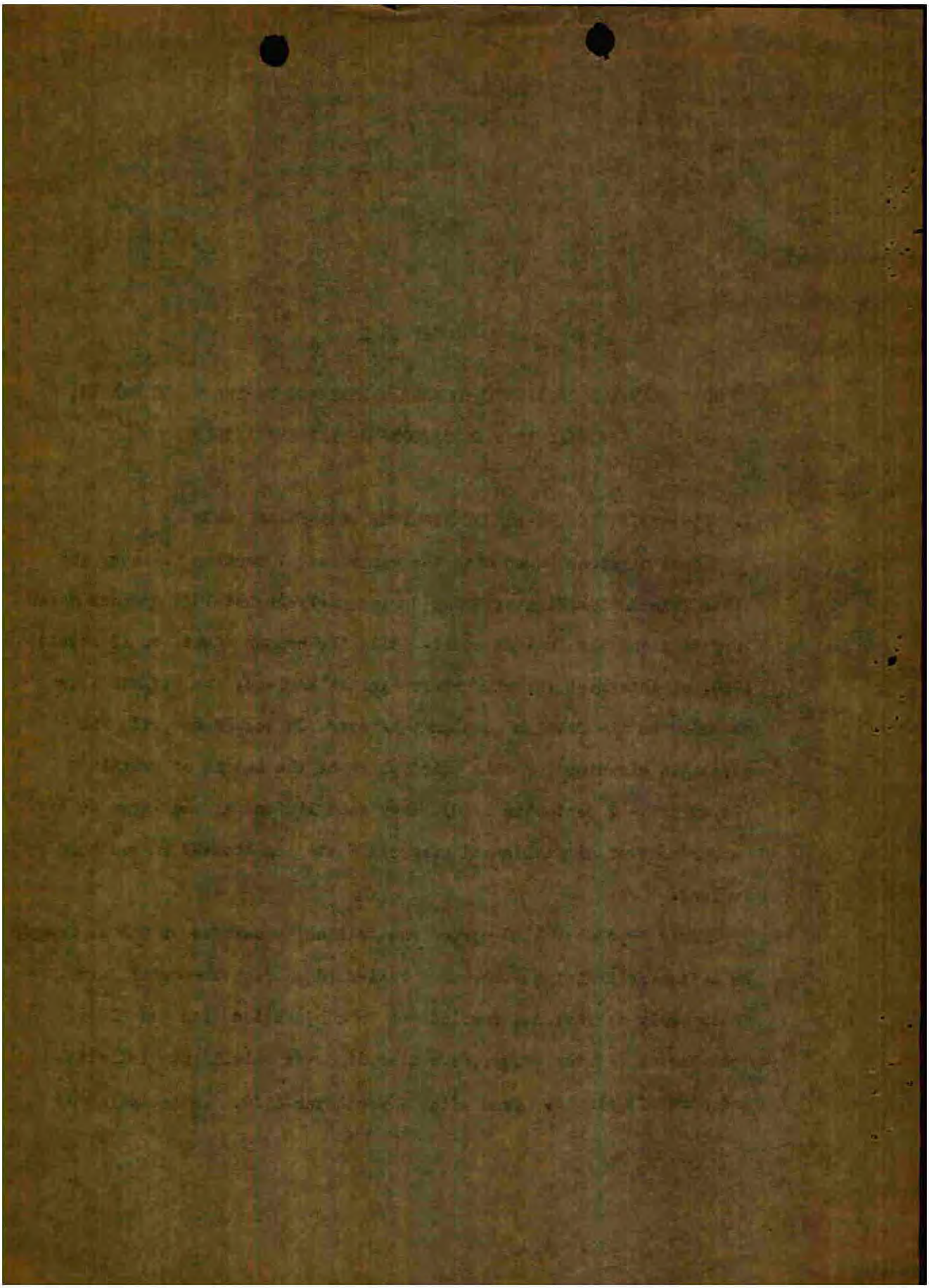
CHAPTER 2

SOME EXAMPLES OF FIGHTER-BOMBER COMMITMENT DURING WORLD WAR II, ESPECIALLY IN SITUATIONS OF AIR INFERIORITY

I. STRATEGIC FIGHTER-BOMBER MISSIONS AGAINST ENGLAND

These missions began with the experimental sorties flown by the 210th Twin-Engine Fighter Group during early August 1940 against ocean targets along the English coast. With the commencement, on 13 August 1940, of intensive aerial warfare against England, the attacks were extended to the British mainland; however, in accordance with the strategic planning for this third phase of the Battle of Britain (13 August - 7 September 1940), they were limited by and large to the bombardment of airfields and aircraft factories located in southern England.

Early September 1940 marked the initial appearance of the II Group, 2d Luftwaffe Training Wing, as a full-fledged fighter-bomber force. Their early operations, carried out in conjunction with the 210th Twin-Engine Fighter Group, were also directed chiefly at airfields and aircraft plants. Even after 7 September 1940, the beginning of



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the fourth phase of the Battle of Britain, these attacks were continued.

Under date of 20 September 1940, the Luftwaffe General Staff communiques report the first employment of the II Group, 2d Luftwaffe Training Wing, (with twenty-two Me-109's) in a fighter-bomber attack on the city of London. The attack was a complete surprise to the British. A total of twenty-two 550 pound explosive bombs were dropped on the city, and twelve enemy fighter aircraft were shot down by the German fighter escort. Only one loss was sustained by the German attackers.

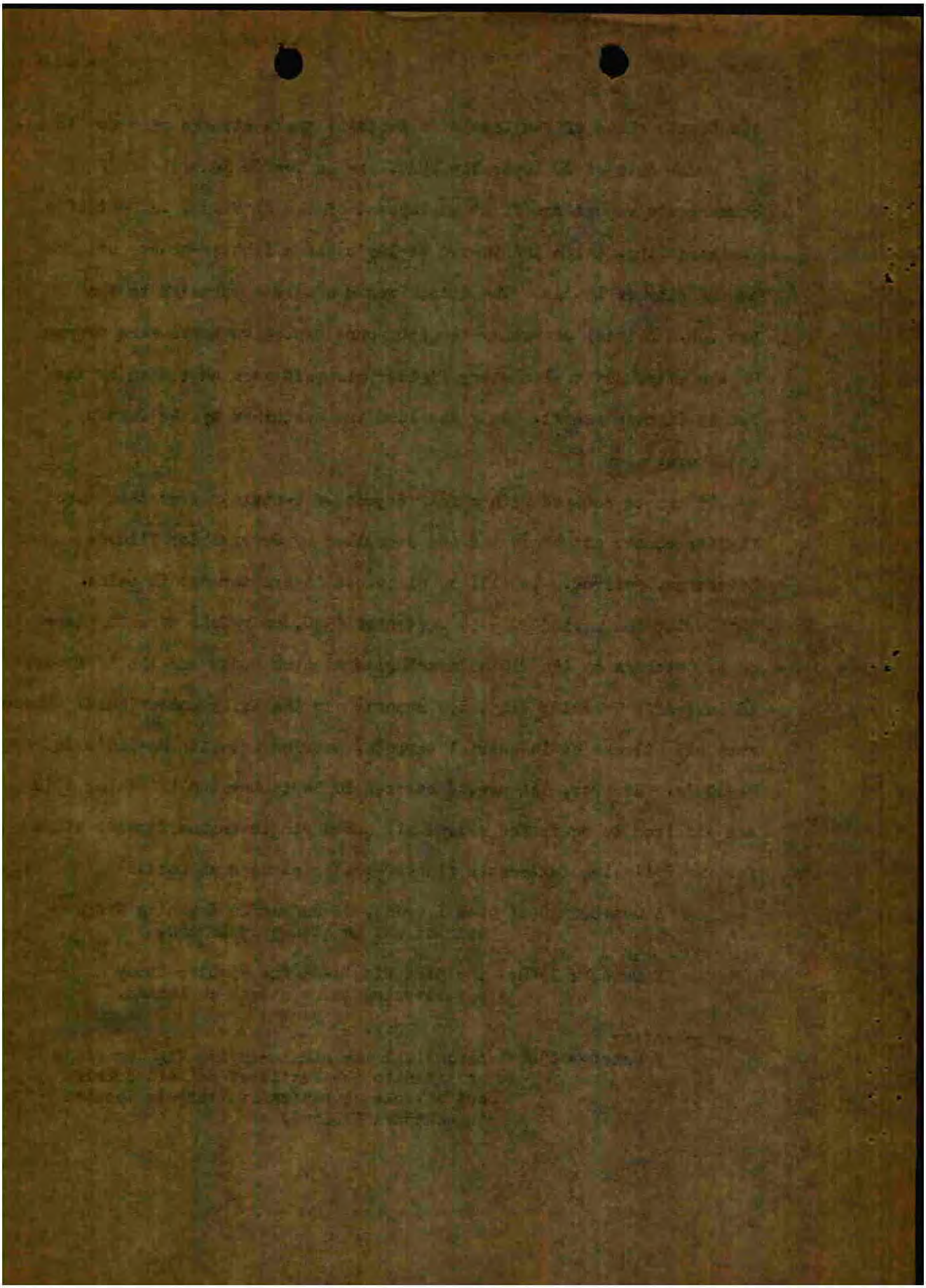
It can be assumed with a fair degree of certainty that this first fighter-bomber attack is the one described by General der Flieger Deichmann, Retired. It will be discussed in greater detail below.

During the period 20 - 30 September 1940, only four more fighter-bomber attacks by the 210th Twin-Engine Fighter Group and the II Group, 2d Luftwaffe Training Wing, are reported in the daily communiques. These were all attacks on industrial targets, carried out with Me-110's and Me-109's. However, the period between 20 September and 1 October 1940 was utilized to equip and orient all seven single-engine fighter wings for the following full-scale fighter-bomber attacks on London:

1 October 1940: the I Group, 2d Luftwaffe Training Wing, carried out an attack on London,

2 October 1940: the 51st Single-Engine Fighter Group participated in an attack on London,

after 7 October 1940: almost all the single-engine fighter wings assigned to the Battle of Britain carried out attacks on London and targets located in southern England,



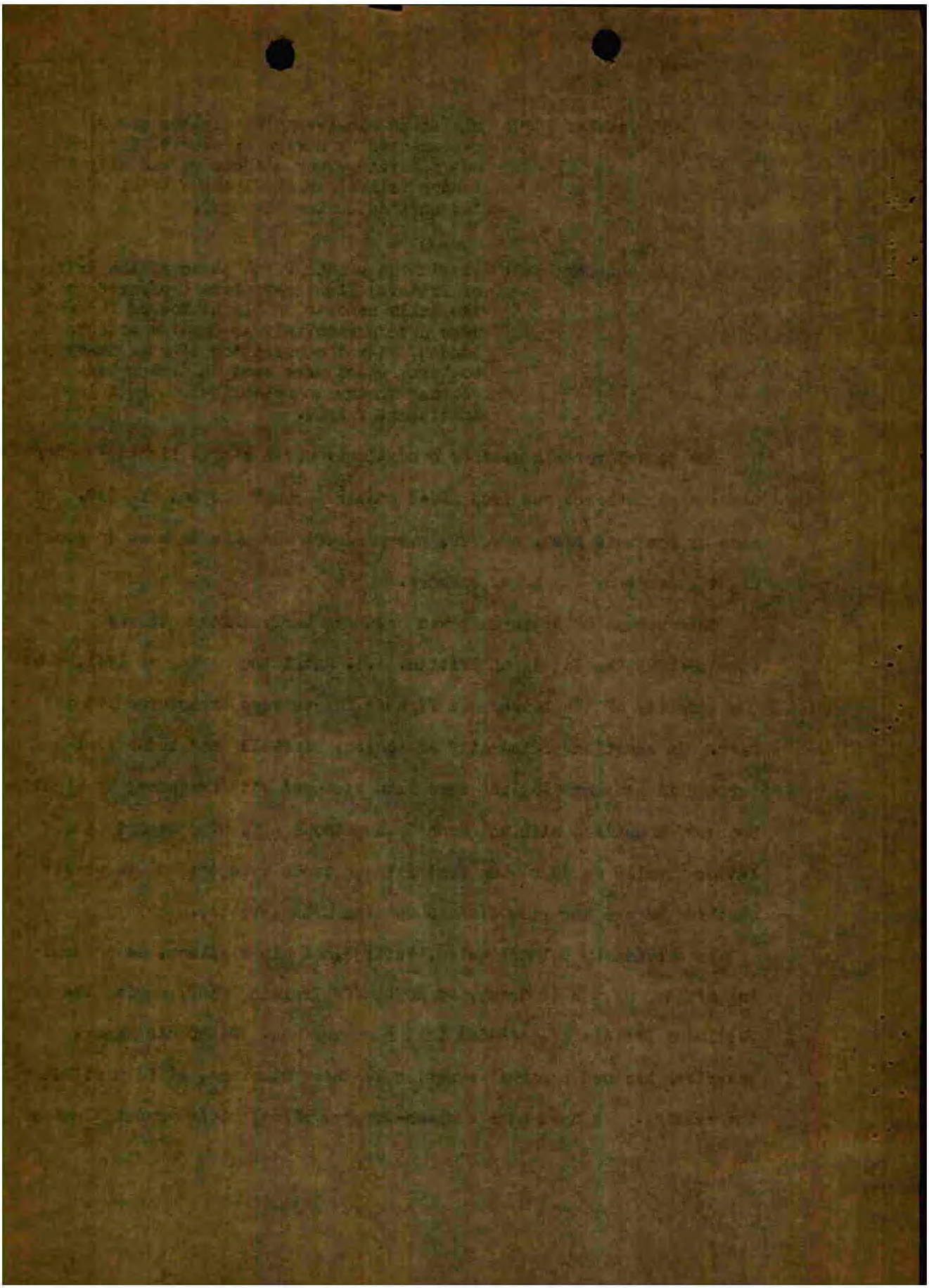
15 October 1940: all seven single-engine fighter wings, accompanied by a fighter escort, carried out fighter-bomber attacks on the city of London (all aircraft flying a total of two sorties during the day),

after 20 October 1940: (beginning of the fifth phase of the Battle of Britain) fighter-bombers (referred to in the daily reports as "light bomber forces") were used exclusively in daytime attacks on London, with the exception of a few heavy bombers, which were sent up during bad weather to try to reach their target in instrument flight.

Due to unfavorable weather conditions, not a single fighter-bomber mission was carried out from mid-December through the end of 1940. To make up for this lack, however, every effort was made to keep up constant night attacks by the heavy bombers.

This method of employment was used regularly throughout the remainder of the Battle of Britain, i.e. until the spring of 1941, when the majority of the bomber and fighter forces were transferred to the East. In addition to the city of London, airfields and industrial targets in southern England were also attacked with frequency by fighter-bombers, sometimes with and sometimes without a fighter escort (the latter usually on days when weather conditions were too bad to permit anything beyond surprise attacks on alternate targets).

An account by Colonel Weise, Retired, of his missions, as commanding officer of the II Group, 2d Luftwaffe Training Wing, during the Battle of Britain is included in the appendixes. Since his report describes his own personal reaction to these missions, it is particularly interesting. We have here a close-support pilot, whose training and



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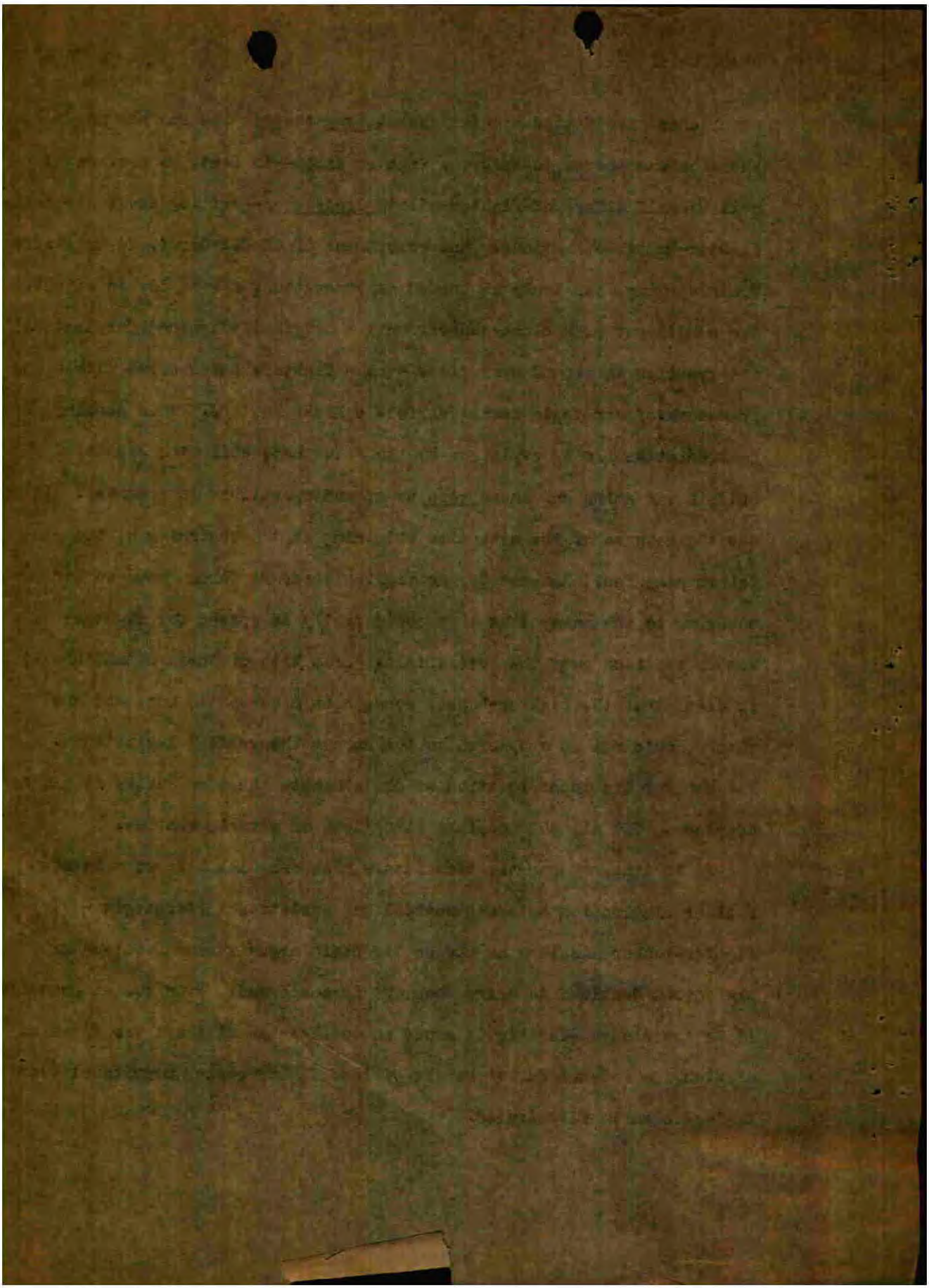
experience have fitted him for combat from the air and who has no ambition whatsoever to become a fighter pilot--in fact, he prefers to call himself a "ground-fighter pilot" /Erdjaeger/--writing about strategic fighter-bomber operations. The commitment of the II Group, 2d Luftwaffe Training Wing, can truly be termed an innovation, for it is, in effect, the commitment of a close-support unit - originally trained for tactical intervention in ground operations - as a fighter-bomber force within the framework of strategic aerial warfare against England. This seeming contradiction can be explained by the fact that, while the Battle of Britain was going on, there were no ground operations in progress. It was the reverse of the situation obtaining at the beginning of the Balkan campaign, when the German fighter aircraft forces were so far superior to the enemy that they could easily be spared for fighter-bomber missions over the battlefield. From both of these situations it is clear that the fighter-bomber concept is a versatile one, and one which should not be subjected to too narrow theoretical limitations. The broader the interpretation of the concept, the more easily it can be adapted to fit all the possible situations of actual practice.

It is true, of course, that future planners will have to maintain a clear distinction between tactical and operational (strategic - ?) fighter-bomber missions as far as the basic organizational set-up of the forces destined to carry them out is concerned. Even so, in practice it is not always possible to avoid an overlapping of these two types of mission, as Colonel Weiss' report of the fighter-bomber commitment over England clearly illustrates.



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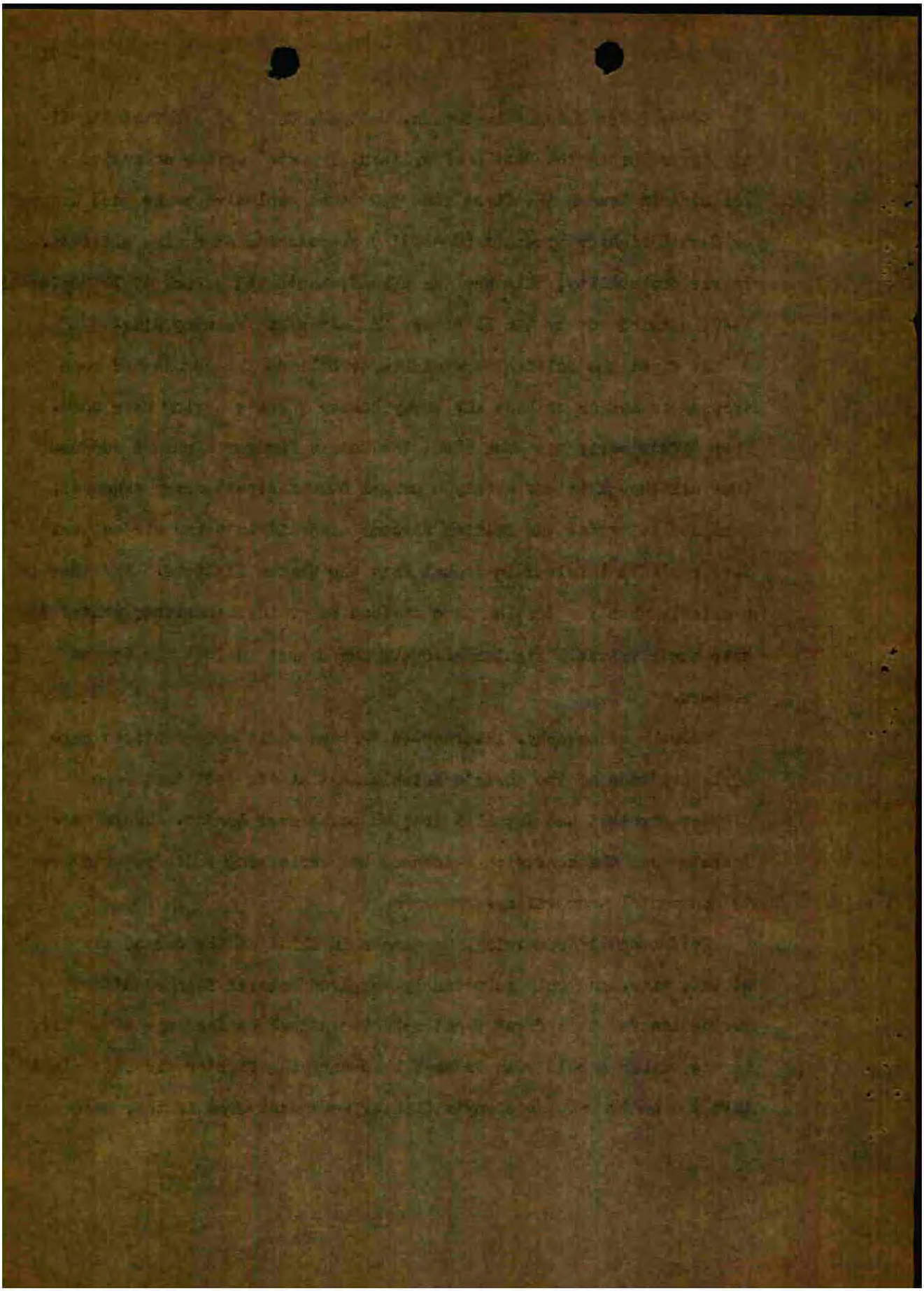
General der Flieger Deichmann, Retired, Chief of Staff of the II Air Corps during the Battle of Britain, reports[1] on the confusion reigning in London the first time 550 pound explosive bombs were dropped by German fighter aircraft (Me-109's) approaching at a high altitude. In all probability, this was the already-mentioned attack of 20 September 1940, carried out by the II Group, 2d Luftwaffe Training Wing.

At first the British were unable to believe that bombs had been dropped on London without any enemy bomber force's having been seen. They didn't worry too much about the German fighter aircraft because they all though it was merely a normal German deceptionary maneuver, designed to entice the British fighter aircraft into the air so that they could be involved in combat with the German fighters. And this is precisely what the British were anxious to avoid, since they wanted to save their valuable fighter aircraft for combat against the German bombers.

Shortly afterwards, intercepted British radio conversations gave ample evidence of the enemy's astonishment at the fact that German fighter aircraft had actually dropped bombs over London. There were moments when the confusion evidenced by overlapping radio reports grew to monumental proportions.

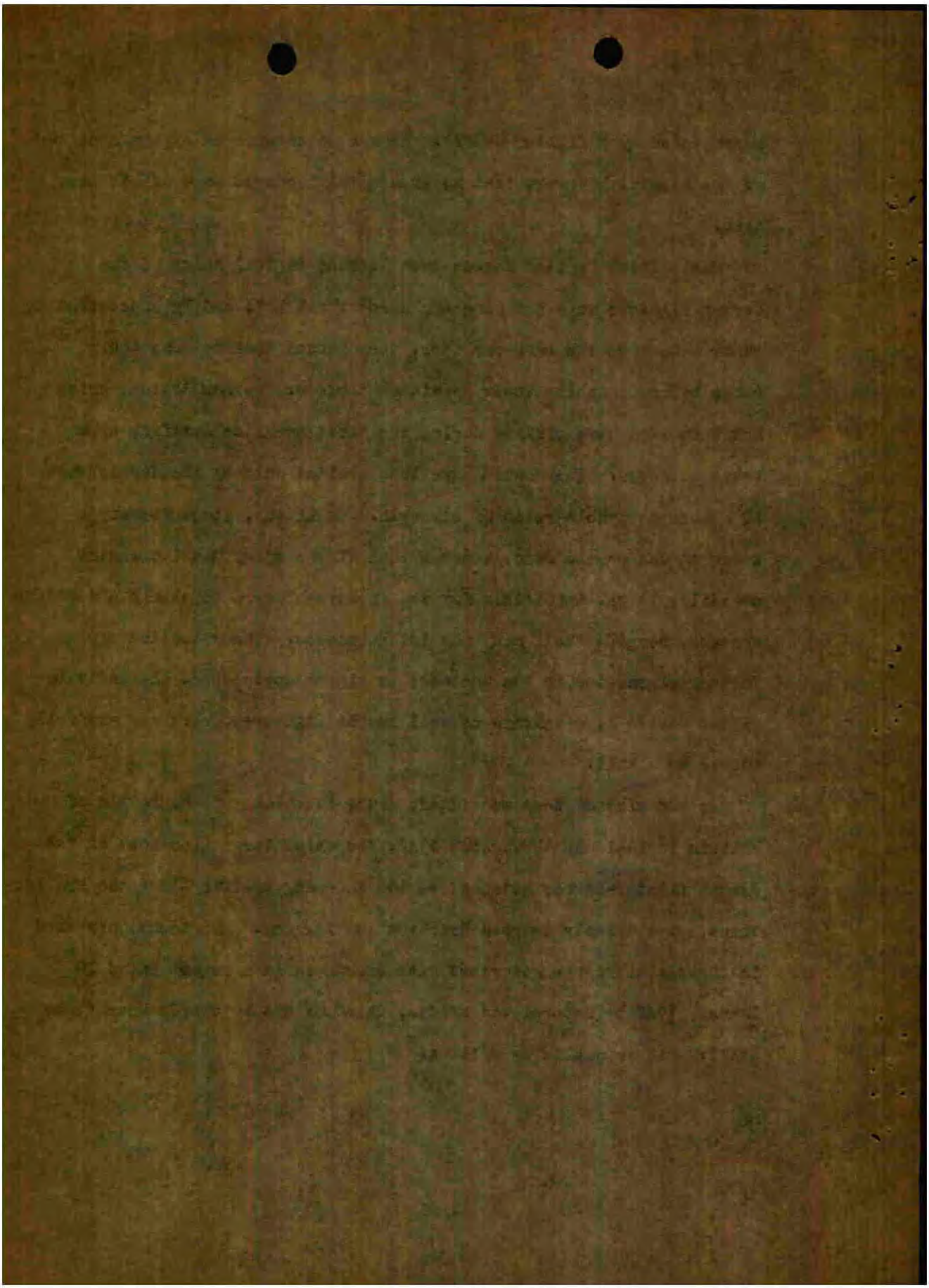
Feldmarschal Kesselring, Commander in Chief of the Second Air Fleet at this time, had only reluctantly approved General Deichmann's suggestion for this first fighter-bomber attack on London - after all, it was rather a bold risk to send bomb-carrying fighter aircraft right into the center of the enemy's fighter defenses, even if they were



accompanied by a fighter escort. He was so encouraged by the success of the attack, however, that he immediately ordered more of the same type.

The British fighter forces soon learned to tell which of the German fighters were carrying bombs and which not, and by concentrating their attack on the bomb-carriers, they forced them to dump their bombs before reaching their appointed targets. German losses, which had been at a bare minimum during the first surprise sorties, soon began to mount. They could have been avoided only by the development of a more favorable ratio of strength. As it was, since Germany's strength was on the wane, whereas that of the enemy was increasing steadily, it was impossible for the fighter-bombers to obtain a decisive success, despite their many partial successes. The situation was further aggravated by the weather; as winter approached, the activity of the German day fighters as well as the fighter-bombers was gradually forced to a halt.

As has already been mentioned, after the close of the Battle of Britain in 1941 and throughout 1942, the chief target for most of the German fighter-bomber attacks was the shipping traffic along the English coast, particularly between Brighton and Torquay. The techniques used in these attacks are described with exactness in a report dated 20 January 1942 by General von Waldau, Chief of the Luftwaffe Operations Staff. His report is as follows:[2]



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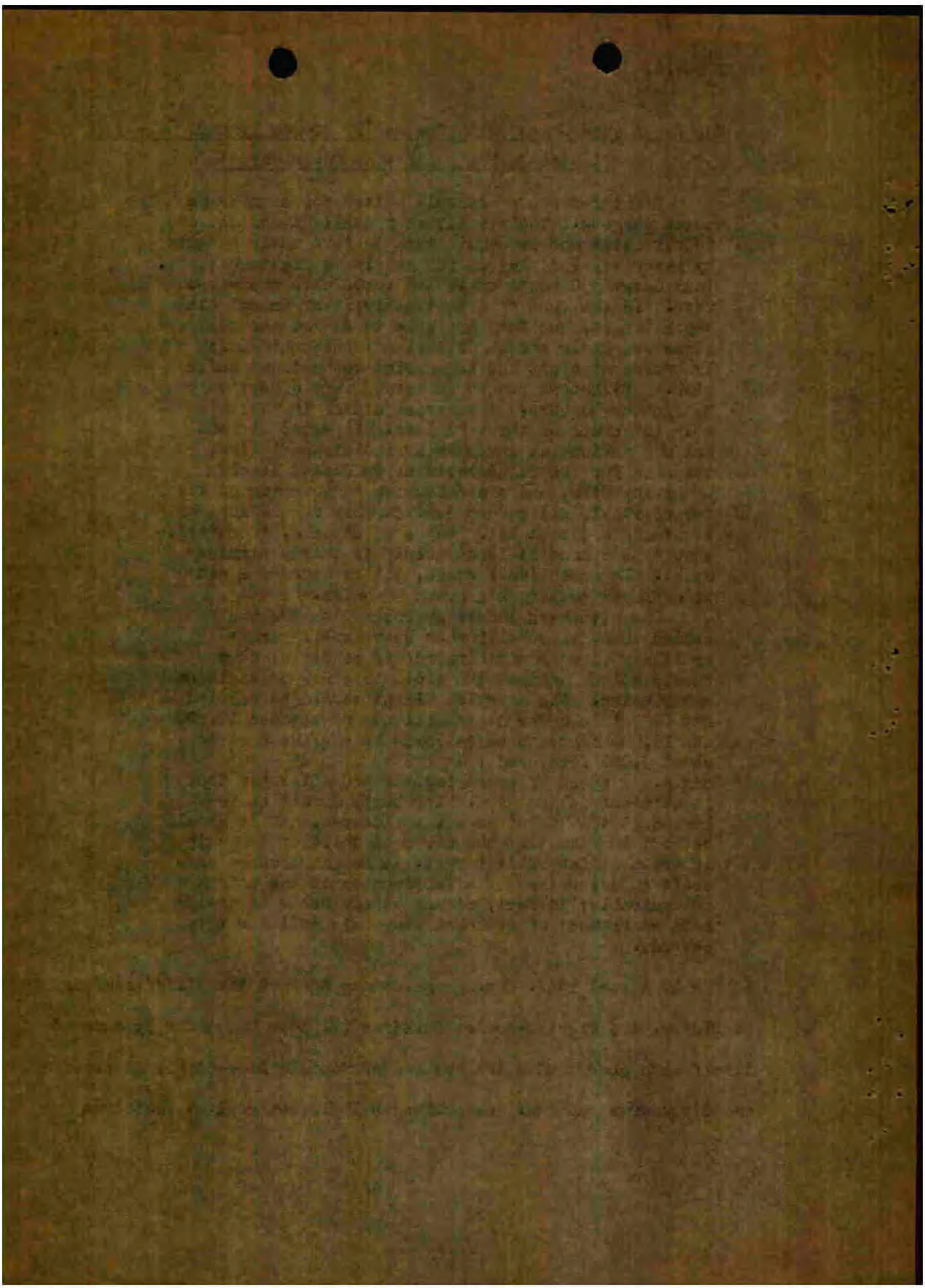
The Experience Gained with the Me-109 (Motor Type DB 601-A) in Fighter-Bomber Attacks on Ocean Targets

Fighter-bombers are well suited for attacks on ocean targets. Their relatively small dimensions and fairly quiet motors permit them to take their targets by surprise, and they do not require a fighter escort. They carry 550 pound explosive bombs with a 38-type fuze. In the case of a battleship, they cannot sink their target, but they are able to damage the superstructure badly enough so that a subsequent attack by bomber aircraft can be carried out without undue risk. Freighters can be bombarded very effectively by fighter-bombers. A surprise attack is possible only in groups of three or less. Repeated attacks are not advisable, inasmuch as antiaircraft fire, the need for the fighter-bomber to defend itself by giving fire, and the defensive maneuvering of the target itself all reduce considerably the chances of attaining a direct hit. Repeated attacks, therefore, should be spaced at least twenty to thirty minutes apart. In exceptional cases, entire squadrons can be employed to attack a group of ships.

The attackers should approach with the sun behind them, especially when heavy antiaircraft artillery fire is anticipated; if possible, they should attack against the wind, in order to minimize motor noise. The approach flight should be carried out in battle order at an altitude of between 12,800 and 16,000 feet, to be followed by a glide down to about 9,000 feet, and then a dive at a 45 - 60° angle. A speed of approximately 440 miles per hour is attained in the dive. The bombs should be released at the lowest possible altitude, and it should be kept in mind that the foremost third of the ship is the most favorable target. A reconnaissance aircraft to determine the effectiveness of the attack is desirable; in fact, it may be advisable to designate an element of reconnaissance aircraft for this purpose.

On 19 August 1942, during operations against the Allied landing at Dieppe, the Fighter-Bomber Squadron (Fighter Commander 3) covered itself with glory under the command of Captain Liesendahl, an experienced squadron captain. Generalmajor Ibel, Retired, at that time



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Fighter Commander 3, described as especially successful the operations of Liesendahl's squadron, which - sometimes with fighter escort and sometimes without - carried out repeated attacks with both bombs and airborne armaments against the enemy convoy. All the fighter aircraft forces attached to the Fighter Commander 3, however, carried out relentless attacks with airborne armaments (chiefly 20-mm cannon) on the Allied landing forces whenever the air situation, i.e. the battle against the British fighters assigned to protect the convoy, permitted. In any case, the fighter-bombers were responsible for a good part of the success attained by these defensive operations.

Galland gives us another example* of a strategic fighter-bomber mission over England, taken from a combat report received by him. This was a fighter-bomber attack on the city of London in January 1943, at a time when Germany's inferiority in the air had become catastrophic. The attack was launched as a result of a direct order from Hitler, who, in late 1942, ordered the resumption of retaliatory attacks on the British Isles, particularly on London.

As a last example of a strategic fighter-bomber attack in a situation of air inferiority, we might mention the attack on Canterbury, also one of the retaliatory actions ordered by Hitler after the devastating night bombardment of Hamburg by the British.

The bombardment of Canterbury was carried out by approximately 120 Me-109's and FW-190's from the staff of the Supreme Fighter Commander West.

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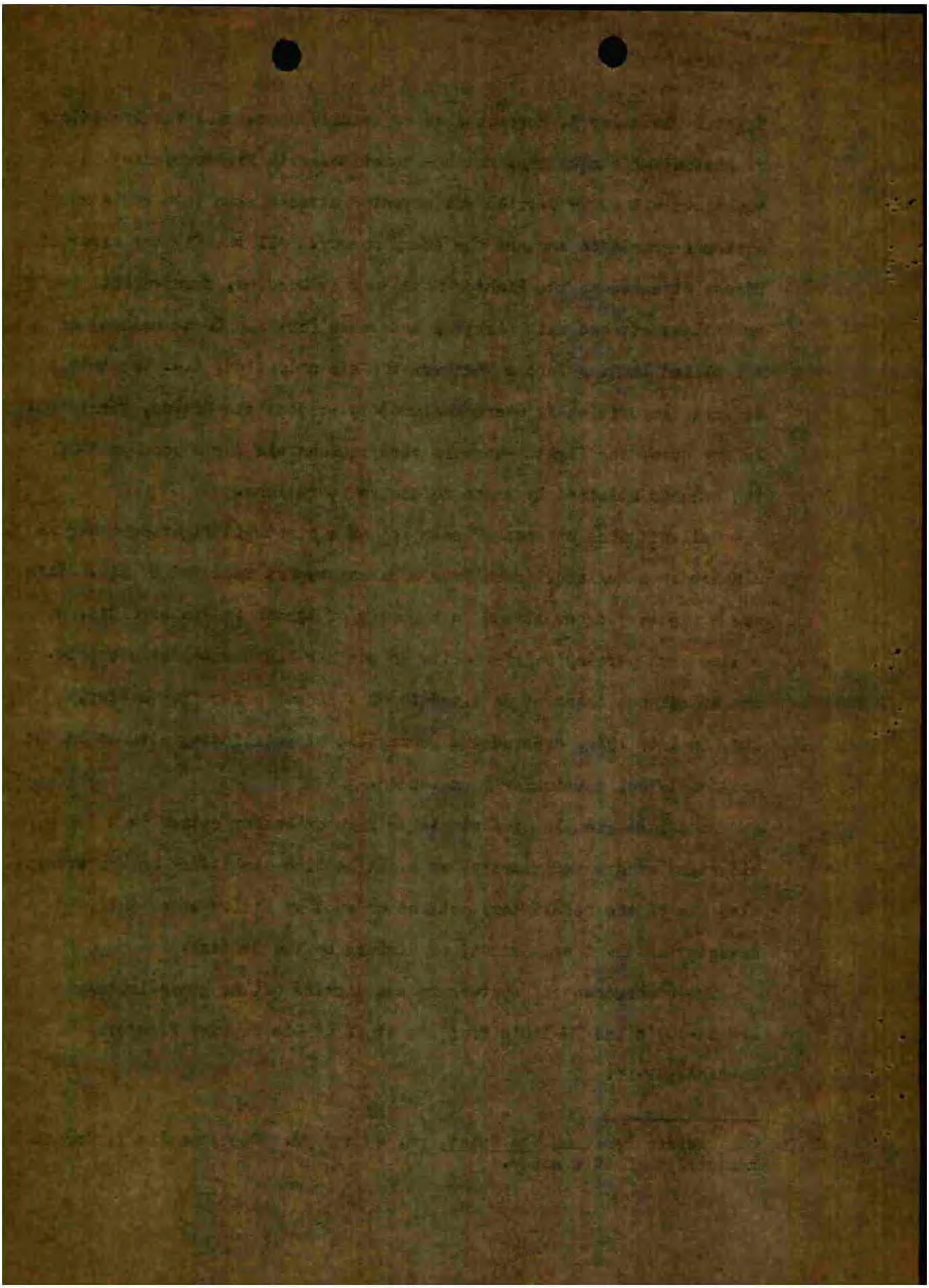
*Werner Baumbach, Zu Spaet, pp. 89 and 90. See Appendix 7, German manuscript of this study.



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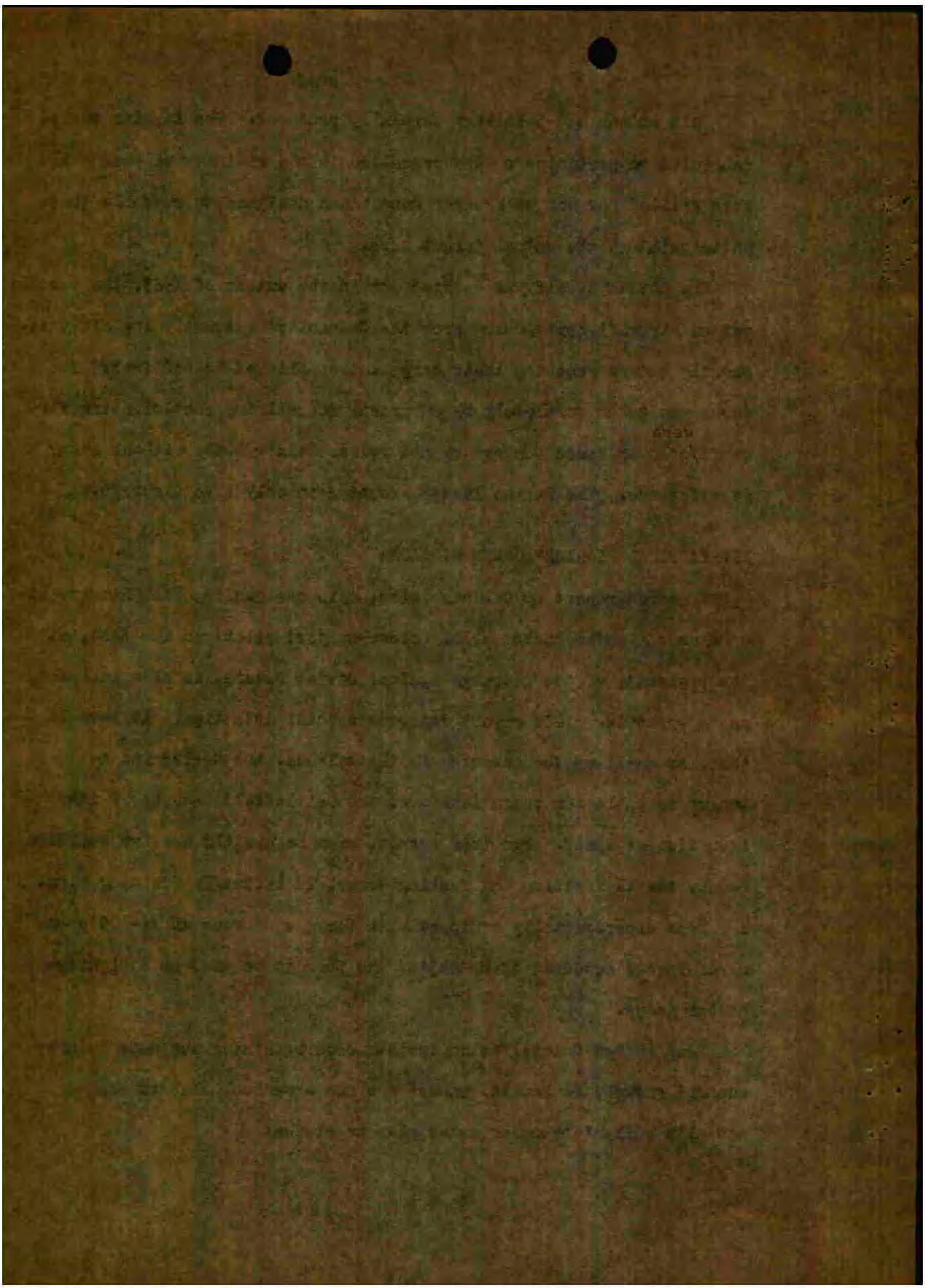
This attack had been very carefully prepared. The fighter forces scheduled to participate were assembled in the vicinity of Amiens and were drilled for one week under conditions designed to resemble those anticipated at the actual target area.

The attack itself was carried out in the autumn of 1943, the participating aircraft approaching over the Channel at extremely low altitude. Shortly before reaching their target, they climbed to 640 feet. The enemy was taken completely by surprise, and all the participating aircraft were able to reach Canterbury and release their bombs without enemy interference. The German losses amounted to only five aircraft.

II. TACTICAL FIGHTER-BOMBER MISSIONS

A second report by Colonel Weiss, this one dealing with his experience as a fighter-bomber pilot (close-support pilot) in the East, at the beginning of the campaign against Soviet Russia, is also included as an appendix. This report deserves special attention. It reveals that, as early as the campaign in the Balkans, the Hs-123 was no longer suitable for operations over the battlefield because of its insufficient speed. For this reason, even before the Russian campaign began, the II Training and Testing Group, 2d Luftwaffe Training Wing, had been experimentally equipped with three squadrons of Me-109's and a reinforced squadron of Hs-123's, the four to be used as a fighter-bomber group.

Even though Colonel Weiss insists upon retaining the name "close-support group", he admits, except for one squadron, that it was actually a fighter-bomber group when he states:



> The training received by the pilots of the close-support group had fitted them to undertake combat in the air if it should become necessary.

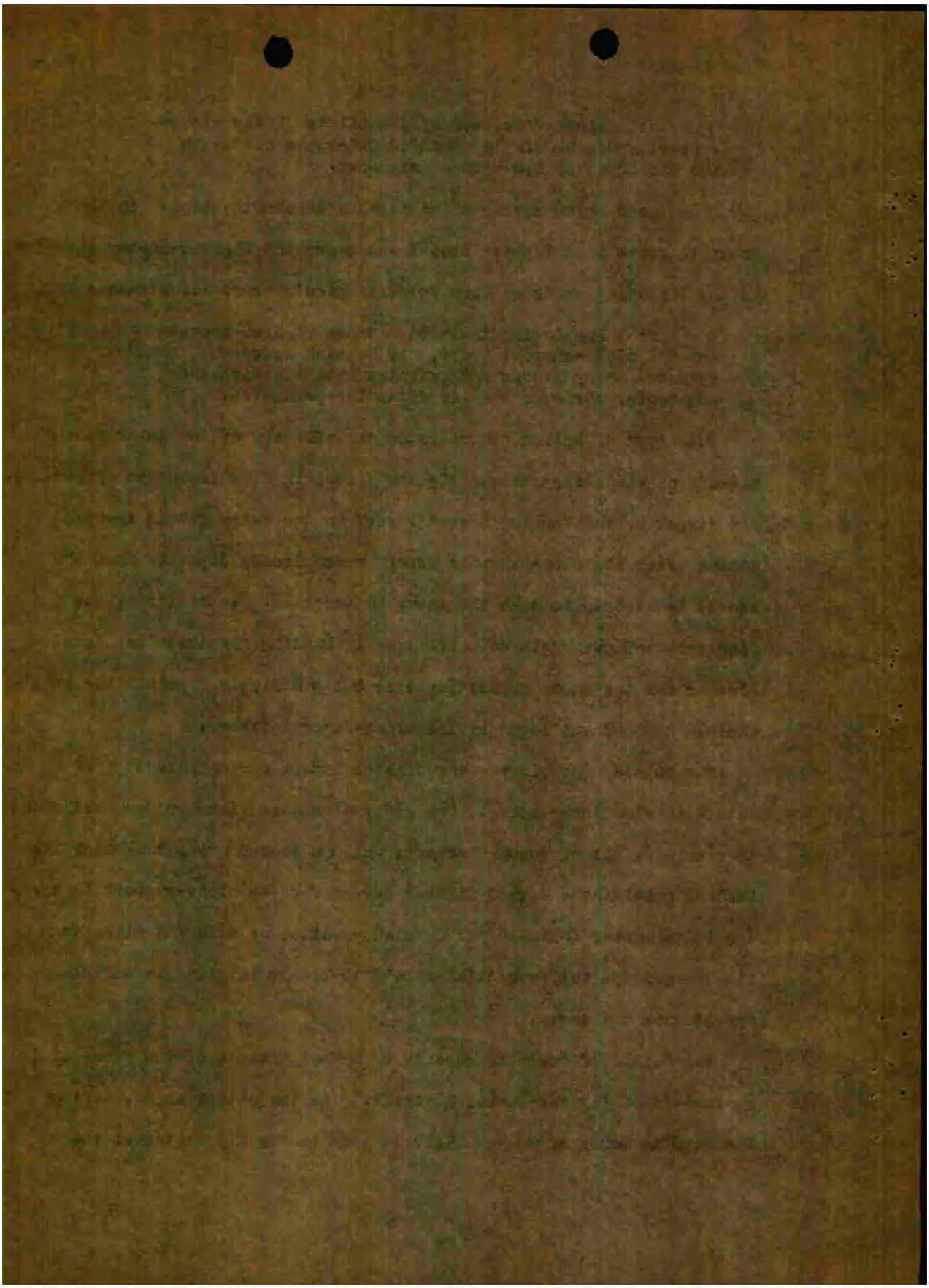
Even the Spanish squadron[3] of fighter aircraft assigned to the group to serve as a fighter escort was a genuine fighter-bomber squadron, as the following sentence from Colonel Weiss' report illustrates:

> After completing their mission as fighter escort for the close-support group, the Spanish squadron attacked enemy troops and vehicles with its airborne armaments, whenever the air situation permitted.

This type of action demonstrates the efficacy of the joint commitment of close-support and fighter forces in fighter-bomber operations. The attack by the fighter escort forces on the enemy ground troops, coming after the close-support forces have already departed from the scene, is certain to take the enemy by surprise. In addition, the fighters need not waste valuable time in hunting for their own front line or for the enemy ground targets, but can simply continue the still-visible bombardment begun by the close-support forces.

The method of employing the fighter escort during this type of action is also interesting. One group of escort fighters was sent ahead to clear the air of enemy aircraft, while a second group took over the task of providing a direct fighter screen for the close-support force. The latter group followed the Russian practice of sticking close to its charges and not permitting itself to become involved in aerial combat with the enemy.

The Battle of Crete represents a perfect example of the successful employment of fighter-bomber aircraft.[4] As the attack began, during the morning hours of 20 May 1941, it soon became apparent that the



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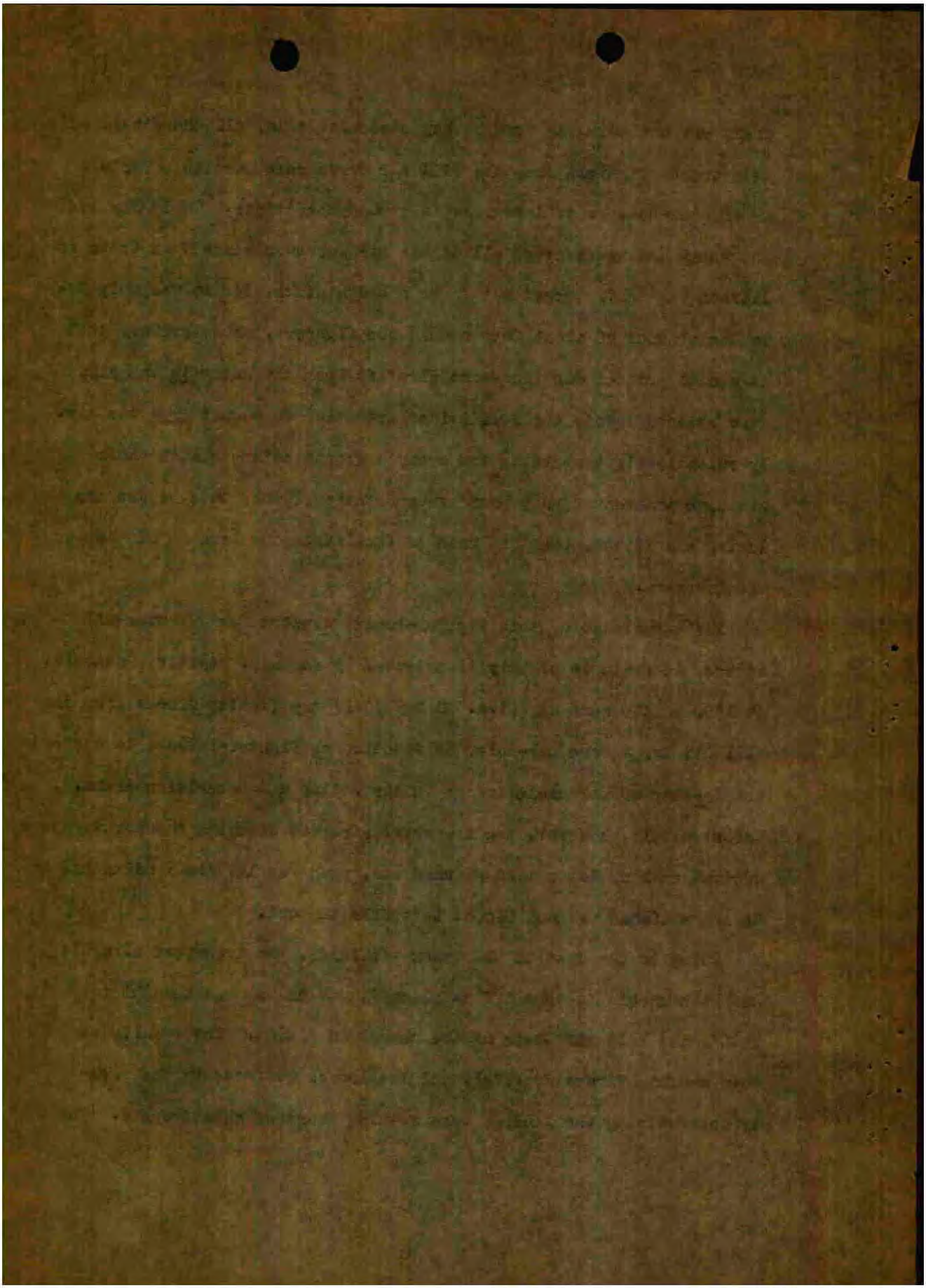
enemy was not going to send up any aircraft; thus, all the single and twin-engine fighters from the VIII Air Corps were available for use as fighter-bombers to intervene in ground operations. On 19 May 1941 the enemy had transferred all of his air forces stationed on Crete to Alexandria. This turned out to be a bad mistake, for it was only due to the absence of these forces that our fighters, whose primary task it was to protect our transport aircraft from the enemy in the air, were able to devote their undivided attention to combat from the air. By relentlessly bombarding the enemy's ground defenses with their airborne armaments and 5 pound fragmentation bombs, both before and during the attack, they did much to facilitate the landing of the paratroopers.

The importance of this fighter-bomber support for our over-all success in Crete is clearly illustrated by another, negative, example. At 1500 on the same day (i.e. 20 May 1941) the fighter forces from the VIII Air Corps were scheduled to function as fighter-bombers to support the landing of parachute troops in the Retimo and Heracleion areas. Unfortunately, however, the transport aircraft carrying the paratroopers arrived an hour later than planned and, as a result, the landing had to be accomplished without direct Luftwaffe support.

Owing to the dust on the Greek airfields, the transport aircraft had been unable to take off as planned, and no one had thought to notify the VIII Air Corps of the change in timing. The results of this oversight were dreadful, and the losses suffered by the paratroopers during the landing were nothing short of catastrophic. The

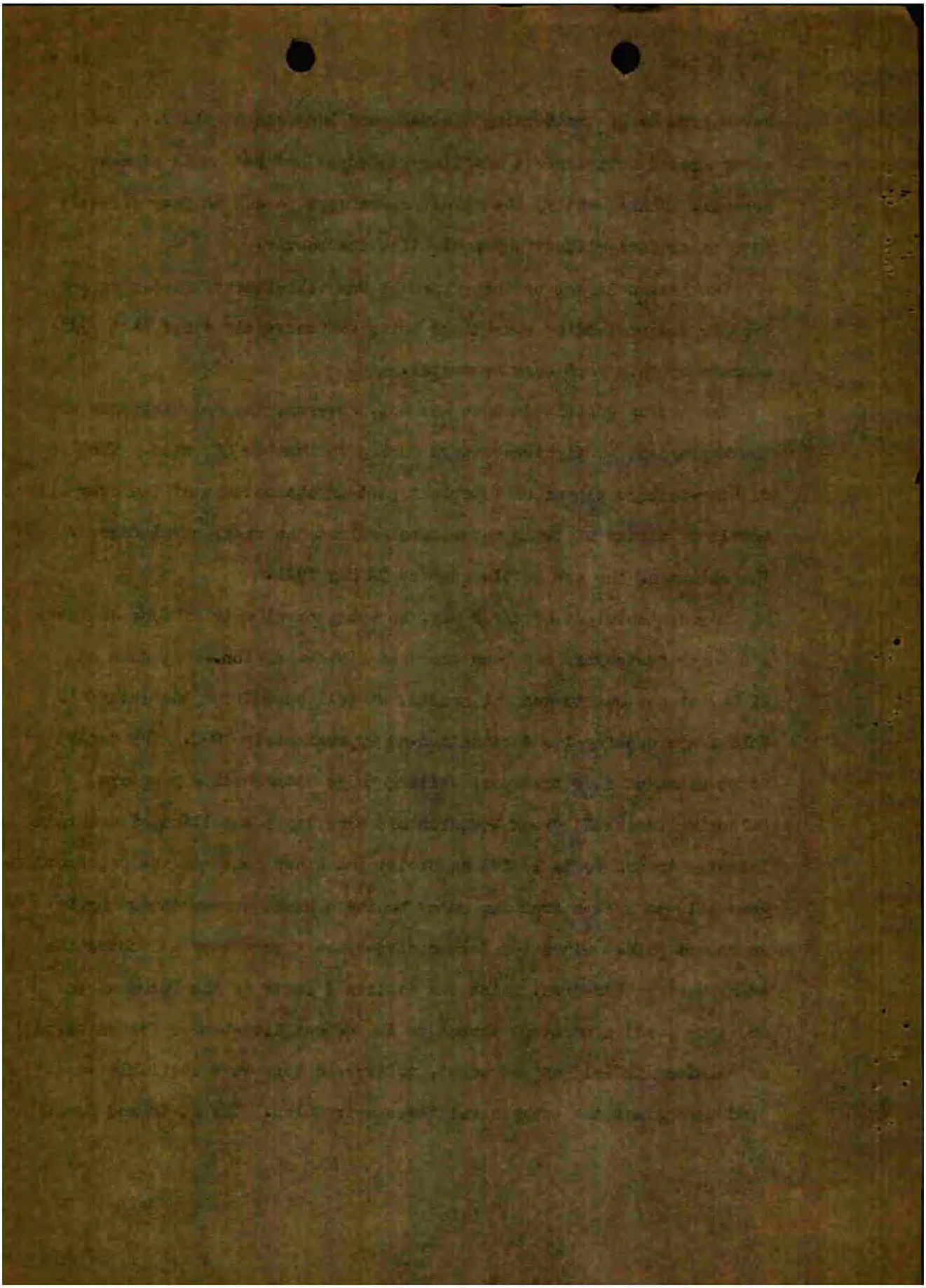


havoc wrought by the morning's attack had long since subsided, and the enemy ground antiaircraft artillery defenses had had ample time to recover. Consequently, the paratroopers were forced to jump directly into enemy fire without any protection whatsoever.

The lesson taught by this disaster was well-learned, later paratrooper and airlanding operations being so accurately timed that all mishaps of this sort were prevented.

The action described above was not, however, the only instance of the employment of fighter-bombers during the Battle of Crete. The fighter-bombers played an important part in the outcome of the over-all battle by virtue of their operations against the enemy naval forces. The climax of the sea battle came on 22 May 1941.

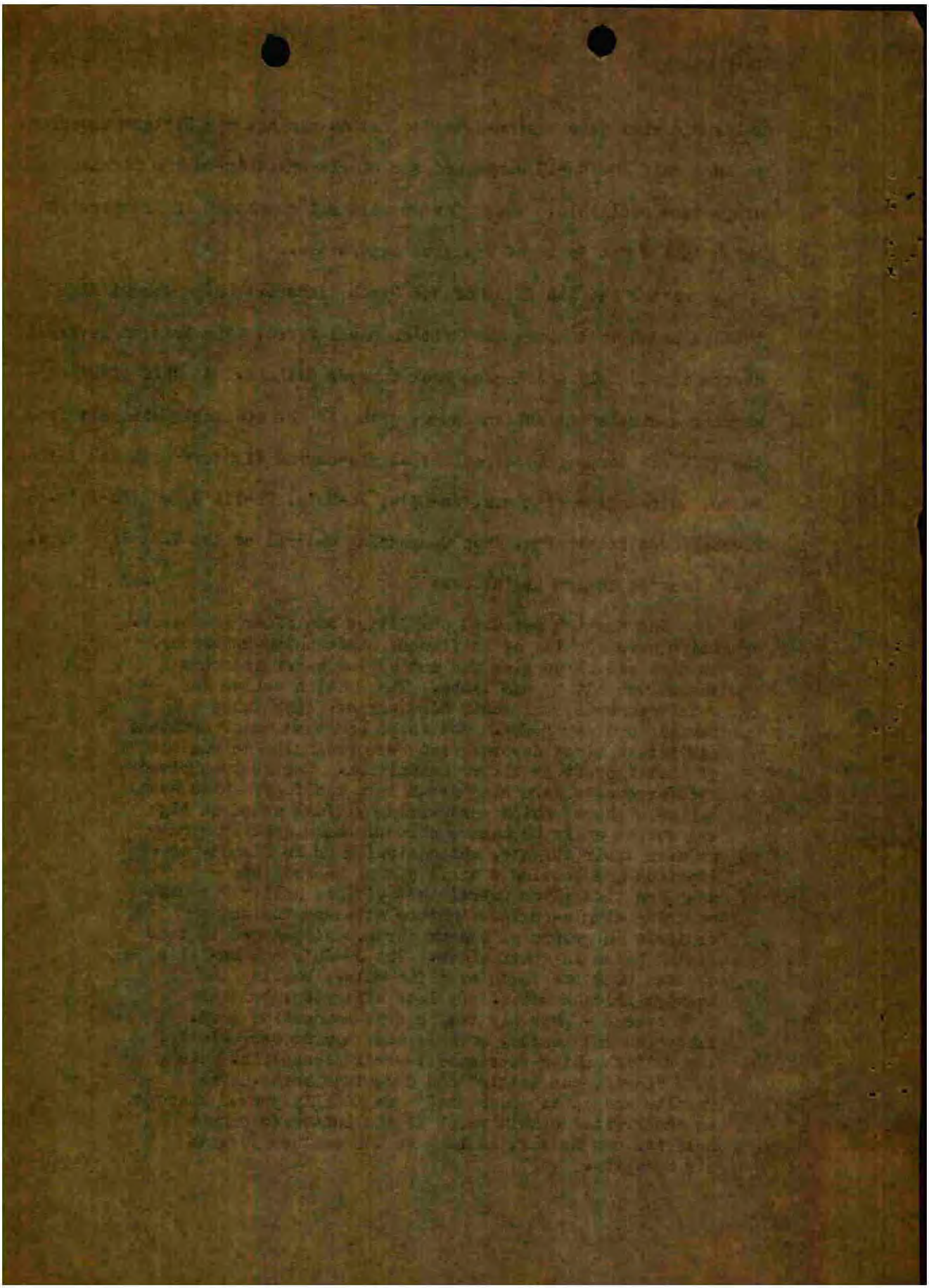
During the night of 21/22 May, an enemy naval unit of four cruisers and three destroyers had been anchored off Heracleion. At dawn on 22 May it put out to sea and headed, at full speed, for the island of Melos, approaching its destination at approximately 1000. The enemy force attacked five transport sailing ships with auxiliary motors belonging to the 2d Greek Squadron and carrying a batallion of mountain infantry troops to be landed on Crete; the other boats of the squadron were able to escape from the enemy behind a smoke screen thrown up by an escort ship. Since the German dive-bombers were busy attacking the enemy Western Squadron, which was stationed south of the Peloponnesus and thus posed a constant threat to the German dive-bomber forces based at Malaios airfield on the coast, no dive-bombers were available to send up against the enemy naval force near Melos. The Ju-88 and He-111



units had also been assigned to the action against the Western Squadron, so that only the Do-17 wings and the single and twin-engine fighter wings were available. These forces were all committed in an operation which turned out to be of decisive importance.

No sooner had the first of the Greek transport ships caught fire than we began to bombard the British naval force. The British reversed course immediately and headed back towards Cythera. At this point a regular encirclement action began, with all the available aircraft from the VIII Air Corps participating; single-engine fighters with and without bombs, twin-engine fighters, Ju-87's, Ju-88's, He-111's, and Do-17's. Freiherr von Richthofen, then Commanding General of the VIII Air Corps, describes the action as follows:[5]

> The English received one direct hit after the other. Ships were sinking or in flames; other ships approached to give aid or to pick men out of the water and were themselves hit by our bombs. The British called for reinforcements, and their headquarters dispatched another cruiser force. The ships had been under constant air attack since daybreak and were beginning to run out of antiaircraft artillery ammunition. The newly-arrived reinforcements were also drawn into the fray, which soon became a chaos; ships maneuvering at full speed in zig-zag course or in haphazard curves, bombs exploding on or near their targets, ships sinking or in flames, or - lopsided and leaving a trail of oil behind them - dragging themselves wearily out of this hell. Our bomb-carrying single-engine fighters attacked the enemy cruisers in groups of two or three, and managed to tear gaping holes in their sides. The Ju-88's and He-111's cruised back and forth over the melee, bombing the heavier British ships. By late afternoon, British fire ceased - probably they had no ammunition left. Exhausted and beaten, some of them moving very slowly, the British ships retreated towards Alexandria. The term "aerial sea battle" had come into being. The results cannot be discounted - we finally proved that an enemy fleet within reach of the Luftwaffe cannot hold its own at sea, as long as the weather permits air activity.



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The success of our operations on Crete can be attributed to three factors:

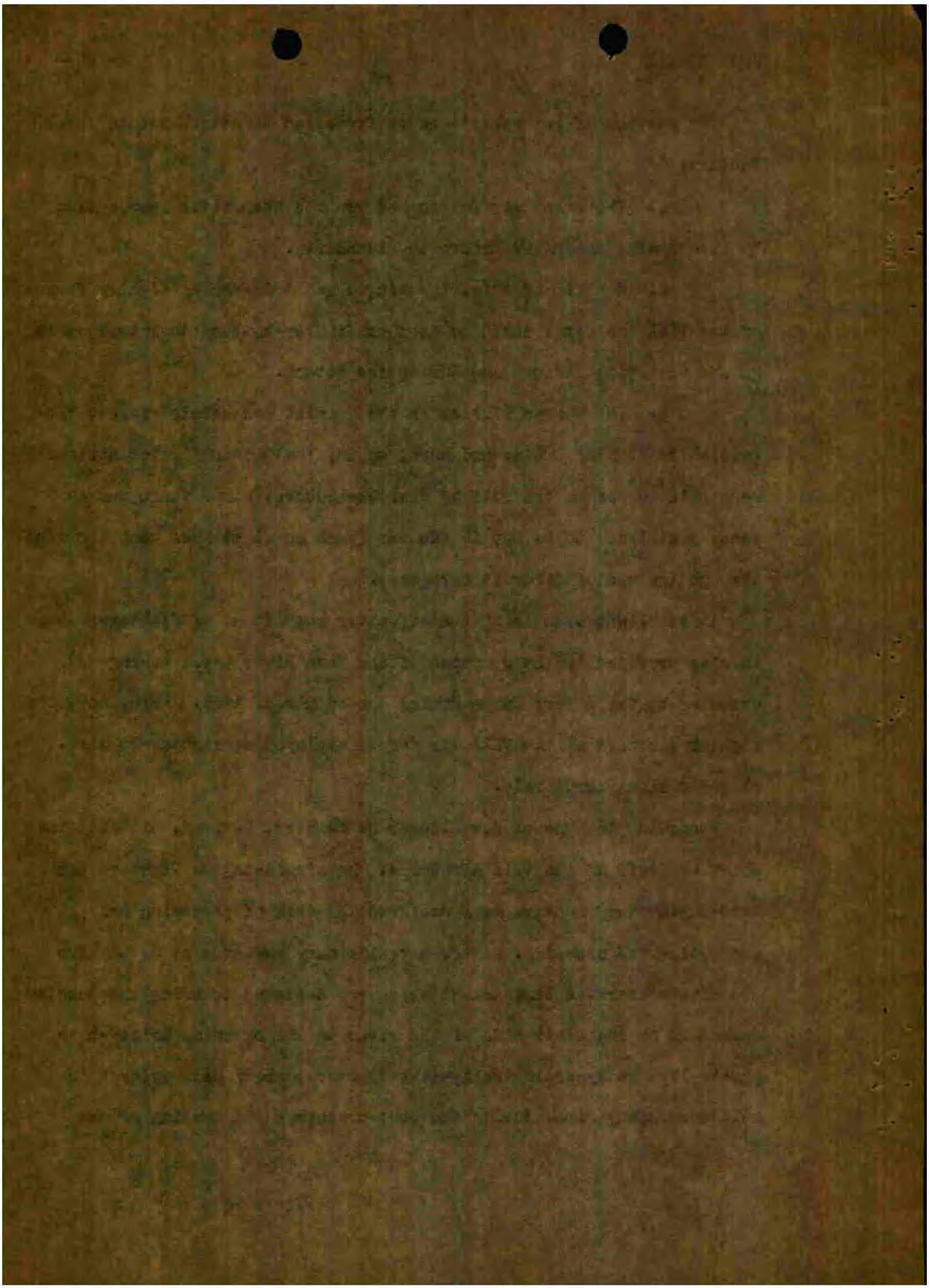
1. The enemy air forces had removed themselves from action by withdrawing the night before to Alexandria.

2. Because of this, the single and twin-engine fighter forces of the VIII Air Corps could be used as fighter-bombers to intervene in ground operations before and during the attack.

3. The German victory in the "aerial sea battle" forced the British to abandon Crete; and here, again, the German fighter aircraft were able to assume the role of fighter-bombers, since there was no enemy resistance to be met in the air (such as might have been provided through the use of aircraft carriers).

An excellent example of the effective commitment of fighter-bombers is also provided by the crossing of the Neva River (near Leningrad) executed by the I Army Corps during the summer of 1941. Here, too, the fighter aircraft of the VIII Air Corps, employed as fighter-bombers, played a significant role.

According to General der Flieger R. Meister, Retired, at that time Chief of Staff of the VIII Air Corps, the single-engine fighters and twin-engine day fighters were assigned the task of preparing and supporting the crossing. After a preliminary bombardment by bombers and dive-bombers, a bombardment which was designed to bring the Russian defenders on the other side of the river to the breaking point--both physically and psychologically--the fighter-bombers were ordered to hold down enemy fire, during the boat-crossings and landing of the



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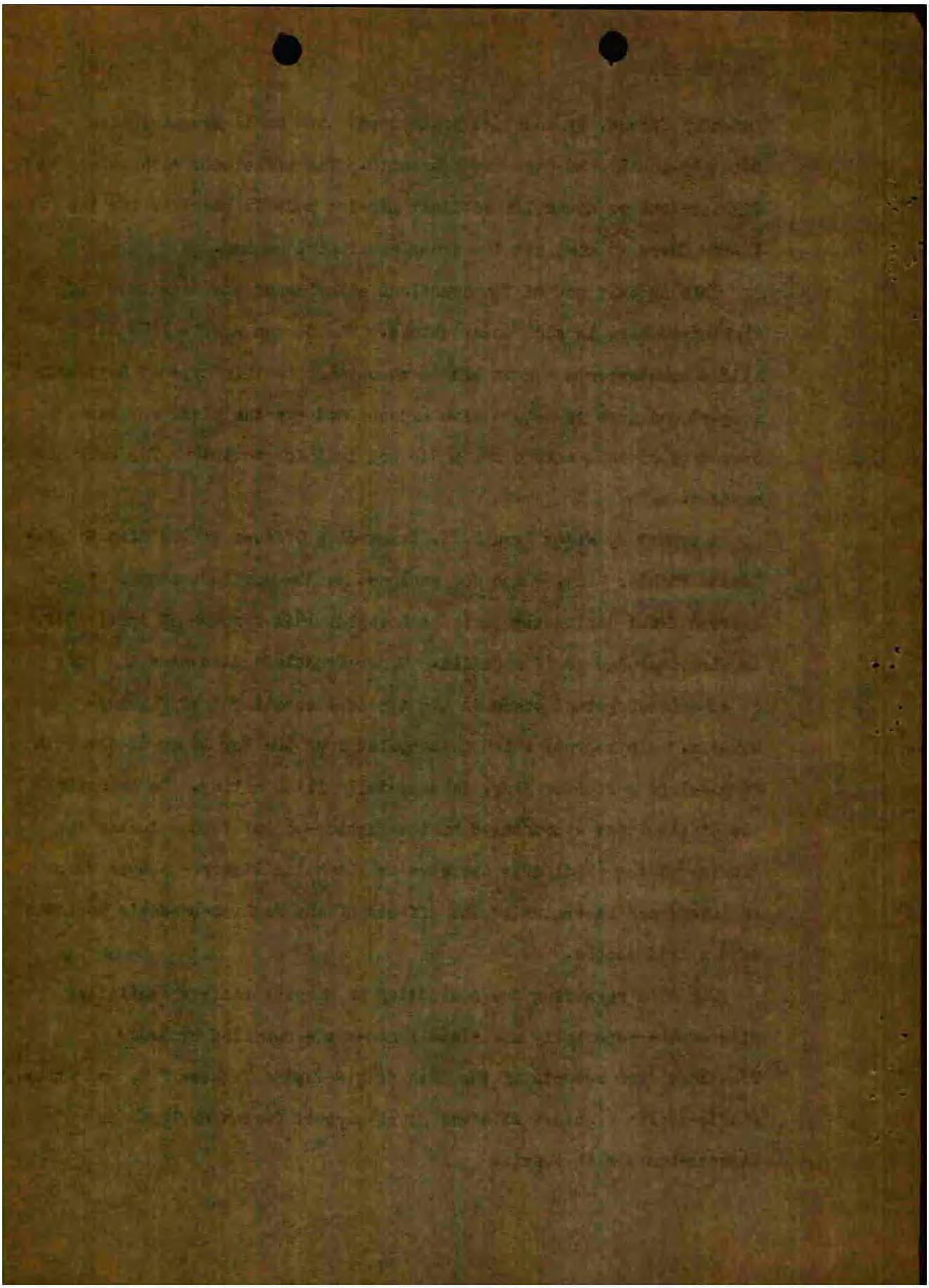
infantry forces, by constant bombardment with small fragmentation bombs (5 pound) and airborne armaments. The efficiency with which the fighter-bombers accomplished their mission made it possible for the I Army Corps to complete its crossing without mishap.

This is only one of the countless examples of the commitment of fighter-bombers in such undertakings. The German Army - like its Allied counterparts - soon became accustomed to this type of Luftwaffe support and grew to regard with a jaundiced eye the plans for any operation of this nature which did not include provisions for such air support.

A report by Major Trautloft, Commanding Officer of the 54th Single-Engine Fighter Wing, which was assigned to the northern sector of the Eastern front during the period 1 November 1941 through 30 April 1942, is also included as an appendix. Major Trautloft discusses the body of experience gained there in the tactical commitment of fighter-bombers. His report, which he compiled from the War Diary of the 54th Single-Engine Fighter Wing, is especially illuminating. He describes the difficulties encountered by the fighter-bomber forces during the Russian winter (1941/42); the ways in which the fighter-bombers were employed; and he evaluates the effects of the fighter-bomber's position as a hybrid weapon.

The data regarding the combatting of Russian railway facilities with bombs--especially nose-fuse bombs--were compiled by Major Trautloft from reports of the 54th Single-Engine Fighter Wing and other single-engine fighter units and close-support forces employed as fighter-bombers in Russia.



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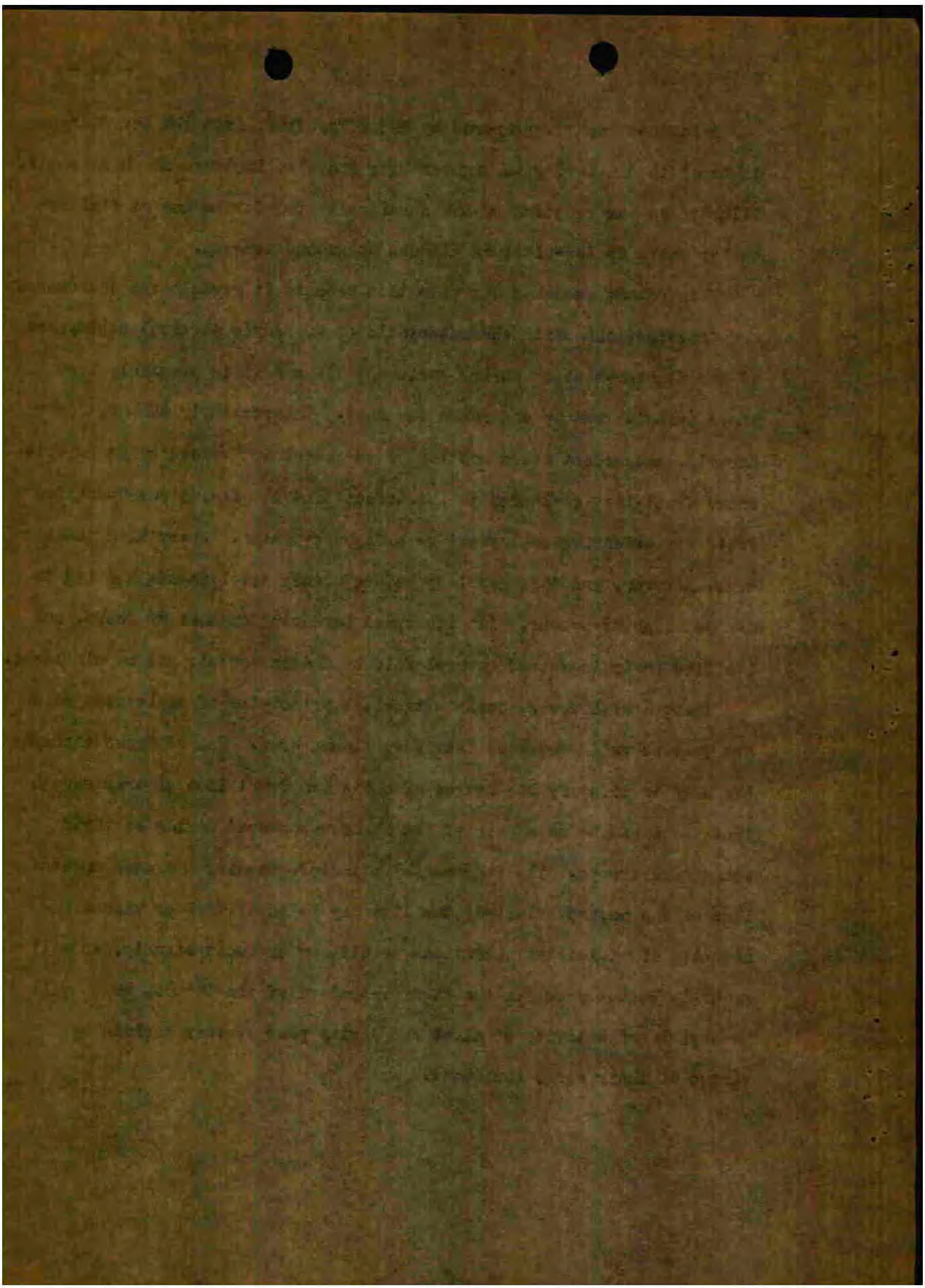
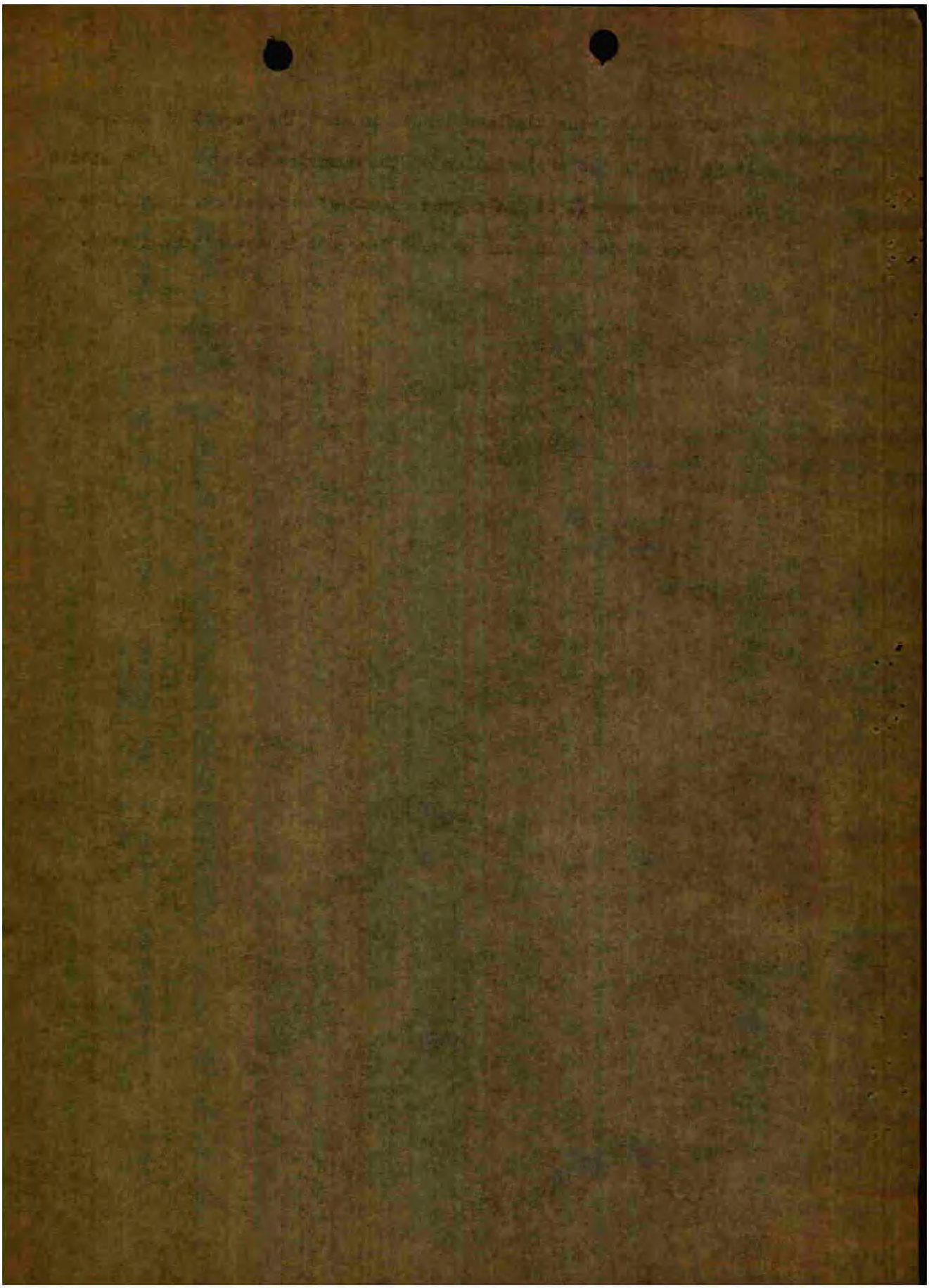
A further report, prepared by Major Trautloft from the War Diary of the 54th Single-Engine Fighter Wing and also included as an appendix, illustrates the reaction of the Russians to the German use of fighter-bomber units in low-altitude attacks on ground targets.

This report deserves our attention because it reveals the weaknesses and imperfections still characteristic of Germany's tactical employment of the fighter-bombers during World War II, and it is precisely from these defects that we can learn the most. Interestingly enough, for example, the report makes mention of the complaint voiced by an experienced front-line commander to the effect that the Me-109 was "much too fast" for effective employment as a fighter-bomber. Everything takes time, however, and this was long before modern developments had led to the jet fighter-bomber, with its speed bordering on that of sound, and its fire power increased several-fold by modern rockets and napalm bombs.

There are, however, certain timeless principles of employment which are just as valid today as they have always been. One of these concerns the need to identify the course of one's own front line clearly enough that there can be no chance of the fighter-bombers' firing at their own ground troops. The fundamental principle remains the same regardless of the method selected; the line may be identified by visual signals, if visibility conditions permit, or by radio signals, as will probably be the case for the fighter-bombers of the future, which will be capable of activity at night and during poor weather periods by virtue of their radar equipment.



Another of these timeless tenets is that the secret of success always lies in the exploitation of the surprise factor. If an action can be kept secret, it has a good chance of succeeding, regardless of the degree of technological prowess inherent in the attack itself.



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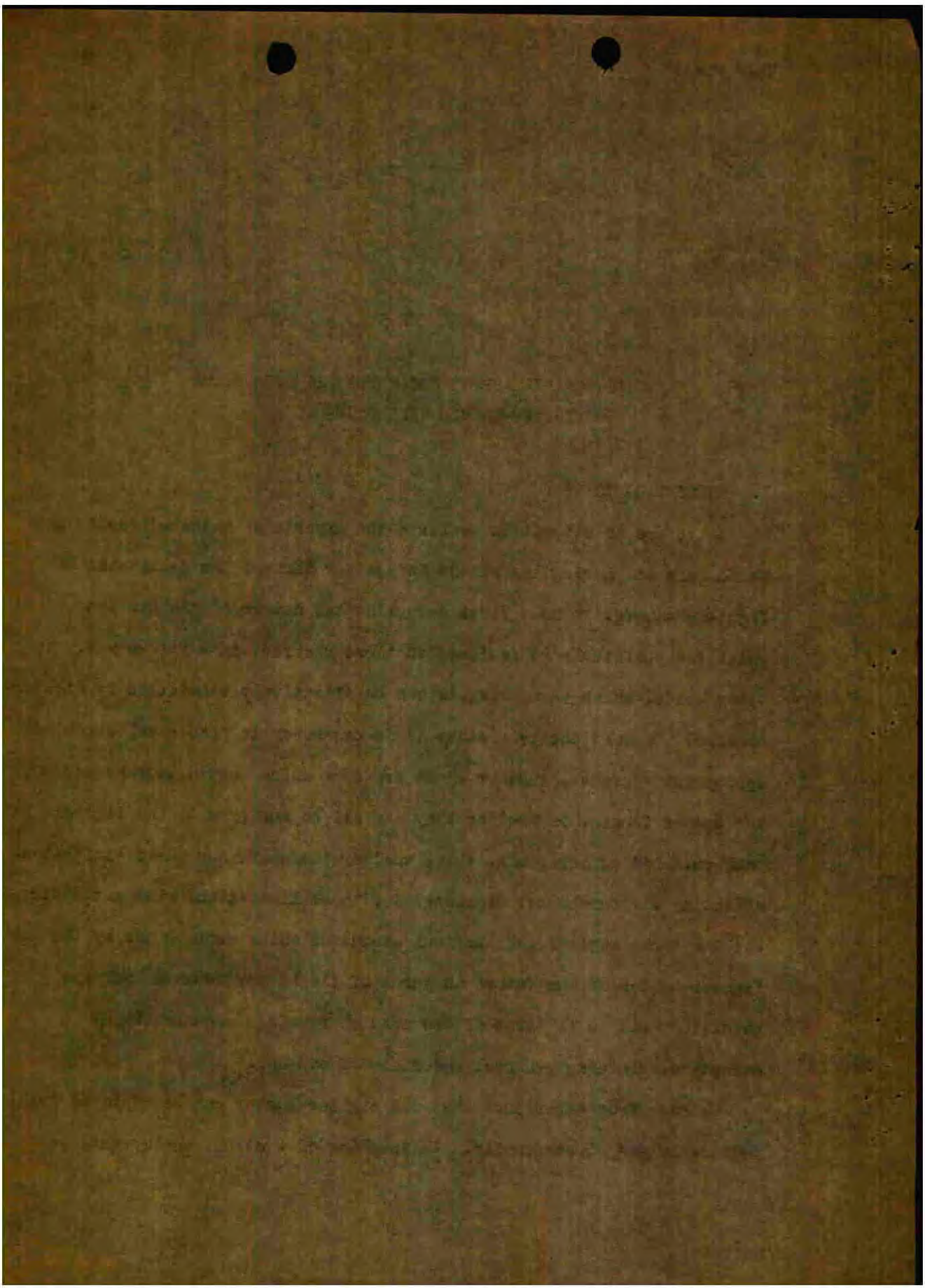
CHAPTER 3

LESSONS FOR THE FUTURE REGARDING THE CONDUCT OF FIGHTER-BOMBER OPERATIONS

I. ENEMY TARGETS

If we are to attempt to evaluate the experience gathered during both World Wars and during the recent Korean War through the commitment of fighter-bombers, we must first determine the nature of the missions which can profitably be assigned to these aircraft in a future war. In other words, which enemy targets can be effectively eliminated by fighter-bombers? We must decide whether it is necessary to make a selection of appropriate targets, whether there are some which should be reserved for the bomber forces, or whether they can all be assigned to the fighter-bombers. Let us ascertain, then, whether there are any basic limitations affecting fighter-bomber missions; for these limitations will automatically set the technological and tactical standards which must be met by the fighter-bomber of the future in terms of flight performance and fire power, as well as in terms of the most appropriate organizational structure, training program, and chain of command.

We know from experience that the fighter-bomber can be employed both tactically and strategically. In speaking of tactical employment, we



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must distinguish between missions carried out over the battlefield itself (usually an area of approximately 20 miles in depth) and missions carried out in the over-all tactical area of operations (to be defined as an area extending up to 65 miles beyond one's own front lines).

The following targets on the battlefield can be effectively combated by fighter-bombers: infantry targets, either engaged in mobile warfare over the terrain or occupying stationary positions; heavy infantry weapons; improvised shelters or bunkers; field headquarters and command positions; communications facilities; artillery targets such as gun batteries in movement or in firing position; observer posts, both elevated and on the ground; tanks, in action or standing by; all troop movements on the battlefield; troop assemblies preparatory to an attack; bridges at river crossing points; boats; flame-throwers; and, as a matter of fact, all living targets, in motion or at rest, under cover or on open terrain, in attack formation or in retreat.

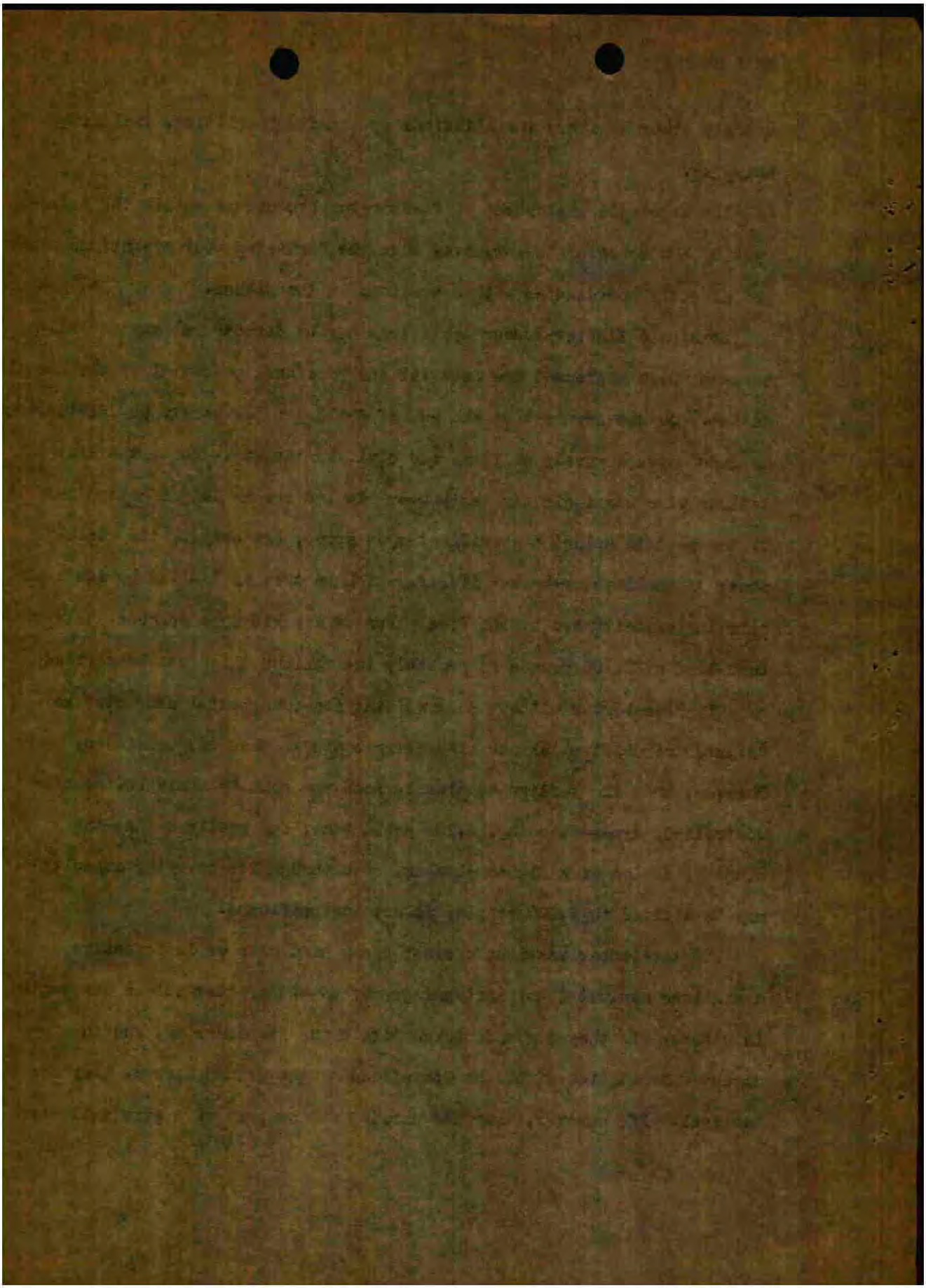
Fighter-bombers may be effectively employed against the following targets within the over-all tactical area of operations: enemy traffic on highways, roads, country paths, in tank assembly ditches, or in wooded areas; troop assemblies and advancing or retreating troop columns; troop concentrations on highways, on open terrain, in wooded areas, and in villages and towns; all railway traffic, on open stretches as well as at railway depots; troop assemblies at railroad stations or while entraining or detraining on open stretches; vehicle parks; tank parks; field or staff headquarters; supply dumps; ammunition, fuel, or food storage points; troop billeting areas; communications facilities; engineer depots;

and all other military installations or traffic facilities, including shipping.

The strategic employment of fighter-bombers occurs within the framework of a strategic air war, i.e. when the fighter-bomber operations are not directly coordinated with operations on the ground.

Strategic fighter-bomber operations may be directed at any and all targets which represent the materiel and personnel potential of the hostile nation. As was apparent at the end of World War II, hardly any distinction is made between purely military and civilian targets. Thus, the limitations of a strategic fighter-bomber mission are no longer determined by the need to select a specific target group, but only by the striking power of the fighter-bomber itself, which in turn is limited by its bomb-carrying capacity and by the fire power of its airborne weapons. A bomb-load of 2,200 pounds is probably the maximum which can be carried by a fighter-bomber without jeopardizing its fundamental character as a "fighter aircraft which can also carry bombs". When one considers, however, that the Italian battleship Roma was sunk by a single, remote-controlled, armor-piercing, 2,200 pound bomb, one realizes that the scope of action of a fighter-bomber, even though its carrying capacity may be limited to 2,200 pounds, is not insignificant.

Fighter-bomber missions against enemy airfields or in defensive operations against enemy airlandings may be either tactical or strategic in nature. If they are undertaken within the framework of, and in direct coordination with, the operations of the ground forces, they are tactical. If, however, they are carried out as part of a strategic air



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war without direct coordination with ground operations, then they must be termed strategic. The same is true, of course, of airlanding operations undertaken by one's own side.

II. CHAIN OF COMMAND, ORGANIZATION AND TRAINING PROGRAM

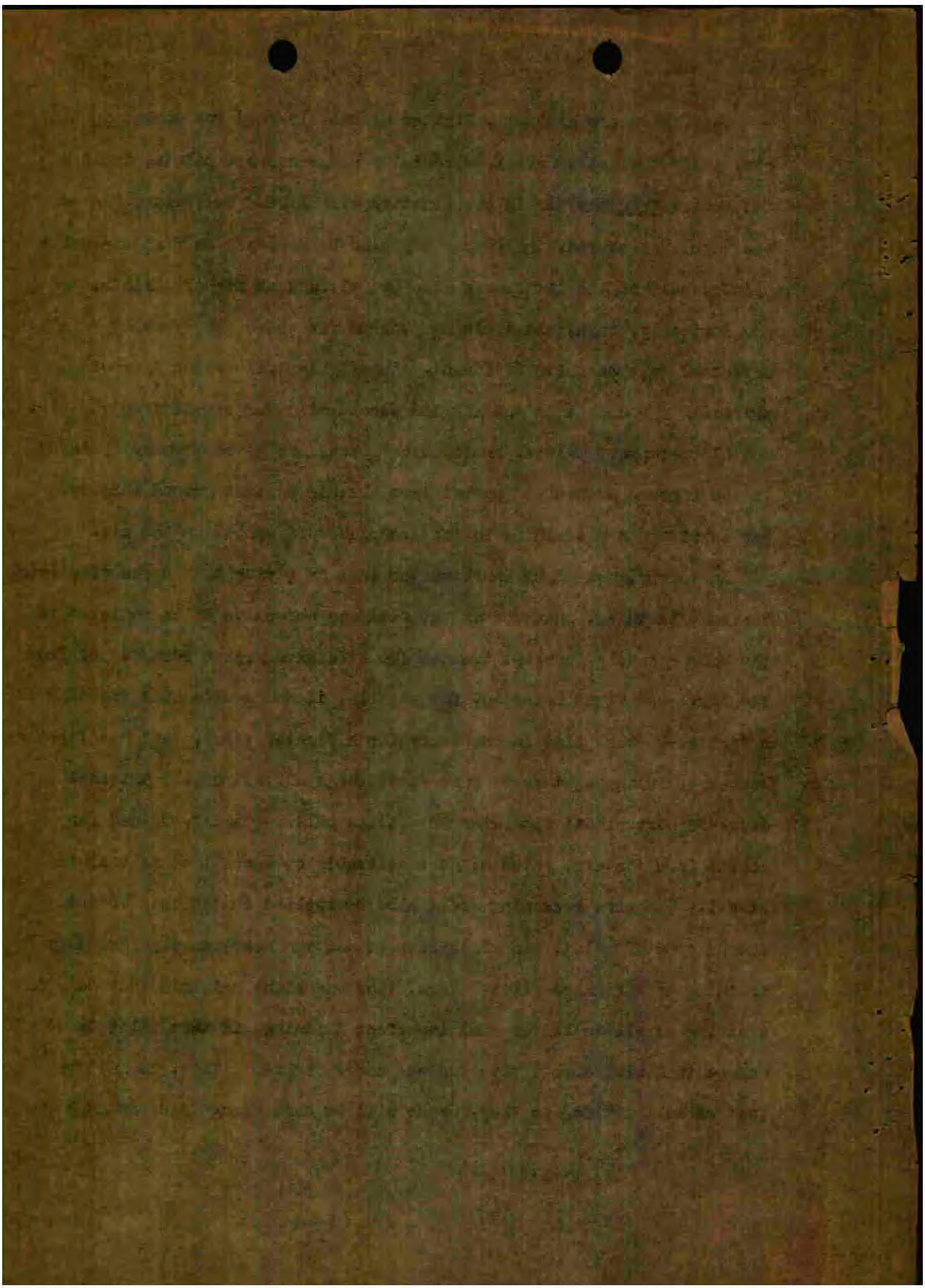
If we are to reach a definitive appraisal of the fighter-bomber problem, we must first decide just which forces are to be designated by the term fighter-bomber. As the definition established at the beginning of this study indicates, the fighter-bomber concept incorporates the two main weapons of an air force, the fighter aircraft and the bomber. If a fighter pilot is given bombs and ordered to drop them over ground targets, he has become a fighter-bomber pilot. And if a close-support pilot (regardless of the type of training he has had - as a ground-support, dive-bomber, antitank fighter, bomber, or reconnaissance pilot) after completing his bombardment assignment, is ordered to carry out combat in the air (either defending himself against attack by enemy fighters or chasing and attacking them himself) then, whether he likes it nor not, he has become a fighter-bomber pilot. The same basic aircraft type is used by both types of pilot - the single-seater fighter aircraft, modified somewhat for its employment as a fighter-bomber. Even the modifications do not constitute basic differences, however, since the only fundamental change from fighter to fighter-bomber is the addition of the weapons needed for combat against ground targets.

As regards personnel, however, there is a fundamental difference between the fighter pilot and the fighter-bomber pilot--and this difference is a very vital one.

The former are basically fighter pilots, trained for combat in the air, while the latter are fundamentally close-support pilots, trained for combat from the air in coordination with ground operations. In an emergency, of course, the former may also be employed as fighter-bomber pilots, just as the latter may also be utilized as fighter pilots.

Logically, then, the training program for these two types of personnel must be quite different. The fighter pilots are trained primarily for combat in the air and secondarily for combat from the air. The close-support pilots, on the other hand, are given primary training in the various methods of combat from the air against ground targets, and supplementary training in the techniques of combat in the air.

In theory, one might conceive the idea of giving both types of pilots the same training, inasmuch as the ultimate objective to be achieved is the same - namely, a pilot trained for offensive action both in and from the air. One might maintain, for example, if one admits that training as a fighter-bomber pilot is necessary for a fighter pilot, that his fighter-bomber training ought to be just as thorough as that of the original close-support pilot; otherwise he will be only partially trained for combat from the air, which might conceivably be worse than no training at all. The same reasoning could also be applied in the case of the second type of pilot, the close-support man who receives supplementary training as a fighter pilot. Here, too, one might maintain that no training at all is better than imperfect training: if this pilot is to engage in aerial combat with trained enemy fighter pilots, he must be just as well trained as they, or he will be shot down. And, to a

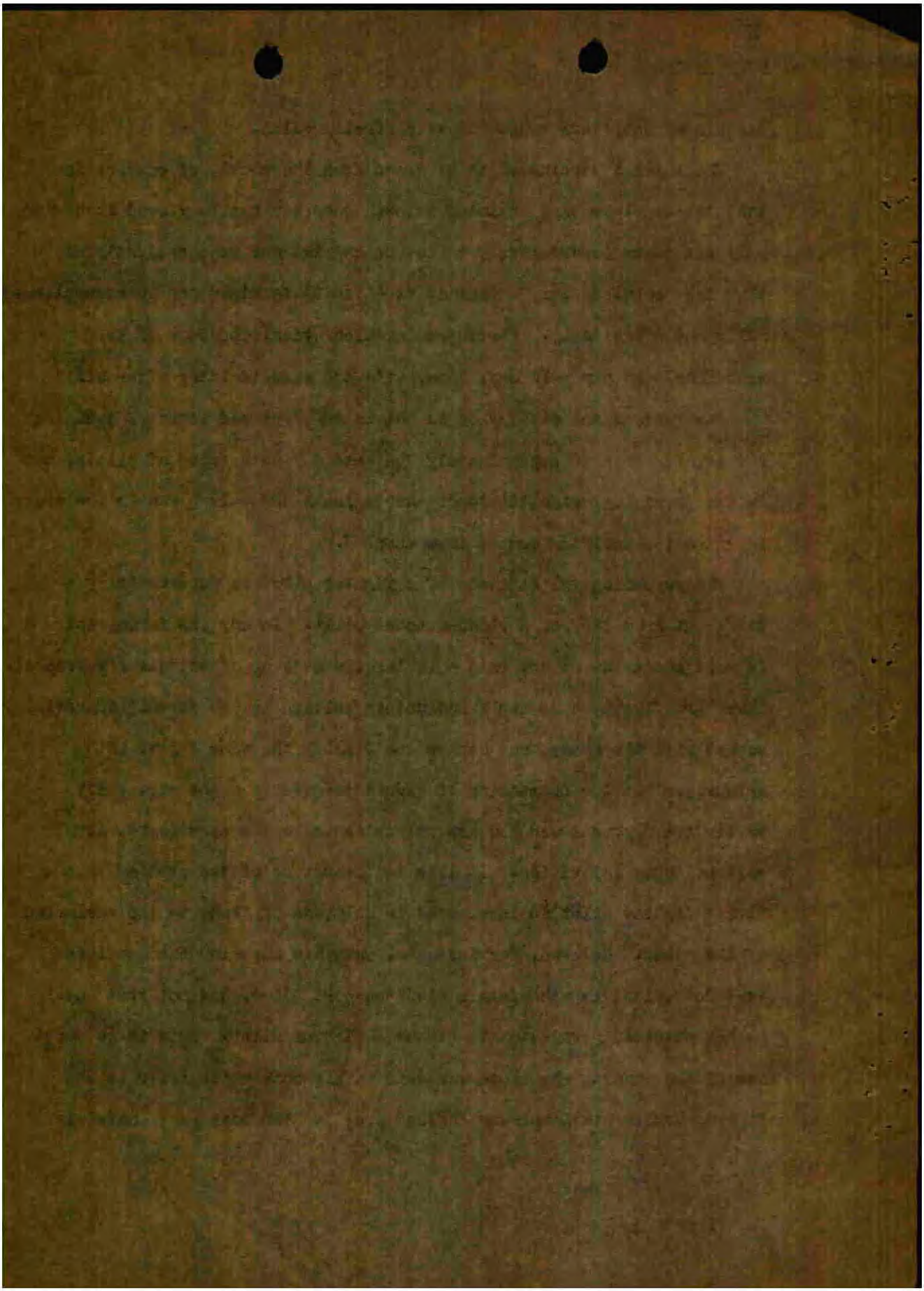


certain extent, this reasoning is perfectly valid.

The logical conclusion to be drawn from the above, of course, is that the supplementary training in each case may not be viewed as having only secondary importance, but must be carried out so conscientiously that the "supplementary" missions at which it is aimed can be accomplished fully and effectively. Whereupon our theoretical objector of the preceding page may well say, "Aha, it's the same training after all!"

The fundamental difference is not in the type and scope of training matter, for this is approximately the same for both types of pilots, but in the psychological attitude of the trainees themselves and in the order in which the training matter is presented.

The psychological attitude of a fighter pilot is fundamentally different from that of a close-support pilot. In any air force, which - in most countries at any rate - is largely made up of volunteer personnel, there are flyers whose whole enthusiasm belongs to the pursuit of aerial combat with the enemy, and others who display the same degree of enthusiasm for the combatting of ground targets from the air. Only rarely are flyers found who are enthusiastic to the same degree about both of these activities. It lies in the nature of the problem that a "born" fighter pilot is interested in only one of them, to the exclusion of the other. Galland, for instance, whom his superior headquarters were determined to make into a close-support pilot, did not rest until he had obtained permission to become a fighter pilot. This is no doubt one of the reasons why those comments in his book which refer to the fighter-bomber missions over England are, for the most part, unfairly



critical. Weiss, on the other hand, is such a passionate close-support pilot that he rejects completely the fighter-bomber concept and insists upon remaining a close-support man.

Just as the psychological attitudes of the fighter and close-support pilots are different, the order in which their fighter-bomber training is presented must also be different. The fighter pilot must be trained first for fighter activities, and this training must be complete and thorough. Not until he has mastered this phase of his training should he be given the supplementary course in the missions of a fighter-bomber pilot.

In the case of the close-support pilot, the situation is reversed. For him the fighter-bomber training must come first, and must include all the techniques required in tactical commitment within the framework of ground operations, so that he may be capable of carrying out successful combat from the air at any time. Achievement of this objective presupposes not only adequate flight training but also the acquisition of familiarity with the techniques employed in the ground operations themselves. The close-support pilot must be versed in ground tactics, he must know his own ground forces, and he must be able to estimate in advance the probable behavior of the enemy ground forces. In short, his training must fit him to keep the battlefield under continuous surveillance, to recognize promising targets when he sees them, and to use his tactical training in distinguishing between his own troops and the enemy forces. This goal can be achieved only by means of frequent practice drills together with the ground forces and by periodical

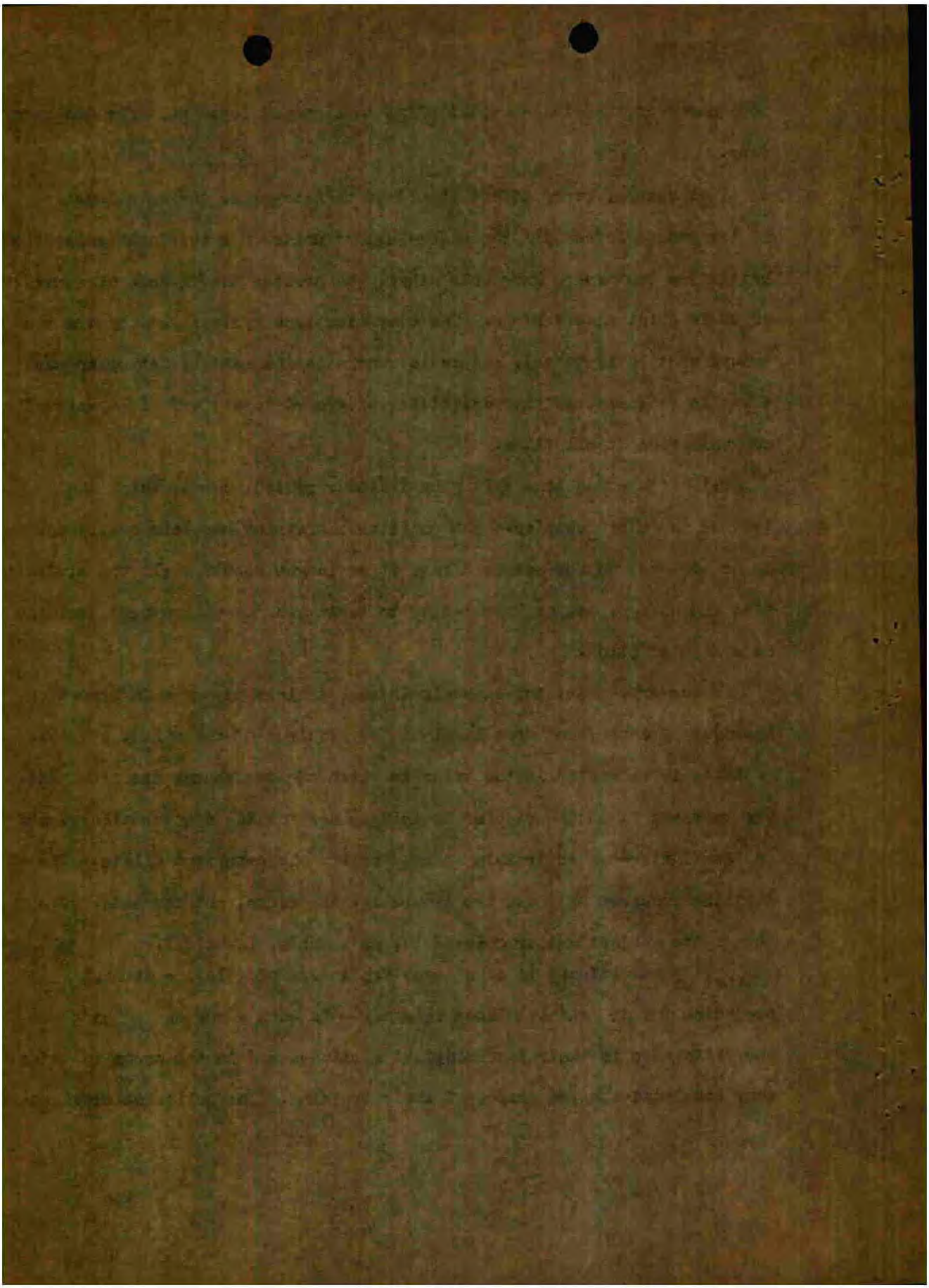
assignment of the close-support pilot to a ground force unit for temporary duty.

Furthermore, every effort should be made to place the relationship of the ground forces and the close-support units on a personal basis; the better the two groups know each other, the greater the chances of success of their joint undertakings. The communications systems used by the two groups must be identical, and radio communication must be set up in such a way as to guarantee the possibility of ground-to-air and air-to-ground communication at all times.

All of this requires a lengthy training period, during which the trainee is fully occupied. Not until this training has been completed, or is at least so far advanced that it no longer requires all the student's time and energy, can he be expected to begin his "supplementary" training as a fighter pilot.

In summary, then, the emphasis in each training program is placed on the type of employment most likely to be required of the pilot, and this emphasis is reflected in the order in which the two phases are presented. The emphasis is on the fighter training phase for the fighter pilots, and on the fighter-bomber training phase for the close-support pilots. The training received by these two groups is, therefore, not the same, even though the subject matter covered is, as a whole, identical.

Let us now attempt to name these two groups of pilots - without prejudice for or against either category - in such a way as to bring out the difference in their psychological attitudes and in the order in which they completed the two phases of their training. The following distinction



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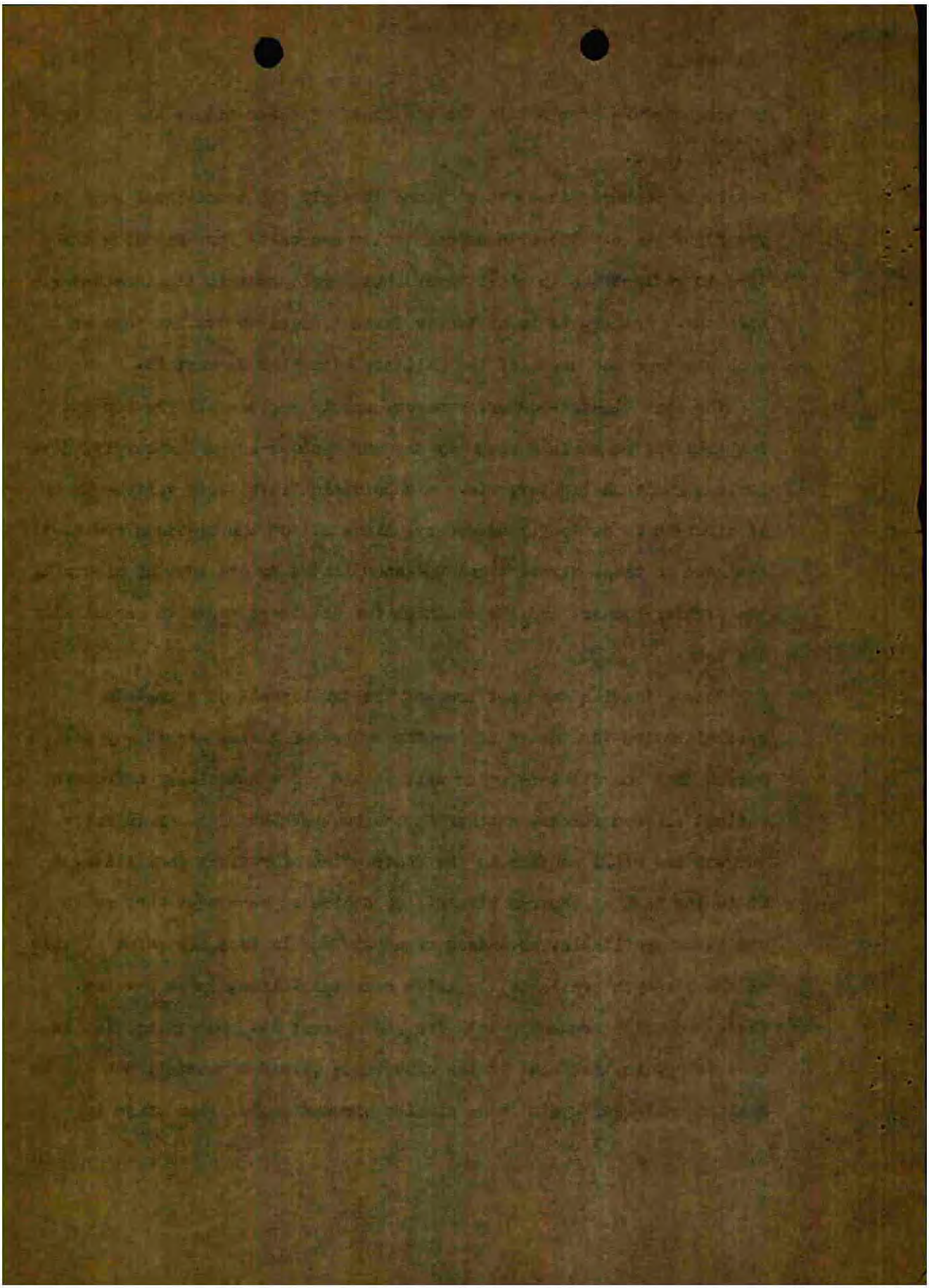
in nomenclature is probably the simplest: fighter pilots and fighter-bomber pilots.

It is perhaps wisest to continue to apply the traditional name to the first group. There is no particular necessity for expanding the term to reflect the possibility of their employment in fighter-bomber missions. Rather, it is up to air force leaders to utilize them as such whenever the needs of the military situation warrant it.

The term fighter-bomber, however, should include all the concepts formerly expressed in Germany by the words close-support aircraft, dive-bomber, antitank fighter, etc. A subdivision into these various types of aircraft is no longer necessary, since all of the missions ordinarily assigned to these aircraft can be accomplished by one type of aircraft, the fighter-bomber, and the training for all these tasks is essentially the same.

This situation need not prevent the development of a certain specialization in mission during the course of a war, and it may well happen that one fighter-bomber unit should prove especially effective against armored forces, another in the bombardment of enemy infantry targets and still another in the destruction of railway facilities. It is the task of command elements to decide in each case whether or not it is profitable, or indeed even permissable from the point of view of the strength available, to allow such specialization to develop. There are valid arguments both for and against it. Specialization is a good thing, in that none of the experience gained is wasted, but can be applied again and again under similar circumstances; also there is



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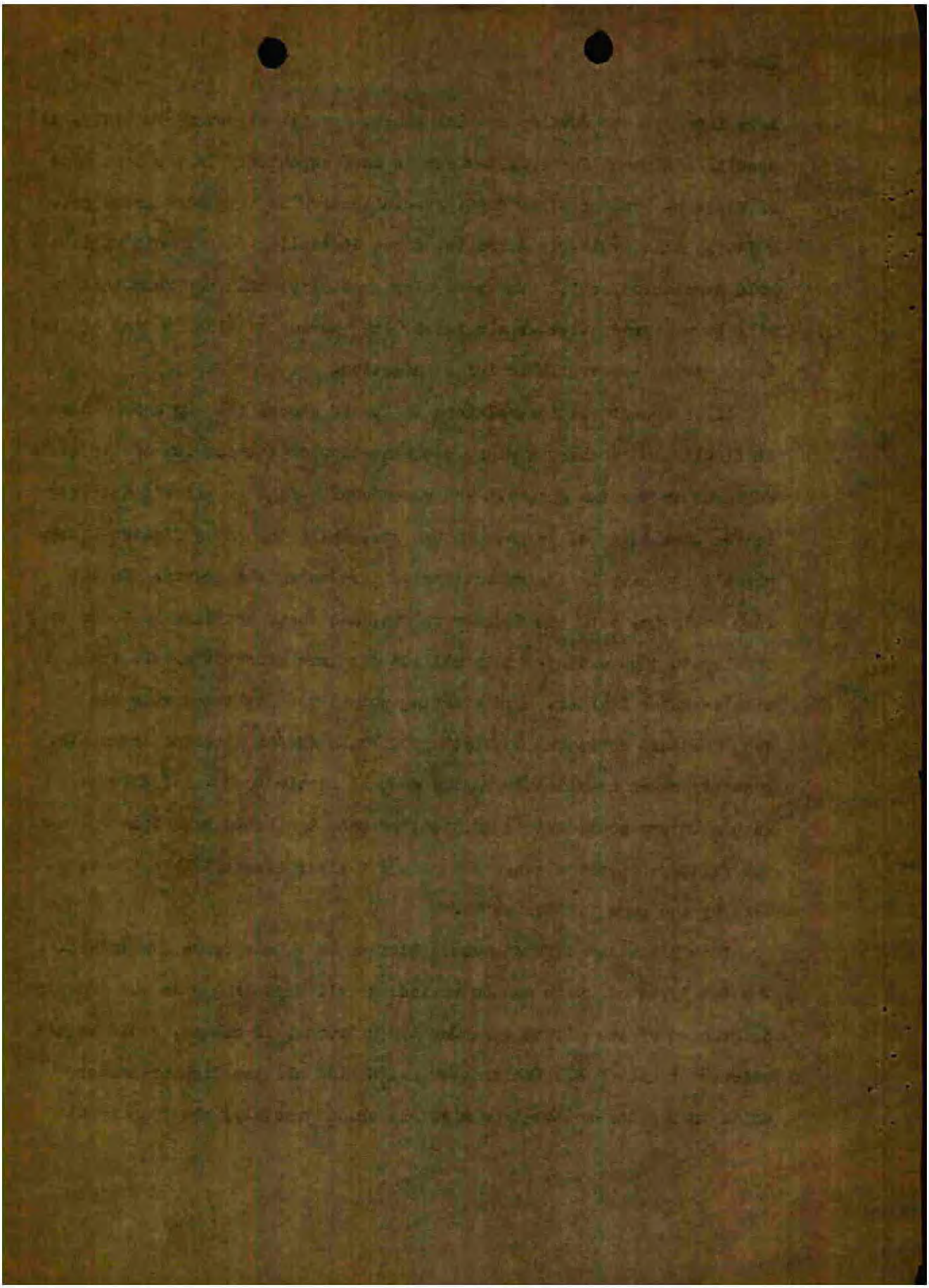
more incentive to develop special bombs, special airborne armaments, and special equipment for a unit which is used repeatedly in the same type of mission. On the other hand, specialization of this sort presupposes a fairly high available strength, since it implies that a unit will be held available for its own particular specialty; this may mean that it will be non-productive over a fairly long period of time if none of its target types are available for elimination.

If we accept the nomenclature suggested above, then we should have no difficulty in reaching a clear determination of the essence of the tasks assigned to the two groups. The essence of a fighter pilot's activity is the combatting of targets in the air, while that of a fighter-bomber pilot's activity is the combatting of targets on the ground. In the last analysis, both are fighter pilots, and their activity is bound to overlap to some extent. Both utilize the same aircraft model, the single-seater fighter, as a starting point; the fighter-bomber has supplementary equipment consisting of bombs and/or airborne armaments, possibly non-conventional weapons such as napalm bombs. If this supplementary equipment is omitted, or once the bombs have been released, the fighter-bomber is again a standard fighter aircraft like the ones used by the pure fighter units.

This situation offers immense advantages to air force commanders. The two types of units can be varied at will depending upon the momentary exigencies of the situation. The two extremes, of course, would be the concurrent use of all the fighter units plus all the fighter-bomber units in fighter-bomber-type missions or, conversely, the concurrent



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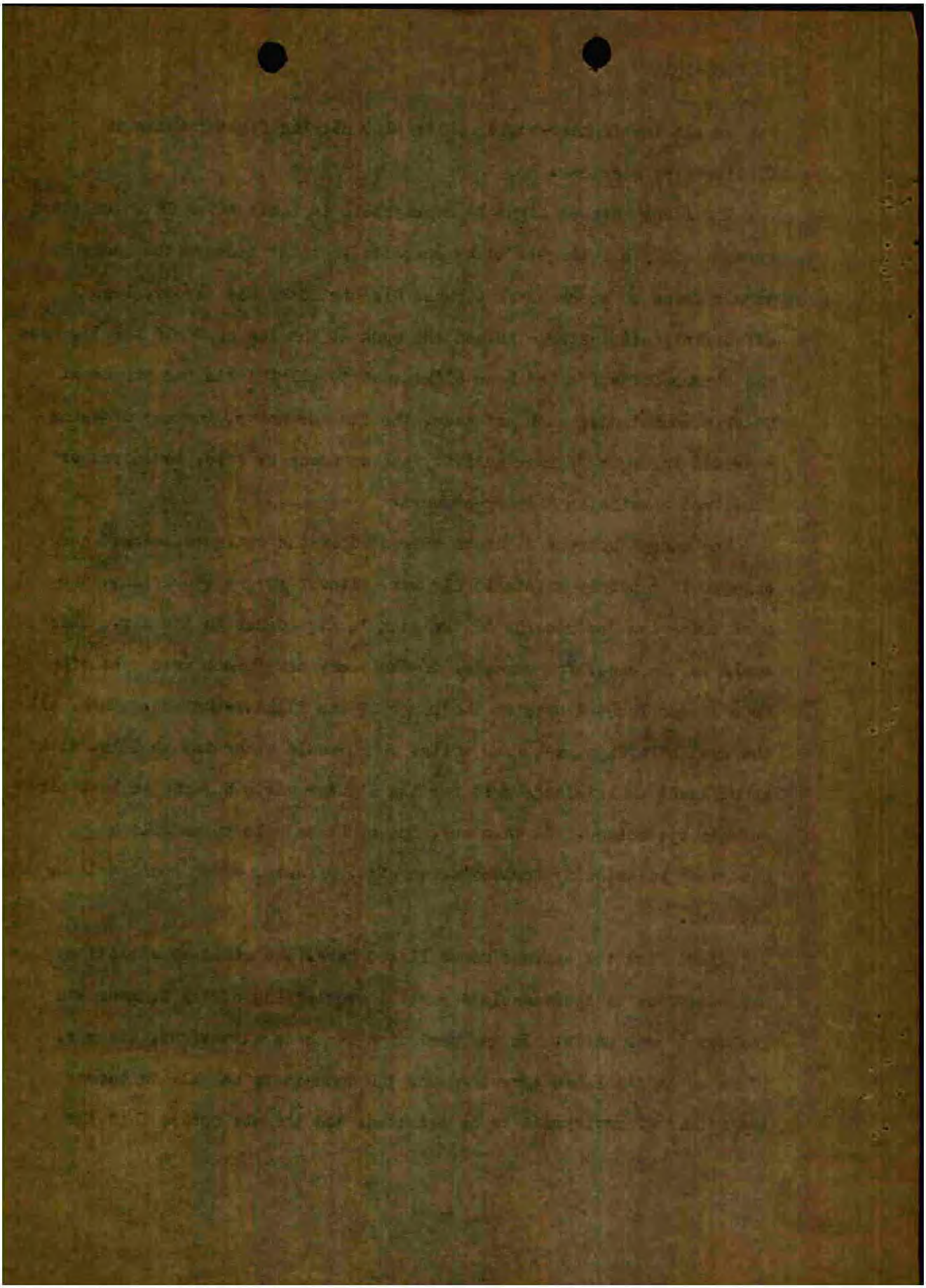
use of all the fighter-bomber units plus all the fighter units in fighter-type missions.

The first extreme might be appropriate in a situation in which there were no enemy air targets to be combatted, either because the enemy had no air force to speak of or because his air force had already been effectively eliminated - as was the case at the end of World War II, when the German Luftwaffe had been eliminated to all intents and purposes. Under circumstances such as these, the fighter units, instead of being reserved for pure fighter activity and standing by idle, could render excellent service as fighter-bombers.

The second extreme might be warranted if the nation concerned were engaged in a purely strategic air war, without ground operations, the goal being the destruction of the enemy's air forces in the air. This would be the case, for example, if the enemy air forces were operating from a base located outside the range of the fighter-bombers. Then, all the available fighter-bomber units, which would otherwise be idle, might be utilized as reinforcements for the fighter units engaged in home air defense operations. In this way, one might be able to establish numerical superiority for one's own side, a factor which could well be decisive.

Apart from the extreme cases listed here, the military situation may sometimes make advisable a partial overlapping of the fighter and fighter-bomber units. In any variation of these situations, however, it is an incalculable advantage for the command to be able to choose the method of employment to be selected, and thereby assure that the



available forces will be committed for maximum effectiveness.

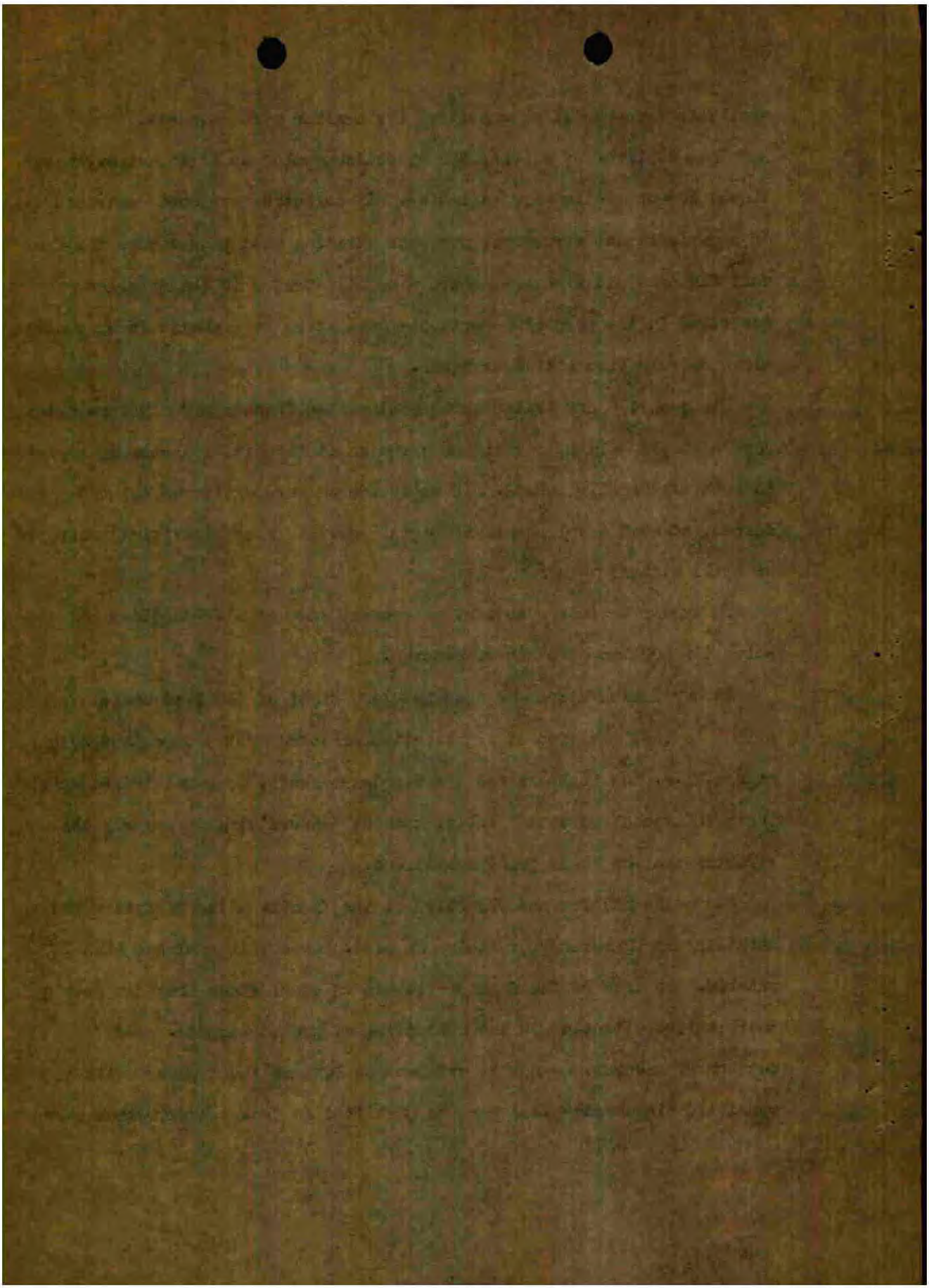
This implies, of course, the establishment of an efficient organizational set-up at the very beginning. In selecting the most desirable type of organizational structure, due consideration must be accorded the fact that fighters and fighter-bombers - as illustrated in the examples described in the preceding section - must often be employed in exceedingly close coordination with each other.

The question now arises as to whether the fighter and fighter-bomber forces should belong to a single organizational unit or should be organized in separate parallel units. If we decide on integration of the two forces, at what level should it begin? group? wing? division? corps? or still higher?

In answering this question, of course, we must also consider and solve the problem of chain of command.

In our deliberations we must not lose sight of the fundamental principle that the type of organization selected must assure that both groups, i.e. the fighters and the fighter-bombers, be permitted to develop their individual potential fully, without jeopardizing in any way the effectiveness of their joint commitment.

It is the mission and objective of the fighter units to attain and maintain air supremacy for their own side. Once this goal has been reached, the task of the fighter-bombers is easy, since they can devote their entire attention to the combatting of ground targets. Air supremacy, however, cannot be attained as long as the fighter units are committed piecemeal - they must be committed in mass concentration over



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the battlefield. Accordingly, the organizational set-up must make such concentrations possible at any time. This can only occur if the fighter and fighter-bomber forces are not integrated, but are organized into separate units at operational level.

The size of the unit depends, of course, on the strength of the available forces. On the basis of past experience, one may safely assume that every army* will need a close-support air fleet in order to fully exploit the potentialities inherent in air force intervention in ground operations.

The close-support air fleet, in turn, should be composed of one close-support air corps and one close-support fighter corps.

A close-support air corps should consist of two or three close-support air divisions. One could, of course, also call it a close-support fighter-bomber corps or simply a fighter-bomber corps; however, since there are also long-range bomber units, which may be employed with an escort composed of long-range fighter-bombers, the author feels that it is less confusing to retain the term close-support air corps.

A close-support air division should be composed of the following: two or three reconnaissance groups (equipped with fighter-bomber aircraft in order to enable them to carry out both close-range and long-range armed reconnaissance), two or three fighter-bomber wings, and one night and all-weather fighter-bomber wing.

A close-support fighter corps should consist of two or three close-support fighter divisions.

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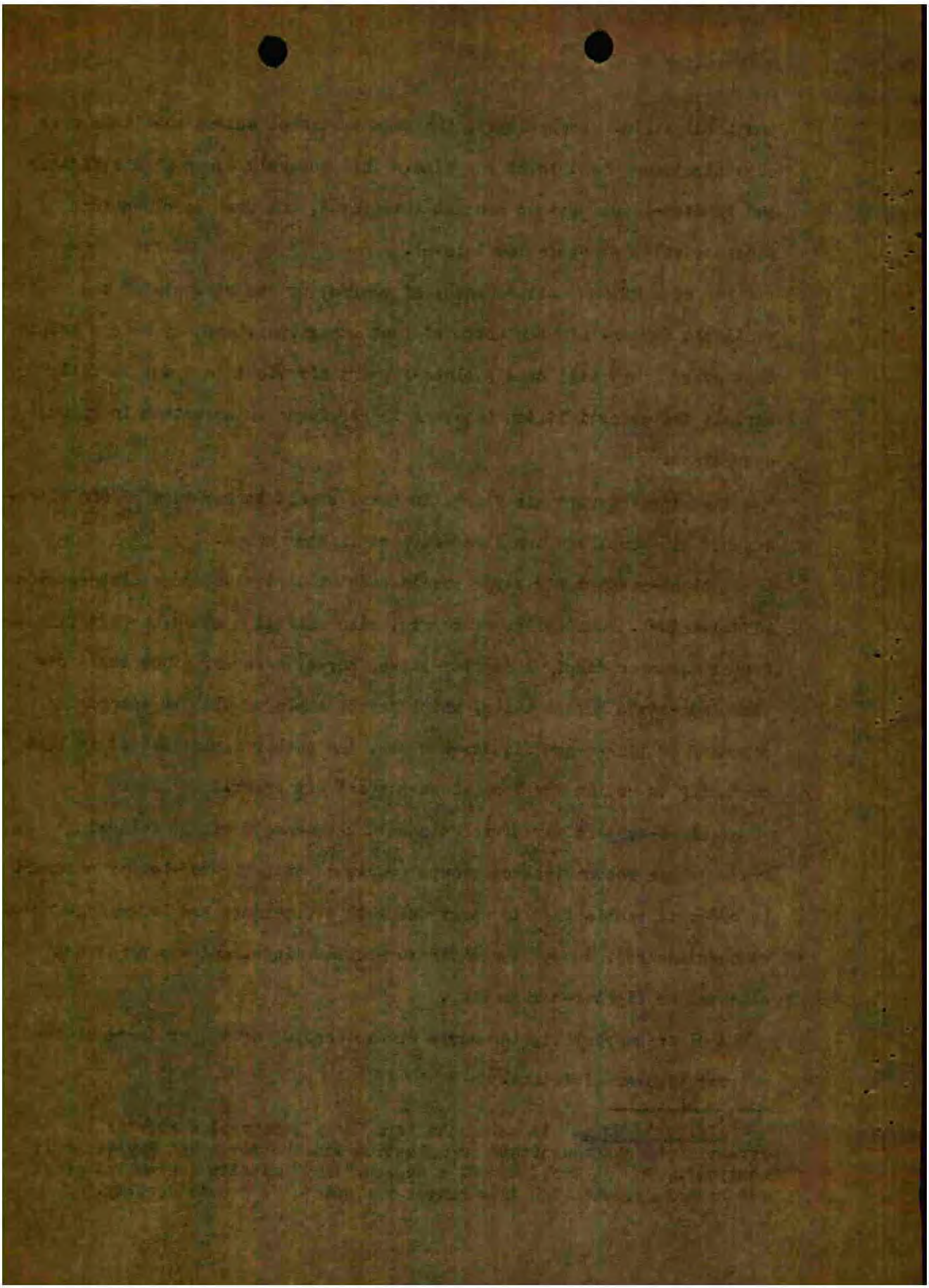
*Editor's Note: In using the term "army", General Kammhuber is referring to a headquarters organization and the corps and divisions it controls. During World War II a German "army" usually controlled about ten divisions, although this number was apt to vary considerably.



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A close-support fighter division should be composed of the following: two or three day fighter wings, one night and all-weather fighter wing, and the usual supporting units (aircraft observation and reporting units, radar units, radio intercepting units, communications units, etc.).

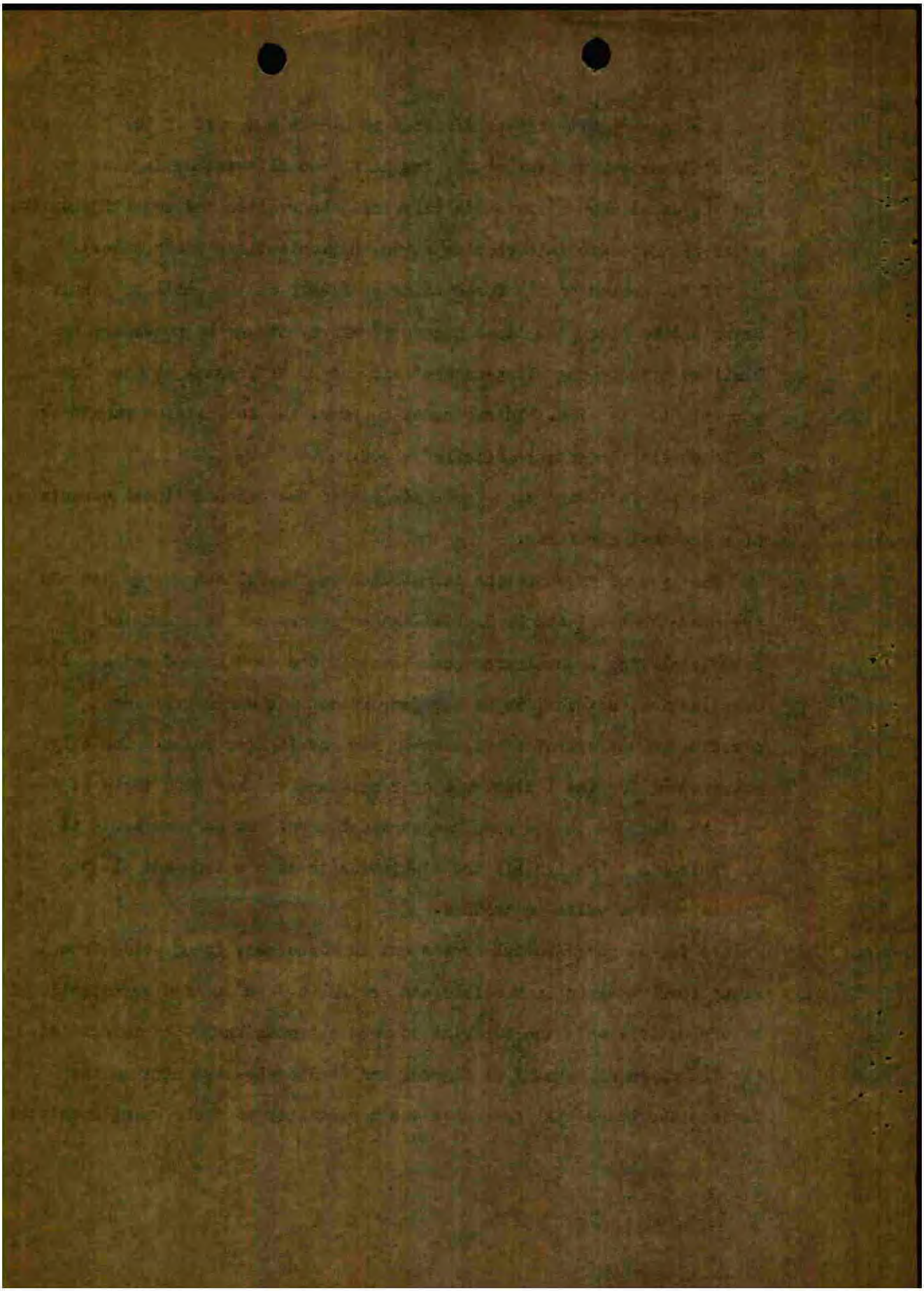
If the number of air force units available is too small to permit organization along the lines suggested above, it may be necessary to limit an army to one close-support air corps, or perhaps to one close-support air division. In any case, however, the subdivision should be analogous to the pattern detailed above.

See the following page for a diagram of the organizational structure of a tactical air force.

The type of organization illustrated on the following page has the advantage that all the available fighter forces can be assembled immediately for concentrated commitment if the need should arise. Such organization, however, in no way jeopardizes the concurrent and coordinated employment of fighter-bomber and fighter units. The only requirement for the latter type of commitment is that both types of unit be assigned to the same geographical area. In no case would it be desirable to assign all the fighter units to one area and all the fighter-bomber units to another.

As far as geographical assignment is concerned, integration from group level upwards is feasible and desirable. As regards organizational subordination, only the superior command elements should be integrated.

The mixed assignment of fighter and fighter-bomber units to the various air bases will guarantee the possibility of their being committed



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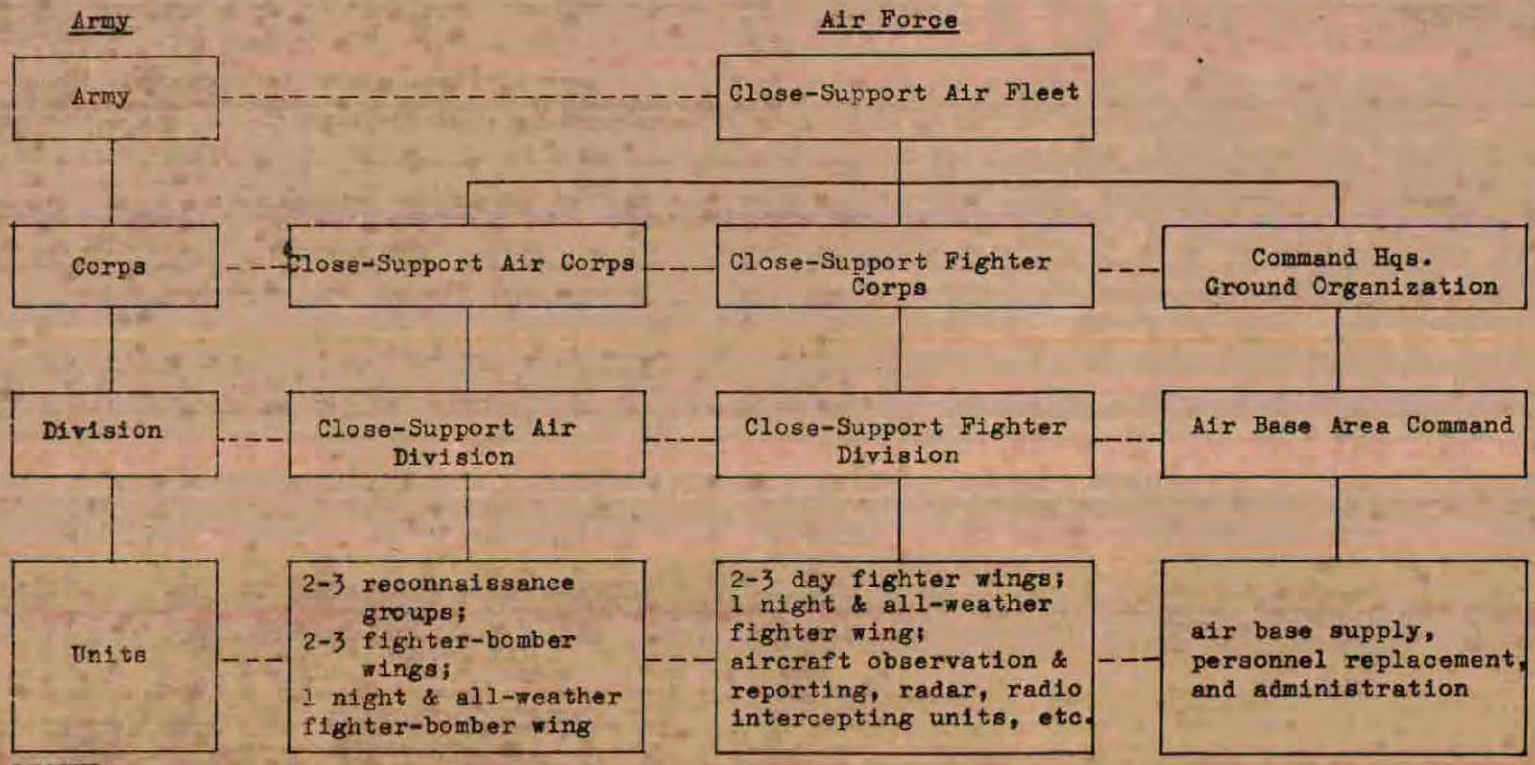
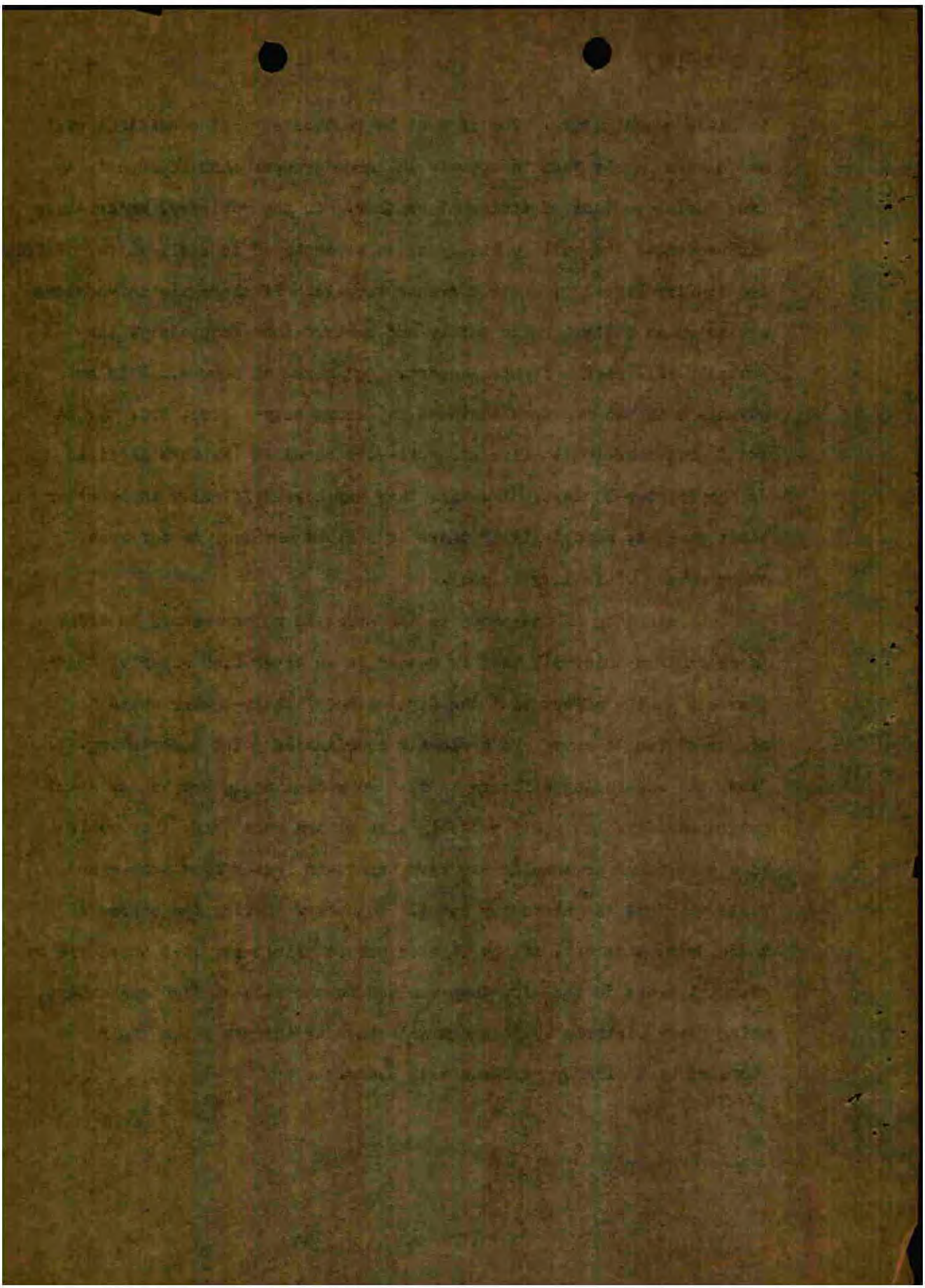
ORGANIZATIONAL STRUCTURE OF A TACTICAL AIR FORCE

(Within the Framework of an Army)



in close coordination. For it must be remembered that conditions will not always permit them to operate in large groups; this is especially true during periods of inclement weather. On the contrary, under these circumstances they will probably often be employed in small units, of from two to five aircraft, against ground targets. If these fighter-bombers are to reach their targets safely and bombard them accurately, they probably will need a fighter escort. And here, of course, it is an advantage if the fighters assigned to escort duty--these, too, may be small groups of two to five aircraft--are based at the same airfield as the fighter-bombers; otherwise they may have difficulty in locating their charges, especially if there is a cloud cover or if for some other reason visibility is poor.

Subordination of one group to the other is not necessary in order to accomplish this; all that is needed is an order from superior headquarters to the effect that the fighter and fighter-bomber units concerned are to carry out a closely coordinated joint undertaking. Since the commanding officers of the two groups would not be far apart geographically, but would probably live at the same base, they would know each other personally - a very important factor sometimes - and could work out the necessary details together. During the course of these joint missions, if the fighter escort pilots see that there are no enemy aircraft in the air, they can assume the role of fighter-bombers, using their airborne weapons against the same targets which their comrades have already attacked with bombs.



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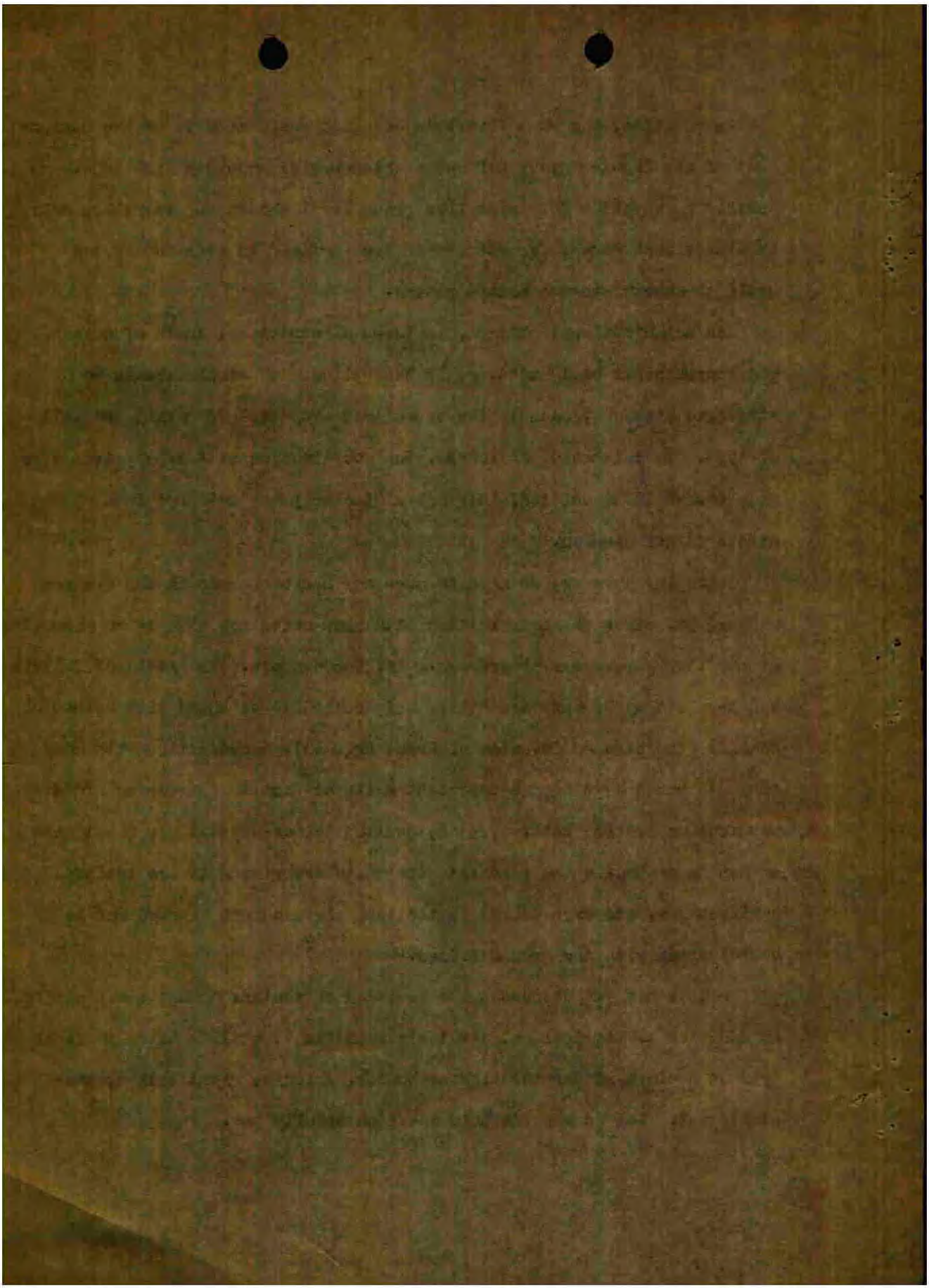
In practice, the most favorable solution would seem to be the assignment of one fighter group and one fighter-bomber group to each base. Further integration downwards from group level should be undertaken only in exceptional cases, for example if the airfield in question is too small to accomodate two entire groups.

The organizational pattern, in terms of structure, chain of command, and geographical assignment, could be applied with equal success to strategic missions, such as the operations over England during the fall of 1940. In this case, of course, the coordination with appropriate army agencies would be omitted, inasmuch as the army has no part in a strategic air mission.

There is, however, no need to make any basic changes in the diagram on page 98, since the coordination with army units may have to be resumed at any time as the war progresses. If, for example, the Battle of Britain had been won by Germany and Hitler had decided to go ahead with Operation SEALION (the planned invasion of Great Britain), coordination with army elements would have become important again as soon as the German armies set foot on British soil. The designation "close-support air fleet" was chosen to emphasize the idea that the units comprising it are trained, equipped for, and experienced in tactical air missions carried out in coordination with the ground forces.

We have not yet discussed the question of whether or not there exists, in addition to tactical and strategic commitment, still a third possible type of employment for the fighter-bomber, which we might call "grand-strategic". Let us examine this question briefly now.



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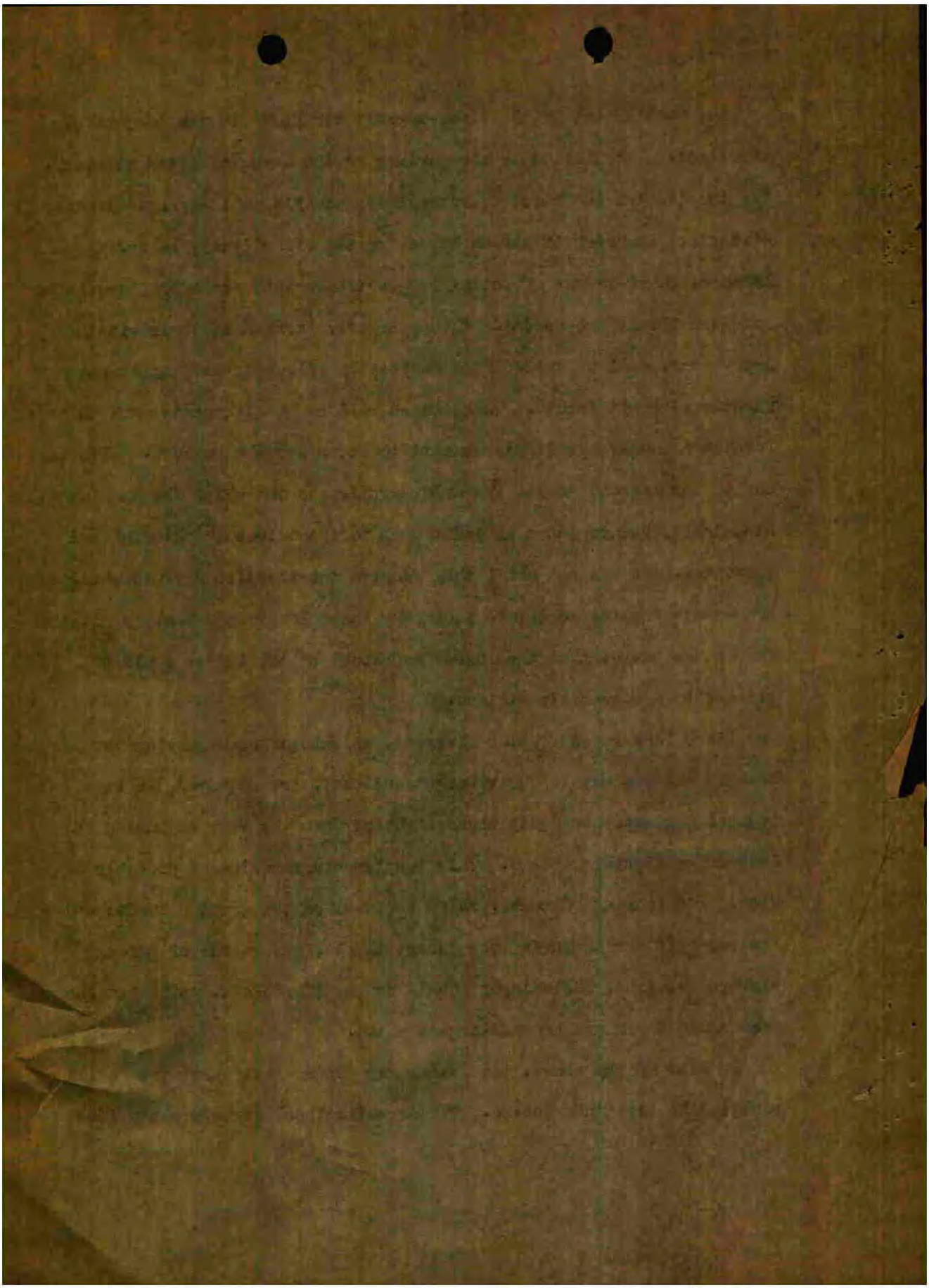
The counterpart of the close-support air fleet is the long-range air fleet. Its mission is air warfare on the level of grand strategy. Its targets are the vital sources of the enemy's military and economic strength. In order to attack these targets effectively, long-range bombers, whose radius of action is great enough to reach the targets in non-stop flight are needed. These targets, because of their vital importance, will undoubtedly be especially well protected by strong fighter aircraft forces. Thus, there will be no alternative but to furnish a long-range fighter escort to accompany the bombers. This is one of the lessons taught by World War II, and one which the Americans, especially, had to learn at great cost to themselves in materiel and personnel. It was not until they adopted the practice of furnishing a long-range fighter escort to accompany their long-range bombers all the way to the target that the losses sustained by the latter could be reduced to a reasonable minimum.

Since long-range fighter aircraft, capable of accompanying the bombers all the way to their target and back, are required, it is a logical next step to equip these fighters from the very beginning as long-range fighter-bombers. This supplementary equipment probably should not consist of bombs, which would place too great a burden on the aircraft during their long escort flight, but rather of strong airborne weapons, including a goodly number of rockets, which can be used against air and ground targets alike.

In view of the above, the reader may wonder just where the medium bomber fits into this scheme. The organizational structure provides



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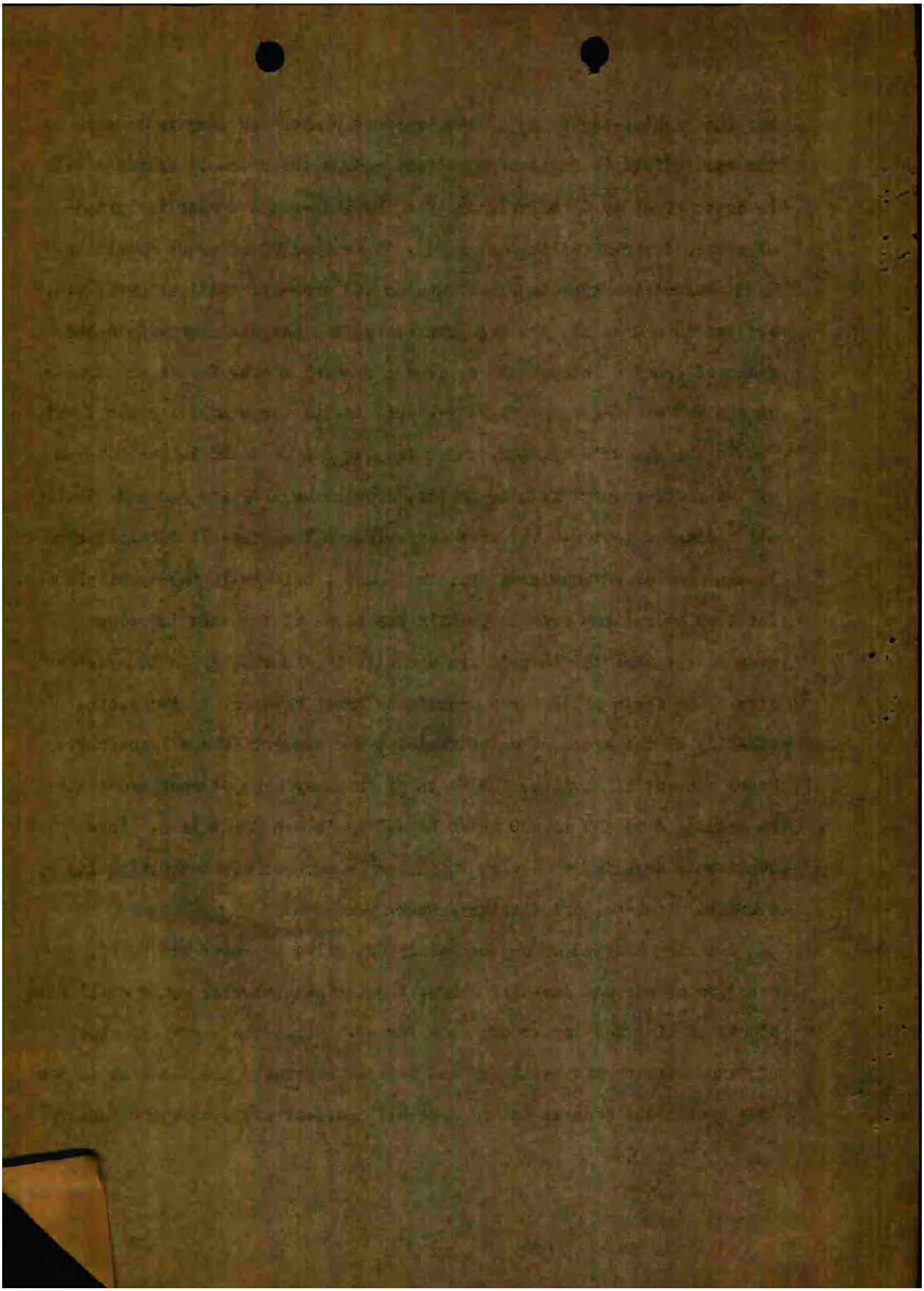
for the fighter-bomber as a close-support bomber for targets located on the battlefield (a depth of 20 miles) and in the over-all tactical area (a depth of up to 65 miles), and for the long-range bomber for grand-strategic targets (unlimited range). What type of aircraft should be used against the targets lying outside the over-all tactical area, i.e. between this area and the area containing the targets assigned to the realm of grand strategy? Do we need a special bomber for these targets, or can the close-support fighter-bomber assume responsibility for them?

In the author's opinion, these targets can be added to the mission of the close-support fighter-bomber, insofar as they are located within its radius of action. The area bordering on the over-all tactical area is the Army operations area and, in a sense, belongs to the tactical area. The Army operations area is usually the scene of the enemy's troop assemblies; thus the targets are essentially the same as in the tactical area. The depth of the Army operations area, however, is increasing steadily as the speed of motor vehicles and armored forces increases. Under present conditions, the depth of the Army area of operations must be estimated at 300 to 400 miles beyond one's own front line. This represents a radius of action which can be covered without difficulty by a modern close-support fighter-bomber.

Assuming a speed of approximately 625 miles per hour and a flight duration of one and one-half hours, a jet fighter-bomber would still have plenty of time for combat over the target. Since the enemy defenses (ground antiaircraft artillery and fighter aircraft) are the same in the Army operations area as in the over-all tactical area, a medium bomber



could not, in any case, be employed without a strong fighter escort. In addition, there would be the problem of adjusting the considerably greater speed of the fighter escort to that of the slower bomber aircraft, as well as the factor of increased danger from the enemy's ground antiaircraft artillery defenses because of the relatively slow and cumbersome flight of the bombers in comparison with the fighter escort. Moreover, during periods of inclement weather or heavy cloud cover, the bombers could not be employed at all, whereas the easily maneuverable fighter-bombers would often be able to slip through and chalk up surprise successes during such weather.

If there are strategically vital targets, such as industrial plants, power plants, traffic centers, cities, etc., located in the Army operations area, these could be attacked by units from the long-range air fleet. This fleet does not belong to the tactical air force, but is under the command of a commander in chief of the long-range air forces. However, its employment could be ordered through the commander in chief of the air force by the commander in chief of the armed forces, who would be responsible for the over-all conduct of the war. If this top-level organization functions smoothly, and the persons concerned are sincerely willing to work together rather than against one another, then, of course, there is no reason why a tactical air force might not have a few long-range units at its disposal for use against strategic targets in the Army operations area. It is inevitable that the missions of the long-range and close-support units will overlap to some extent precisely in this area of operations; this cannot be avoided, no matter

what type of organizational structure is selected. The best organization, however, is worthless if the persons utilizing it are incompetent; on the other hand, capable leaders are often able to achieve a surprising measure of success even though they may be handicapped by a poor organizational set-up. In the last analysis, success always depends upon the attitudes and capabilities of the leaders concerned.

III. TACTICAL AND TECHNOLOGICAL REQUIREMENTS

1. Tactical and Technological Requirements to be Met by the Fighter-Bomber. In any attempt to determine the tactical and technological standards to be met by the fighter-bomber, we must not lose sight of the conditions which made its development necessary in the first place. Otherwise it is all too easy to set up unrealistic standards and requirements which have nothing at all to do with the basic concept.

There were two factors which led to the development of the fighter-bomber. The first was the increased effectiveness of ground antiaircraft defenses, primarily the development of antiaircraft artillery and antiaircraft rockets, which made it impossible for any but a small, maneuverable aircraft such as the single-seater fighter to outrun ground fire with any prospect of success. The second was the need for a bomb-carrying aircraft which would be capable of defending itself in aerial combat with enemy fighters after it had completed its bombardment mission.

These two considerations must be continually kept in mind in attempting to determine the tactical and technological requirements which should be met by the fighter-bomber of the future. If they are ignored, there

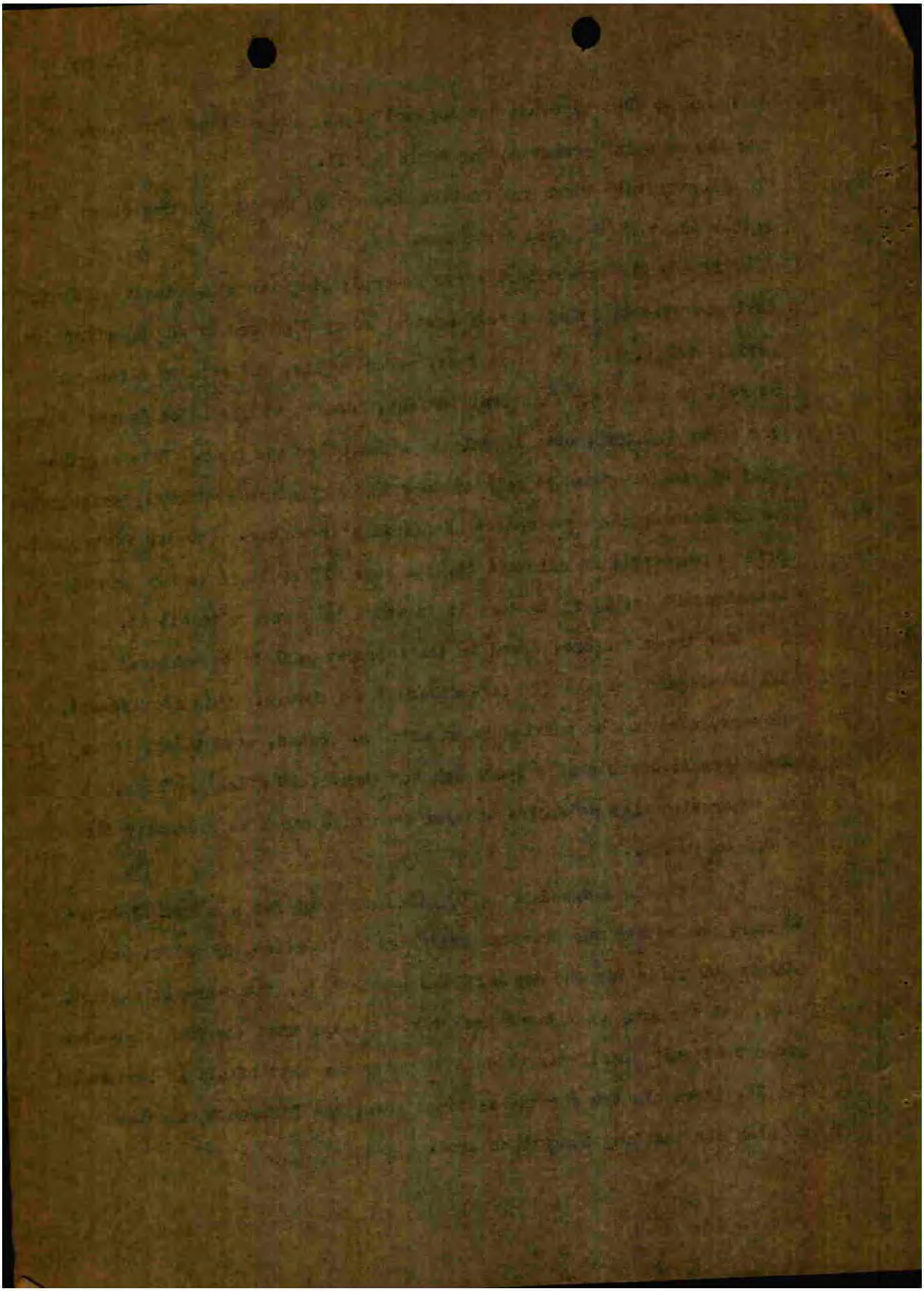
is a danger that aircraft development might take a false direction, as was the case in Germany during World War II.

Fortunately these two factors are not in any way contradictory, but rather point in the same direction.

If the fighter-bomber, after accomplishing its bombardment mission, is to be able to defend itself against enemy fighters by waging effective aerial combat, it must be as fast, maneuverable, and able to climb just as well as the enemy fighters; in fact, ideally it should be faster than the enemy fighters, even if only by a few miles per hour. This requirement of greater speed is related to both the factors previously established as determining the development of the fighter-bomber. For the faster and more maneuverable an aircraft is, the more difficult it is for ground antiaircraft artillery to keep it in range long enough to hit it.

For these reasons, speed is the foremost goal to be achieved in the development of the fighter-bomber of the future. This requirement, however, must not be carried to an extreme. Since, even today, there are aircraft capable of a speed greater than 1,250 miles per hour, it is imperative that we decide whether such high speed is necessary for a fighter-bomber.

If we assume a speed of 1,250 miles per hour for a modern fighter-bomber, and retain our previous estimates of 20 miles, 65 miles, and 300 to 400 miles for the depth of the battlefield, the over-all tactical area, and the Army operations area respectively, then the fighter-bomber would need only thirty-six seconds to cover the battlefield in horizontal flight, three minutes for the tactical area, and fifteen to eighteen minutes for the Army operations area.



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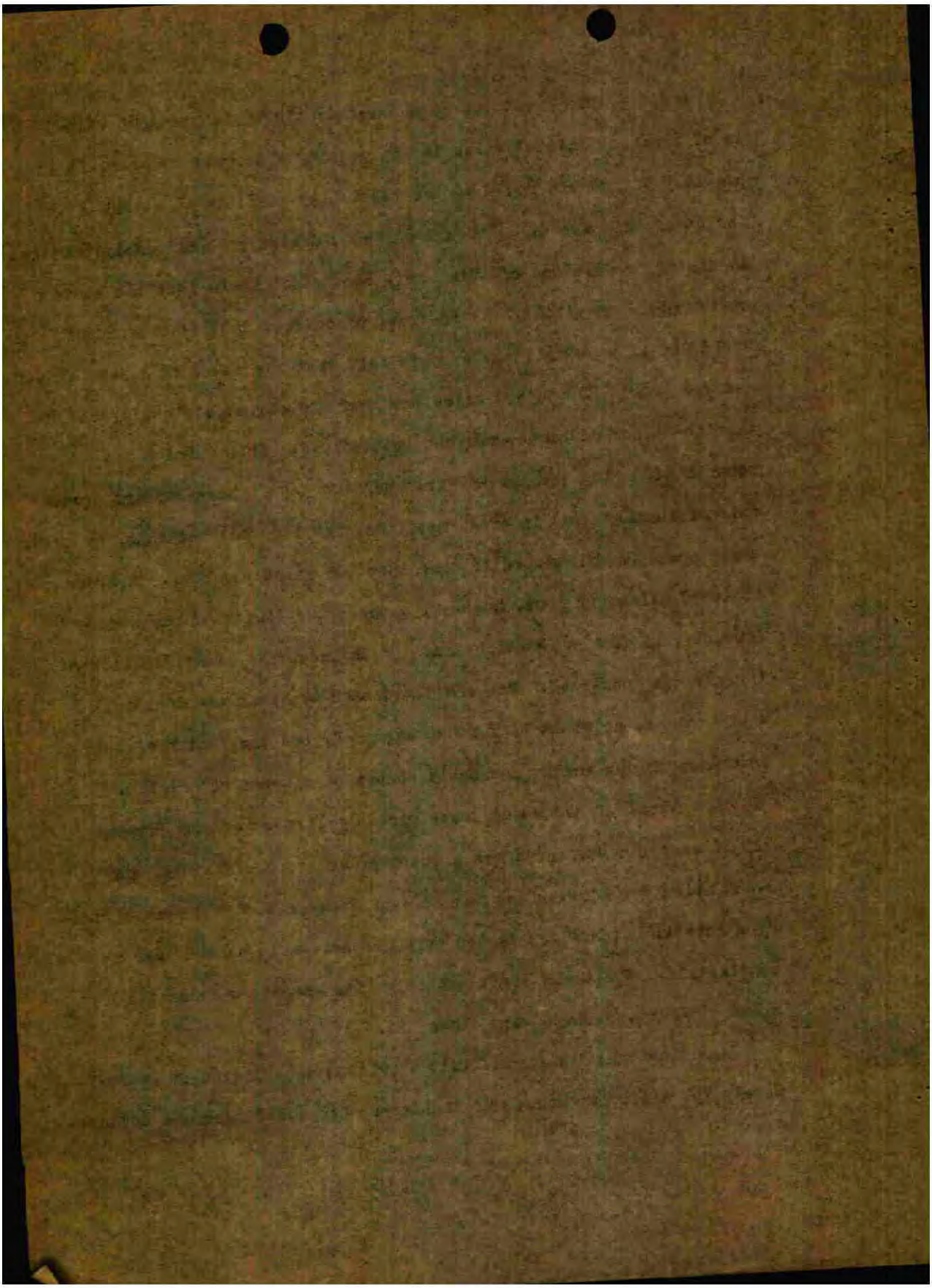
A speed this great (one and one-half times the speed of sound) is of immense tactical value in approaching a target; however, it is probably beyond the realm of the tactically possible to attack a target of this speed. Although one should always be extremely cautious in making predictions of this sort, the author feels that the above statement is justified. It is true, of course, that at the end of World War II some military experts felt that the speed of a jet fighter was too great (500 to 600 miles per hour) to permit its employment in fighter-bomber missions over the battlefield. This opinion was repudiated during the Korean War, when the jet fighter-bombers proved extraordinarily good in these missions, despite the fact that, by then, their speed had increased to more than 625 miles per hour. A speed of 1,250 miles per hour, however, exceeds the limits of human performance, as far as reaction time and the accurate identification of targets are concerned. The limitations of machines and technical equipment can no doubt be further expanded, but the factor of human endurance is one which presumably cannot be altered materially.

The limit of human endurance probably lies somewhere between 625 miles per hour, which has already proved to be feasible, and 1,250 miles per hour, which has already been reached and even exceeded by aircraft, but not yet tested on human beings in action over a battlefield. The human limit probably lies somewhere below the speed of sound, perhaps very close bit.

Assuming that the human limit should be established at approximately 750 miles per hour, our fighter-bomber would need one and one-



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half minutes to cross the battlefield in horizontal flight, five minutes to cross the tactical area, and twenty-five to thirty minutes to cover the Army area of operations.

The speed limit established as most efficacious for the attack on ground targets must then be used as a basis in determining the criteria to be met by aiming devices, bomb sights, navigational equipment, radar instruments, etc., and in planning flight and combat training programs for the pilots.

The speed limit established for the fighter-bomber need have no effect on that of the pure fighter aircraft, for, the latter has targets in the air, where, in comparison with its own flight speed, they seem to be at rest even when they are in motion. An enemy fighter, if it is well-matched, is just as fast as one's own fighters. Thus, the relative difference in speed may be zero when the two aircraft are flying side by side in the same direction, even though the absolute speed of each may be more than twice the speed of sound.

Here is a difference, then, in the tactical needs of the two groups of aircraft, fighters and fighter-bombers. The first must be relatively faster than their enemy counterparts if they are to be superior to them in combat, while the absolute speed of which they may be capable is unimportant. The second, in order to be able to attack ground targets at all, must not exceed a speed, presumably established at somewhere between 750 and 800 miles per hour.

If we wish to adhere to the basic concept of the fighter-bomber, i.e. to the principle that the aircraft type selected should be capable

of employment either as a fighter or as a fighter-bomber - and the body of experience gathered during the war would seem to indicate that this is a valid principle - then there is still another tactical requirement which should be established. The proper technological measures must be taken to assure that the fighter aircraft, when it is being employed as a fighter-bomber, be capable of sustained flight at 750 to 800 miles per hour (i.e. below the speed of sound) for a fairly long period without overburdening its engine, and that this same fighter aircraft, when it is being employed as a pure fighter, be capable of attaining a maximum speed equal to that of any fighter aircraft available to the enemy or to one's own side. Since the difference between these two operational speeds may be a very great one if modern developments continue at their present rate, the requirement outlined above may well pose a number of difficulties for aeronautical engineers. Nevertheless, the problem is one which must be faced and solved.

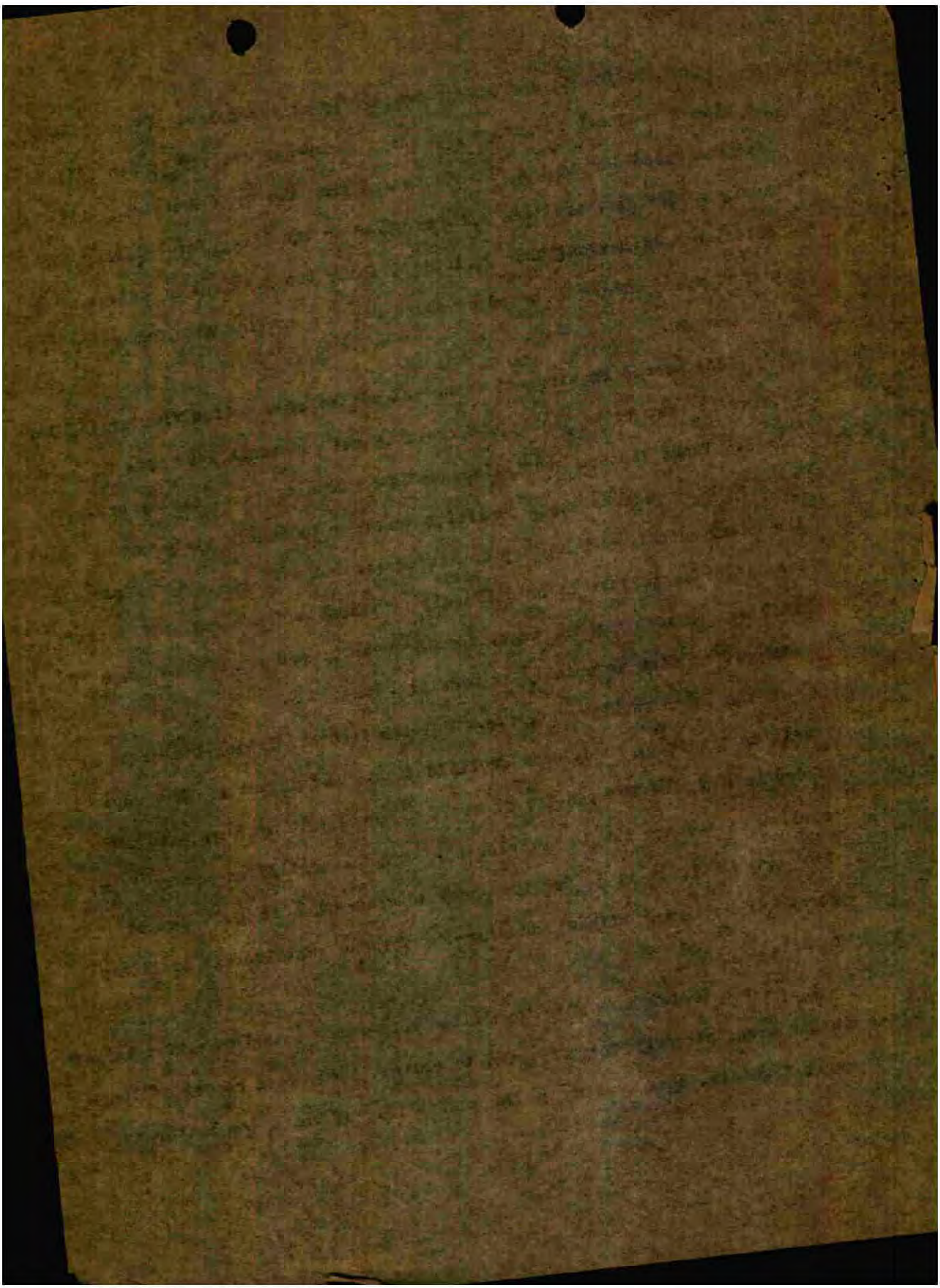
The solution, however, can hardly be sought in the practice of using the same fuselage for fighters and fighter-bombers and merely installing different engines according to the purpose at hand. This would be a deviation from the basic concept, which requires that the fighter-bomber, after bombarding its assigned ground targets, be able to assume the role of a fighter aircraft against air targets or, at the very least, be able to defend itself against attack by enemy fighters. And it can do this, of course, only if its speed is not inferior to that of the enemy aircraft.

The ability to operate at two different speed levels, as it were, is also a tactical advantage for the fighter-bomber, for it can utilize the maximum speed during its flights to and from the area containing its assigned targets, and then cut its speed to the lower level during the actual combat action; thus exploiting fully the tactical advantage of a combat speed under the speed of sound for the hunting and bombarding of its targets.

The second requirement to be met by the combination fighter/fighter-bomber is that it be highly maneuverable and possess a good rate of climb. These factors are indispensable in both types of employment. The fighter must possess these qualities in order to enable it to get up above the enemy quickly and to keep on his track, and the fighter-bomber needs them in order to make it as difficult as possible for enemy antiaircraft artillery to keep him in range, and in order to get out of the range of other ground fire as quickly as possible.

The third requirement, i.e. that the fighter/fighter-bomber be as small as possible, needs some qualification. Let us put it this way: if there is a choice between two aircraft of equal performance, then the smaller of the two should be selected. For the smaller an aircraft is, the more difficult it is for the enemy to spot--thus it has a better chance of appearing without warning--and for the antiaircraft artillery to hit.

If the decision is made to utilize long-range bombers against targets in the grand strategy category, and to protect them by an escort of long-range fighters, thus opening up the possibility of using the latter as



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long-range fighter-bombers, then, of course, the problem of the tactical and technological requirements to be met by these fighters will also have to be solved.

These requirements are bound to be different from the ones set up for the close-support fighter-bomber. Since the long-range fighters must have the same flight range as the long-range bombers, in order to be able to protect them effectively, they will require a type of construction completely different from that of the close-support fighter-bomber. It is impossible to give them the same degree of speed and maneuverability as will be possessed by the enemy single-seater fighter aircraft which they will encounter - and with which they will become involved in combat - during the course of their escort duty. Their inferiority in these two aspects will have to be compensated by heavier airborne armaments. In comparison to the long-range bombers they are assigned to protect, however, their speed, maneuverability, and climbing ability must be greater, so that they will have sufficient freedom of movement around their charges. This can be accomplished by keeping their total weight lower than that of the bomber.

In deciding upon the equipment to be installed in a long-range fighter-bomber, then, the factor of weight must be given due consideration. Unlike the close-support fighter-bomber, however, the long-range fighter-bomber need have no speed restriction whatsoever for use in bombarding ground targets. Its targets are of an entirely different type than the ones to be found on the battlefield, for the latter are often extremely small in surface area. Here we are dealing with the bombardment of

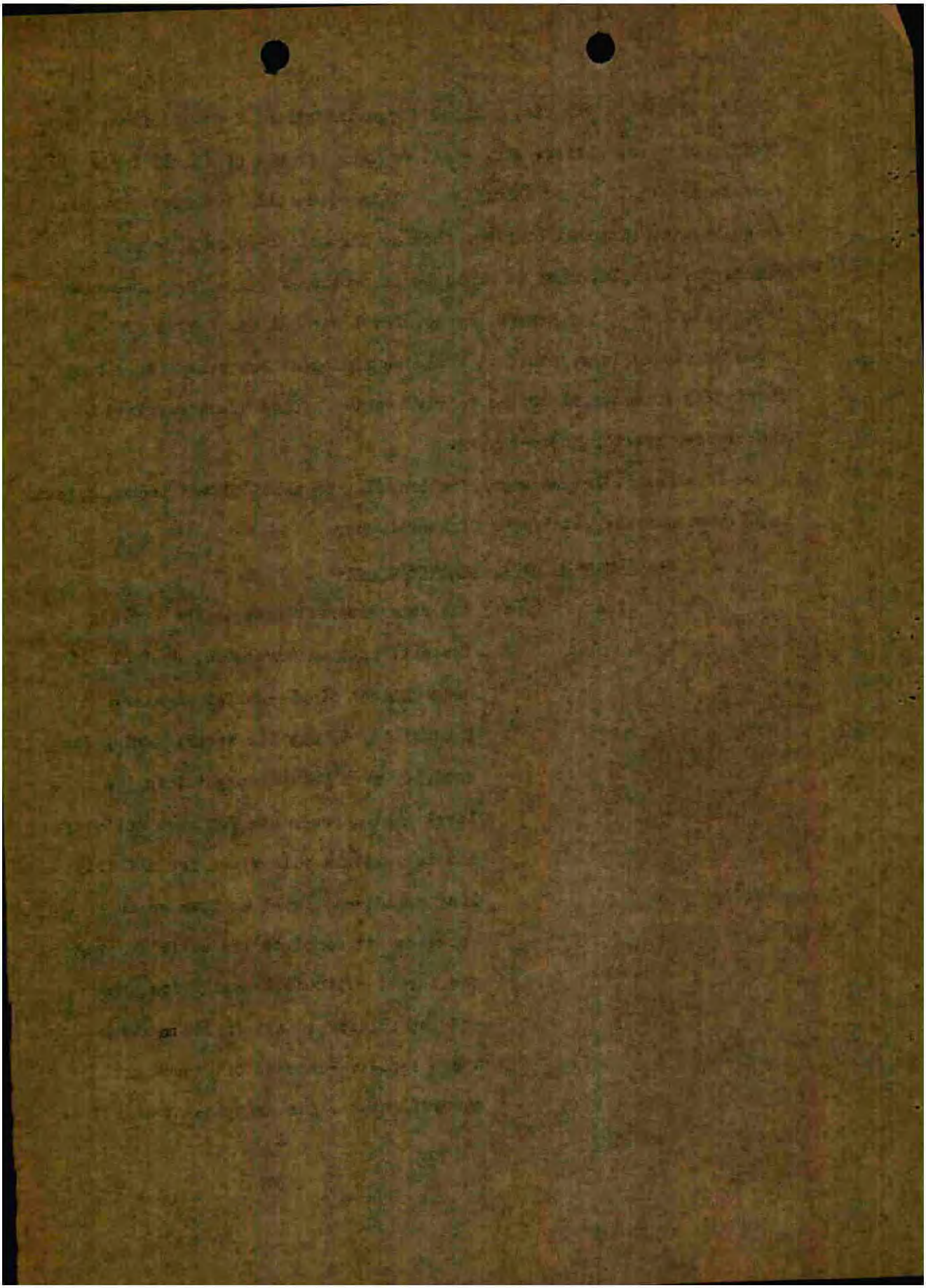
vitally strategic targets, such as large industrial installations, traffic centers, cities, etc. - all of them targets of fairly large surface area. If there should be certain especially important targets which require pinpoint bombing, such as the boiler-house of a power plant, for example, then it would be no problem for the fighter-bomber to cut its speed to a manageably low level without any danger of damaging its engines, since it would be flying at low speed for a very short time in contrast to the fairly lengthy period often required of the close-support fighter-bomber.

In closing, let us summarize briefly the tactical and technological requirements to be met by the fighter-bomber:

a. Close-Support Fighter-Bomber.

Aircraft type: the same aircraft type as the world's fastest, most maneuverable, best climbing, and smallest single-seater fighter.

Speed: the ability to cut its speed, during its activity over ground targets, to the level most appropriate for such activity, and to maintain this speed for a fairly long period--at least as long as is necessary to complete its activity over the target--without damaging its engines; and the ability to attain its maximum speed rapidly--in case of attack by enemy fighters, for example--at any time.



Flight endurance: from two to three hours, if possible.

Service altitude: at least 49,000 feet, with the additional requirement that its performance be uniform at all altitudes.

b. Long-Range Fighter-Bomber.

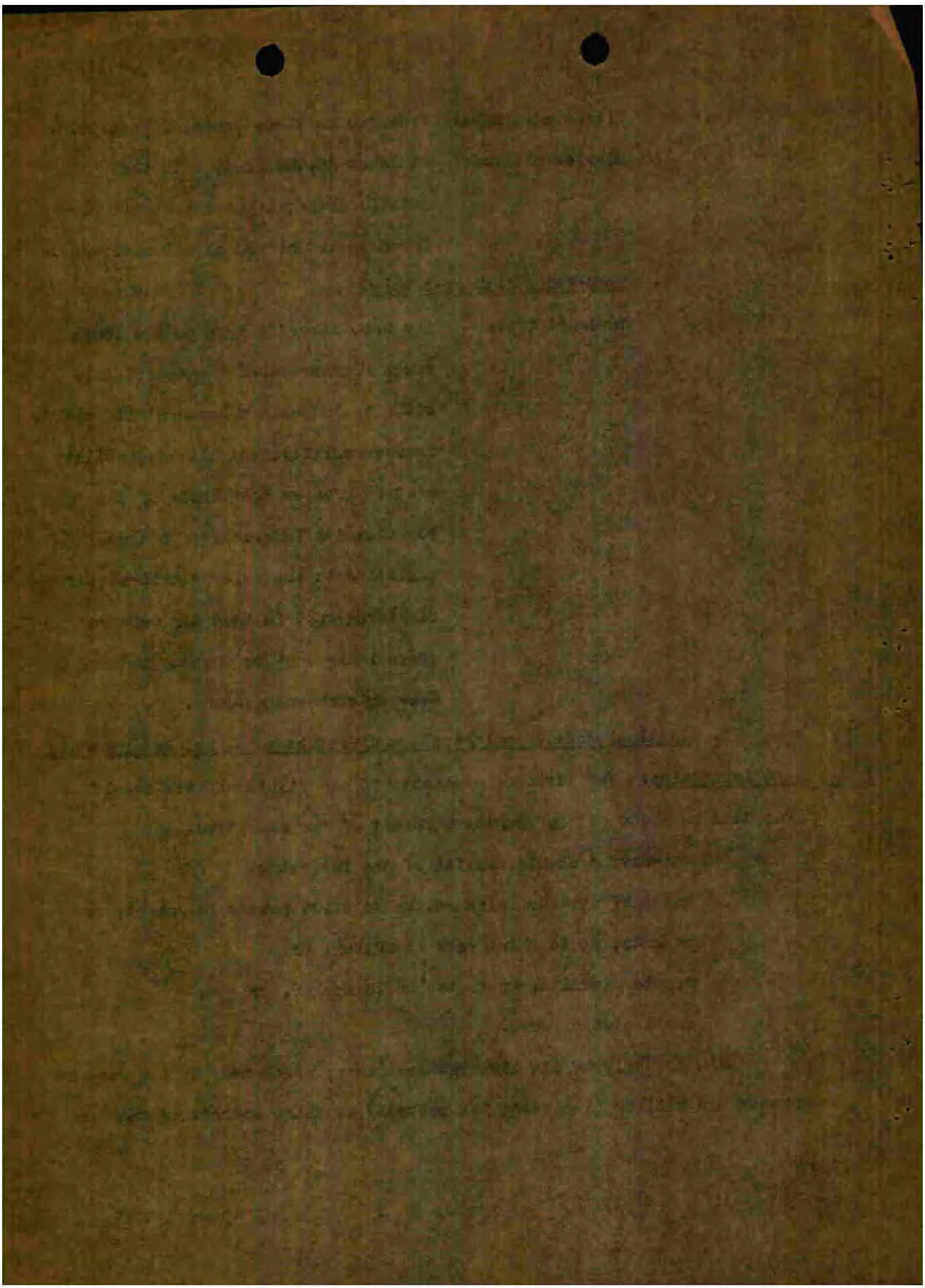
Aircraft type: the same aircraft type as the long-range fighters used for escort duty with the long-range bombers; its speed, maneuverability, and climbing ability must be greater than those of the bombers; its inferiority in these qualities to the enemy single-seater fighters--used in home air defense operations--must be compensated for by heavier airborne weapons.

2. Tactical and Technological Requirements to be Met by Armaments and Ammunition. The airborne armaments of the fighter-bomber should be the same as those of the fighter aircraft of the same type.

Its ammunition should consist of the following:

bombs of various calibers, up to 2,200 pounds in weight, or
rockets, up to thirty-six in number, or
napalm missiles, up to twelve in number, or
small atomic bombs.

With the help of its airborne armaments, which must be the same in number and caliber (including the rockets) as those comprising the



standard equipment of the fighter aircraft of the same type, the fighter-bomber is in a position to wage successful aerial combat with enemy fighter aircraft whenever it should become necessary.

There must be some sort of device to permit the selective release of the most appropriate type of missile for the mission at hand - as is already the case in the most modern American jet fighter aircraft.

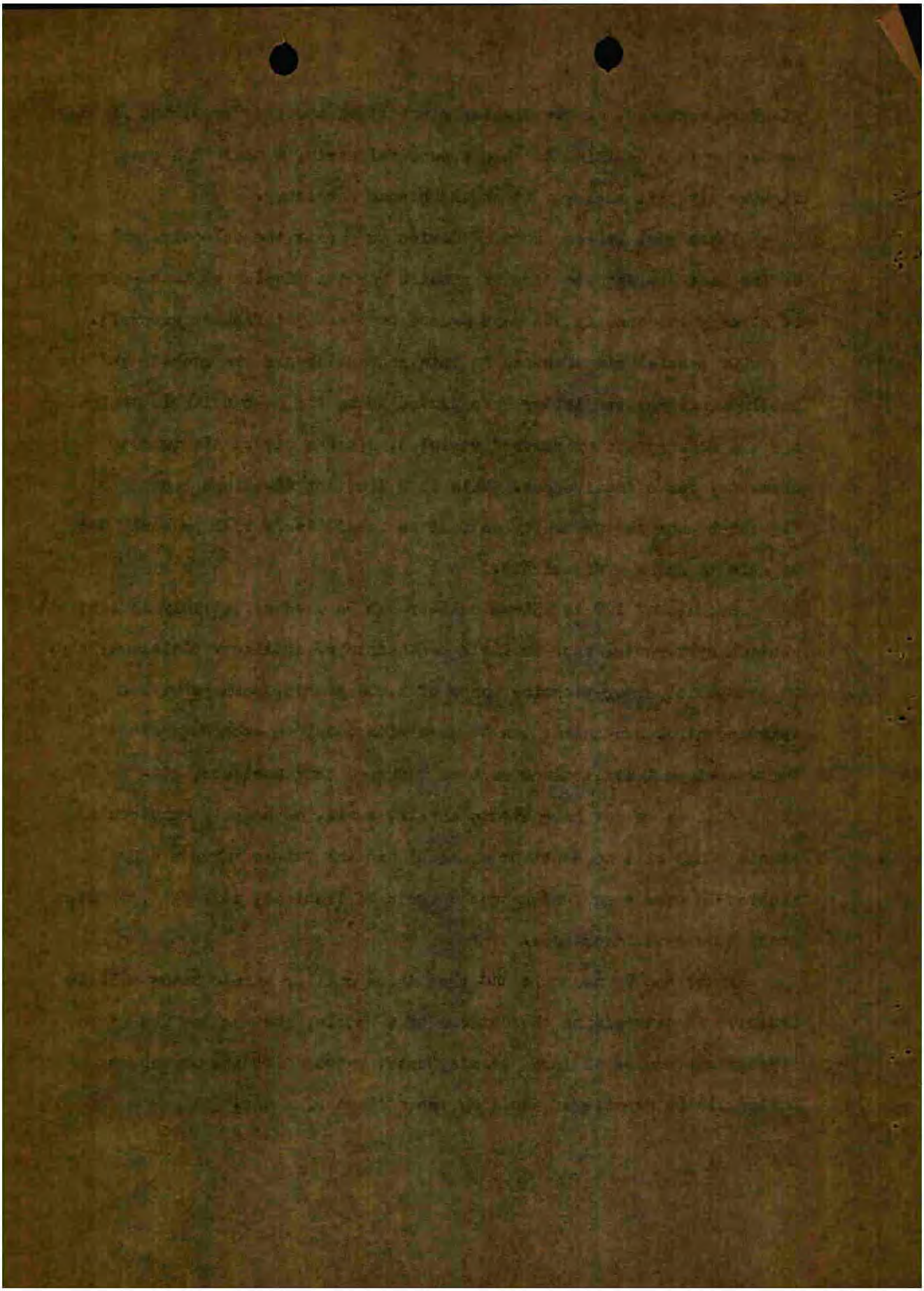
Of special significance in this connection are the rockets and the napalm missiles; the latter have proved to be the most suitable weapon for the bombardment of armored vehicles, since a direct hit is not necessary for effectiveness. This is a distinct advantage because a fighter-bomber moving nearly as fast as sound itself will probably not be able to score a direct hit.

Rockets of 120 to 150-mm caliber can be used effectively against all stationary targets, such as field headquarters, artillery positions, etc.

Special armor-piercing bombs of 2,200 pounds, perhaps with a remote-control mechanism, can be used with complete success against fortress-type installations such as bunkers, tank shelters, etc.

Just as we now have atomic shells, small, especially constructed atomic bombs will no doubt be available in the future for use - by fighter-bombers - against ground targets of tactical, strategic, or even grand strategic importance.

There can be no doubt but that these smaller atomic bombs will be decisive in determining the outcome of a battle, just as the use of an appropriate number of large atomic bombs, hydrogen bombs, or cobalt bombs will be capable of deciding the outcome of a war.



3. Tactical and Technological Requirements to be Met by Sighting and Aiming Equipment. The pilot of a fighter-bomber, whose full attention is required to manage his aircraft at a speed only slightly slower than that of sound, must be relieved in so far as possible of all tasks not directly connected with the operation of the airplane. Thus, in order to facilitate operation by a single person, an electronic aiming device, capable of computing automatically all the necessary ballistic data and of adjusting itself in accordance with these data, is urgently recommended.

In addition, this aiming device must be capable of serving three purposes at once; as a sight for the airborne armaments, the rockets, and the missiles. It must be so simple to operate that the pilot is relieved of all computing and estimating and can simply follow his target with the sighting device in the same manner as a fighter pilot does. In view of his tremendous flight speed, this is the only way the pilot can keep both air and ground under constant surveillance at the same time, which he must be able to do if he is to accomplish his mission successfully.

4. Tactical and Technological Requirements to be Met by Radar Equipment. The significance and scope of action of the future fighter-bomber make it imperative that the radar equipment selected meet very high standards. Above all, this equipment must make it possible for the fighter-bomber to be employed at night and during periods of bad weather, i.e. in instrument flight.

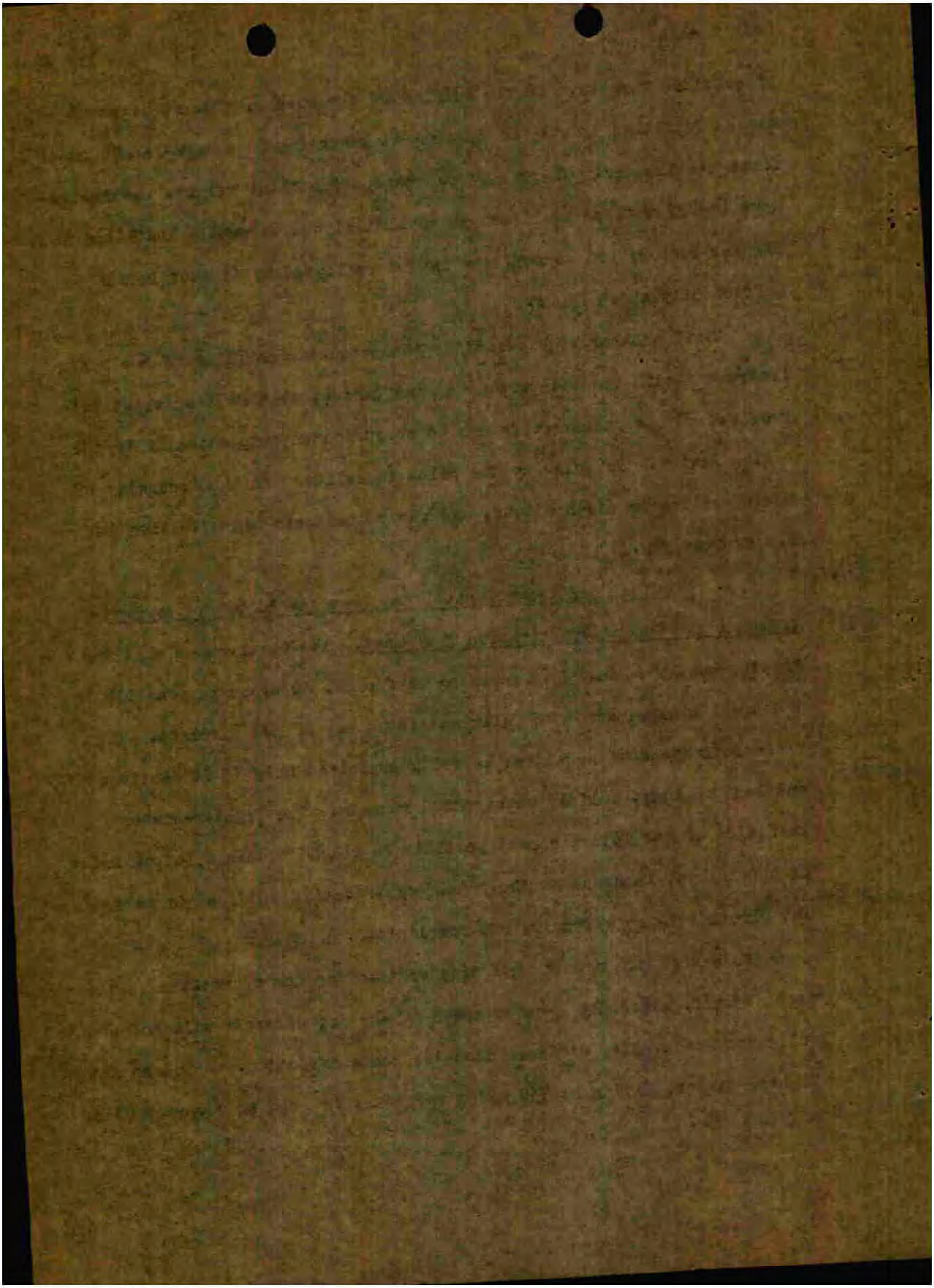
This requirement can be met only by a panoramic view radar instrument directed at the ground, with resolving power great enough to pick up all the details of the terrain below and to permit the identification

of possible targets. In the opinion of the author, this requirement can be fulfilled only by an instrument operating on a wave-length under three centimeters. There are two reasons for this: first, the instrument itself must be small enough so that it can be easily installed in a fighter-bomber; and second, the images reflected by it must be in sufficiently sharp focus.

Still another requirement is the automatic coupling of the radar instrument with the tri-purpose aiming device, so that the target data received on the radar screen can be communicated automatically to the aiming device. In this way the pilot is relieved of the necessity of making ballistic computations, and can concentrate his attention on aiming properly.

5. Tactical and Technological Requirements to be Met by Navigational and Ground Organization Equipment. The requirement that the fighter-bomber be based at advanced airfields, as close as possible to the front lines, cannot be fully met in an age of jet aircraft. The tremendous speed of a jet can be fully exploited only if it can take off and land on long, solidly constructed runways. The fighter-bomber airfields of the future cannot possibly be placed so close to the front as heretofore, inasmuch as the ground organization required to accomodate jet aircraft is so extensive and complicated.

This need not result in a disadvantage for the operations at the front itself, since the greater speed of the jet aircraft will compensate fully for its greater distance from the scene of action. A modern jet fighter-bomber, flying at 750 miles per hour, is able to cover 62 miles



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in five minutes - the same time as was required for a fighter-bomber to cover 31 miles at a speed of 375 miles per hour during World War II.

There is, however, one distinct disadvantage created by the necessity of starting the fighter-bomber missions from bases located farther back from the front, and this is the increased difficulty of maintaining adequate communication between the fighter-bombers and the ground troops and their headquarters.

This is a disadvantage which can and must be offset by the measures to be discussed in detail in the following section. In practice, however, it probably will never be eliminated entirely, for it stands to reason that contact cannot be so close when the parties concerned are geographically farther apart. Even so, it is an inevitable disadvantage and must be accepted as such.

For successful completion of its mission, the fighter-bomber must have completely reliable navigational aids. As was discussed in detail in USAF Historical Study No. 179, "Problems in the Conduct of a Day and Night Defensive Air War", in the section devoted to navigational aids,[1] the fighter-bomber pilot must be provided with a radio compass for direction finding on board, thus making him independent of the ground control station. The latter, of course, provides directional bearings from the ground, and is used to guide the fighter or fighter-bomber to enemy targets in the air.

Once the rendezvous point has been computed, the ground control station stops sending signals, and the fighter or fighter-bomber pilot must resort to direction finding on board to find his way back to base.

In the meantime, of course, the ground control station can be used to guide other units to their targets in the same way.

The airborne radar equipment mentioned above may also be used by the fighter-bomber pilot as a navigational aid in finding his way back to his base.

The same board-controlled direction finding system which enables the fighter aircraft to direct its own course can, needless to say, also be used by the fighter-bomber. The tactical and technological criteria to be met by the direction finding system have been discussed in detail in Study 179.[2] Let us mention them briefly here.

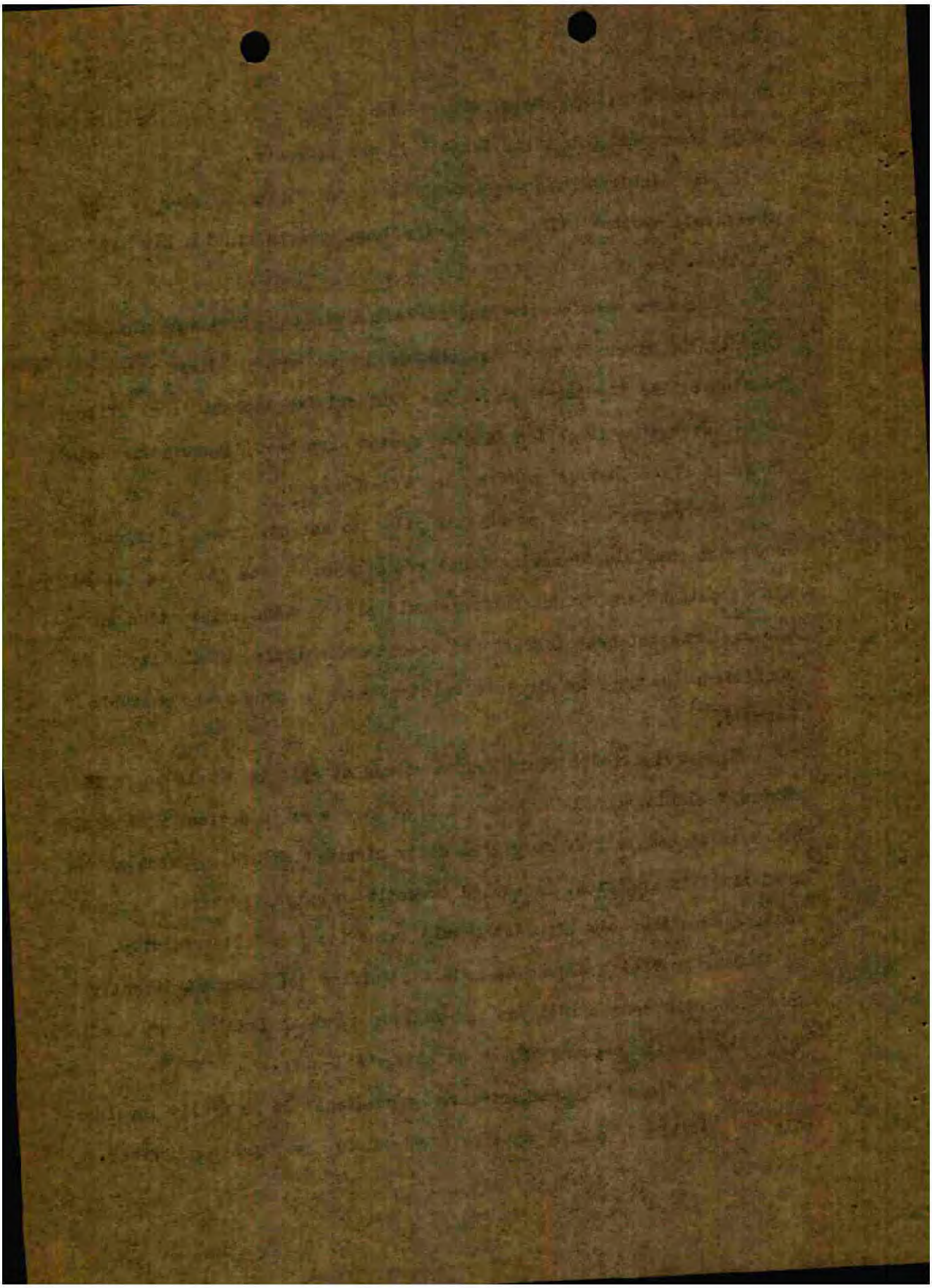
The system should permit the pilot to select, from as large a number as possible of navigational radio beacons, the one best suited to his situation; the ground beacon should also provide information as to the distance between aircraft and beacon and existing visibility conditions (perhaps by wireless teletype - or by some other suitable method).

The navigational radio beacon should be able to handle up to fifty aircraft simultaneously and should have some sort of device which would block it immediately if more than fifty aircraft should approach at the same time; in addition, it should transmit an automatic warning signal in case more than six aircraft should enter its immediate vicinity.

Some provision should be made for guiding the aircraft directly from the radio beacon into the bad-weather approach lane of each airfield.

The landing beacons should be ultrashort-wave.

Both radio and ultrashort-wave beacons must be as nearly invulnerable as possible to normal interference and to enemy jamming devices.



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6. Tactical and Technological Requirements to be Met by Signal Communications Facilities. One of the most important prerequisites to the success of a tactical fighter-bomber mission is maintenance of the closest possible coordination with the ground troops. Thus it is imperative that adequate communications facilities be available; this requirement becoming more important as the geographical distance separating fighter-bomber forces and ground troops increases.

For successful commitment of a fighter-bomber force over the battlefield, there must be voice-radio communication facilities between the aircraft and the ground forces in whose area of operations the action is taking place.

The goal here should be the establishment of a system of selective communication from the aircraft with several ground headquarters; for example, with an over-all command post, such as corps or division headquarters, and - at the same time - with troop units on the battlefield itself, such as armored columns, advance infantry, etc. This radio communication, the "ground rules" for which should be established in the operational orders, must take place independently of the purely "air force" radio communication, carried out over established "air force" frequencies among the individual aircraft participating in the action and between these and their superior air force headquarters.

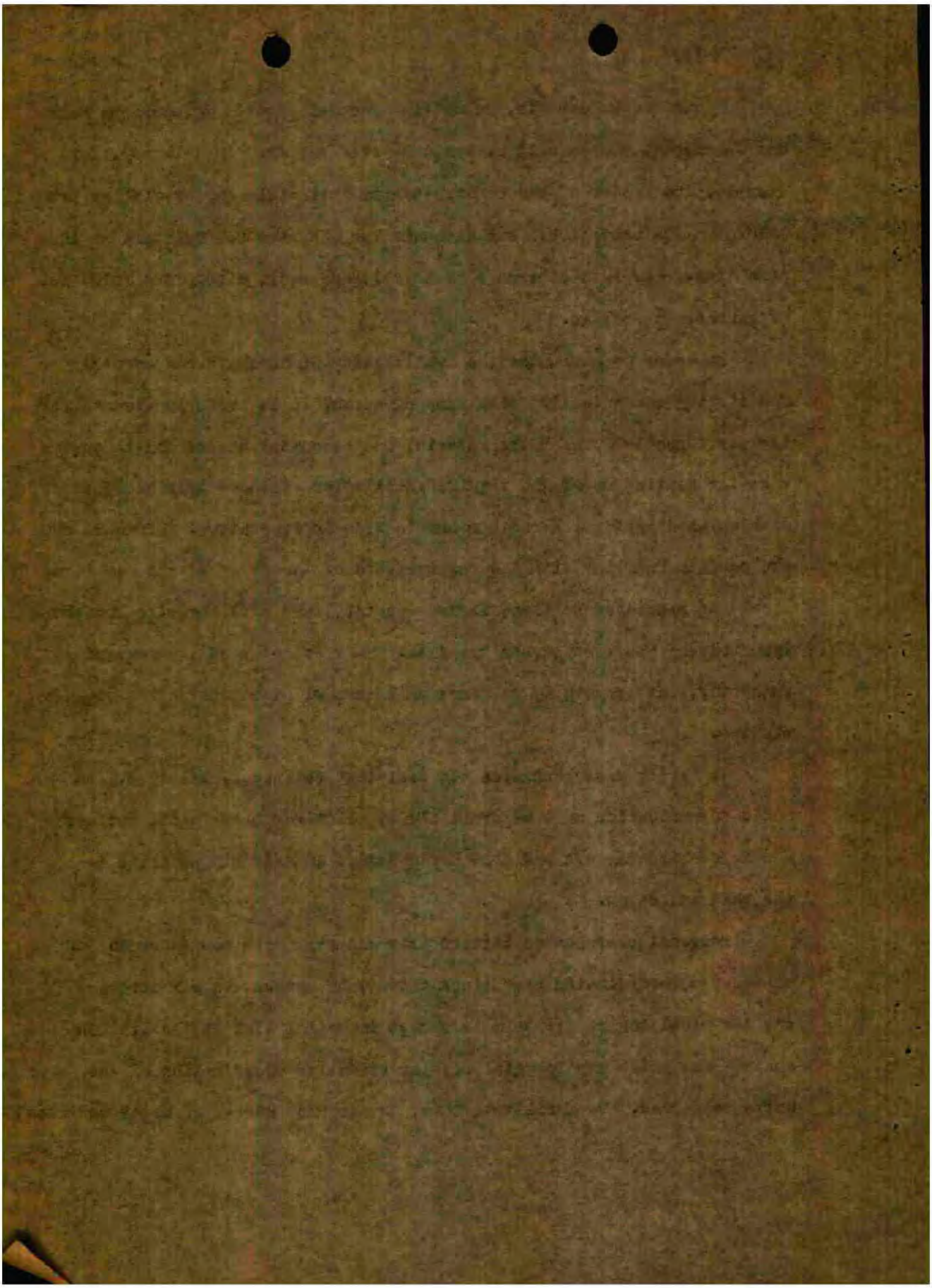
The airborne radio, then, must incorporate the greatest possible number of channels (as many as ten keys) in the smallest possible area, and the selective operation of the available keys must permit immediate communication with the desired headquarters.

A conference circuit, permitting several parties to converse with one another at the same time, would be even better. In this way, for example, the leader of the fighter-bomber unit could confer with an armored column on the battlefield and with his own superior headquarters at the same time. Absolute adherence to established radio discipline rules is, of course, imperative.

In order to guarantee the availability of adequate and smoothly functioning communication with Army agencies, it is probably wisest for the air force to furnish the materiel and personnel needed and to supervise the setting up of the required facilities at those Army headquarters with which direct voice-radio communication is imperative. Officers who are equally familiar with the requirements of the army and the air force should be appointed to these liaison posts. They will form the connecting link between the two weapons branches. They do not need any command authority, but are simply to serve as a channel of communication between the two.

We hardly need emphasize the fact that telephone, teletype, and radio communication must be available at all times between the various air force headquarters and that headquarters immediately superior to the unit in action.

Personal conferences between army and air force commanders of units assigned to coordinated operations cannot, of course, be circumvented by any technical means; for this is a most important link in the liaison chain - one which may be vital for the effective coordination of the units concerned. To facilitate this, an adequate number of motor vehicles



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and aircraft (helicopters) must be kept available.

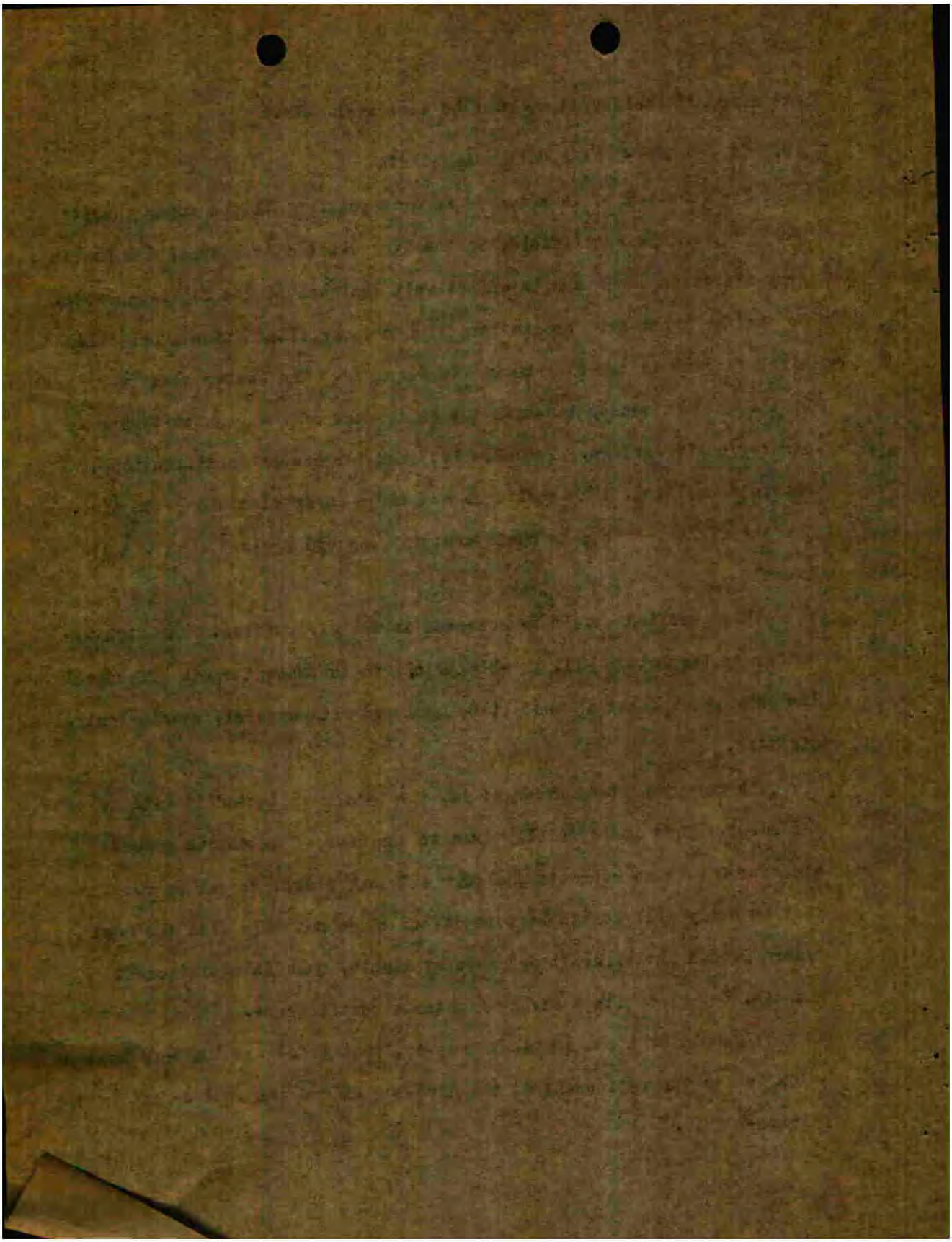
IV. IS THE DIVE-BOMBER STILL NECESSARY?

The question to be answered here is whether all the enemy targets appearing on the battlefield, in the over-all tactical area, and in the Army operations area can be effectively assigned to the fighter-bomber, or whether there are certain targets for whose elimination a specialized aircraft such as the dive-bomber is required. The latter might very well be the case in connection with the employment of the fighter-bomber in strategic air warfare. For example, such targets as fortifications, concrete shelters, tank shelters, and large power plants come to mind. Can the fighter-bomber be committed with success against such targets as these?

This question should be answered in the affirmative. The fighter-bomber of the future will be able to eliminate these targets effectively; the only requirement is that it be equipped with special, remote-controlled missiles.

The more important a target is, the better protected it will be by the enemy. This is especially true in the case of extensive ground structures such as concrete shelters and tank parks; we can be certain that an enemy will do his best to defend these not only with the most modern ground antiaircraft defenses available, such as antiaircraft rockets, but also with a strong fighter aircraft force.

It should be borne in mind, however, that these are the very reasons which led to the retirement of the dive-bomber and its replacement by the fighter-bomber.



The commitment of dive-bombers against targets such as these would be tantamount to suicide.

The fighter-bomber capable of carrying a 2,200 pound bomb is not an unattainable dream of the future; already it has almost been realized. The American Thunderjet can carry a bomb-load of 2,000 pounds, and the remaining 200 pounds should not pose too much of a problem. Even the German Me-110 was able to carry two 1,100 pound bombs - or a total load of 2,200 pounds - although it can hardly be considered a modern or ideal fighter-bomber. A single 2,200 pound armor-piercing bomb is capable of sinking a battleship, as the sinking of the Italian battleship Roma in the fall of 1943 clearly proves.

It is perfectly feasible to equip the fighter-bomber with a missile-control device similar to the German FX-radio (used in the sinking of the Roma). This device obviates completely the necessity for diving, for the missile can be dropped in horizontal flight from any altitude and is guided directly to its target. Thus, the argument that dive-bombers are still needed to carry out pinpoint bombardment no longer has validity.

This missile-control device can also be used most effectively in connection with the airborne panoramic view radar equipment already described. After a bomb is released, its progress can be followed and the control device can be used to guide it to the target reflected on the radar screen. Under these circumstances, weather and cloud conditions would be immaterial; direct hits could be scored at night, in heavy fog, by bombs dropped in the clouds, or even from above the cloud cover. In this way, most of the enemy's ground antiaircraft defenses would be rendered ineffective.

If the target is to be attacked on a clear day, however, a strong fighter escort is indispensible, for the heavily-laden fighter-bomber is considerably slower, less maneuverable, and possesses a poorer rate of climb than the enemy fighter aircraft. Once it has released its bombs, of course, the fighter-bomber can exploit its unattainable speed in getting out of the range of ground antiaircraft fire and is again a match for the enemy fighters.

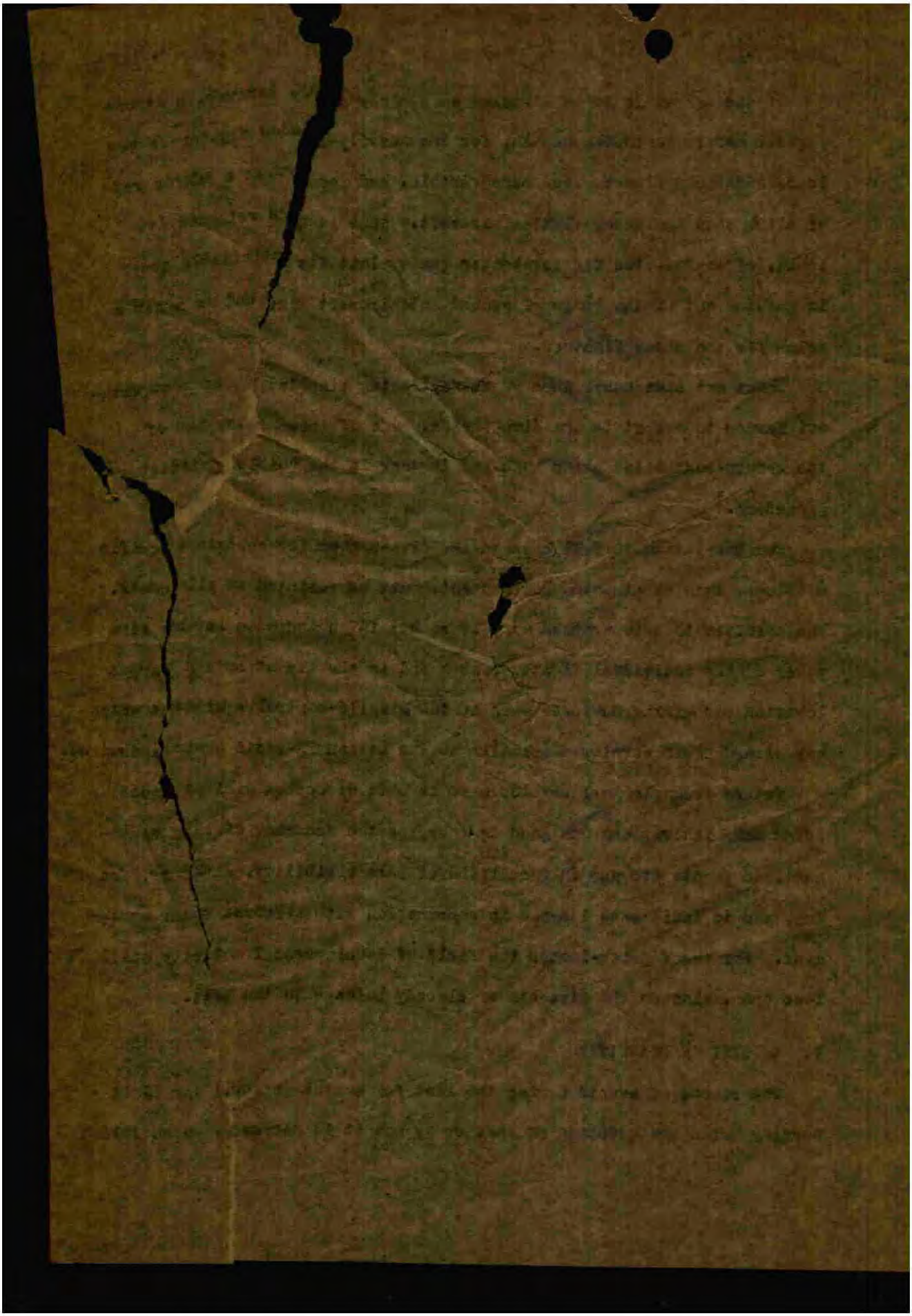
There are also other ways of accomplishing pinpoint bombardment without having to resort to the dive-bomber. One of these is the use of the remote-controlled glide bomb and another is the "Mistel" [mistletoe] procedure.[3]

The temptation to fall back on the dive-bomber for certain specific missions, such as pinpoint bombardment, must be resisted at all costs. The solution to this problem must be sought in an increase in the fire power of the individual fighter-bomber and in the use of modern target location and aiming devices, such as the missile-control equipment which has already been developed (similar to the German FX-radio control device).

Future technological developments in this direction will no doubt bring many innovations designed to increase the accuracy of this equipment, to permit its use in conditions of zero visibility, darkness, and fog, and to facilitate its use in combination with airborne radar equipment. For the fighter-bomber the field of developmental activity still lies open, whereas the dive-bomber already belongs to the past.

V. QUALITY OR QUANTITY?

The course of events during the last few months of World War II in Germany raise the question of whether or not it is necessary to establish



such high tactical and technological standards for the fighter-bomber of the future, and to devote so much attention to the selection and training of fighter-bomber pilots. Does victory depend upon the quality of the aircraft and their crews, or can it be attained just as well by creating a numerical superiority so oppressive that the enemy is simply overwhelmed?

This latter question can be answered in the affirmative only if the enemy is so inferior, in point of both quantity and quality, as Germany was at the end of the last war. Quantity alone is never enough to assure victory over a well-matched enemy. As long as the enemy's will to resist remains unbroken, quality alone can lead to success. Even though, in a future war, fighter-bombers might be used in terror raids on the civilian population, a country which is determined to resist will soon be able to discover the weaknesses of the attackers and to exploit them.

It is not until a country's morale has been completely broken by relentlessly repeated attacks - and this goal can be attained only by quality - that the factor of overwhelming quantity can have any effect. Once this stage has been reached, any sort of aircraft can be thrown into the fray, for the mere appearance of an enemy airplane on the horizon --even if it is only a training plane--will be sufficient to spread panic and to break the will to resist. Therefore, quality first, and then quantity!

VI. THE EMPLOYMENT OF FIGHTER-BOMBERS AGAINST OCEAN TARGETS

World War II has already proved the fighter-bomber to be an excellent instrument for the bombardment of ships. Its speed and maneuverability,

and above all its relatively small size, help it to achieve the element of surprise; and its chances of achieving surprise grow with its increasing speed. Moreover, in approaching its target, the fighter-bomber can fly low enough over the water to keep below the range of the enemy radar equipment until the very last minute. This low-altitude approach also eliminates effectively most of the enemy's ship-based antiaircraft artillery fire. This method of attack has proved to be especially appropriate against freighters and smaller battleships. The use of small bombs (up to 550, or at most 1,100 pounds), rockets, and possibly napalm missiles are effective.

If the target consists of a group of ships under convoy, or of larger battleships, then the fighter-bombers can hope for success only if it carries a special remote-controlled armor-piercing bomb.

If attacks on ocean targets are to be accomplished under good visibility conditions, the fighter-bomber will have to be accompanied by a double fighter escort in order to reach their target safely. Half of the escort fighters will be needed to keep the skies over the target area free of enemy aircraft, and the other half to provide direct protection for the bomb-carrying fighter-bombers. Under no circumstances should the escort leave the fighter-bombers until the latter have released their bombs and guided them to their targets. Then the fighters are free, for the fighter-bombers are not only able to defend themselves effectively but can also participate, together with the fighters, in aerial combat against the enemy.

As technological developments progress to the point where bombardment can be carried out with the joint assistance of airborne panoramic

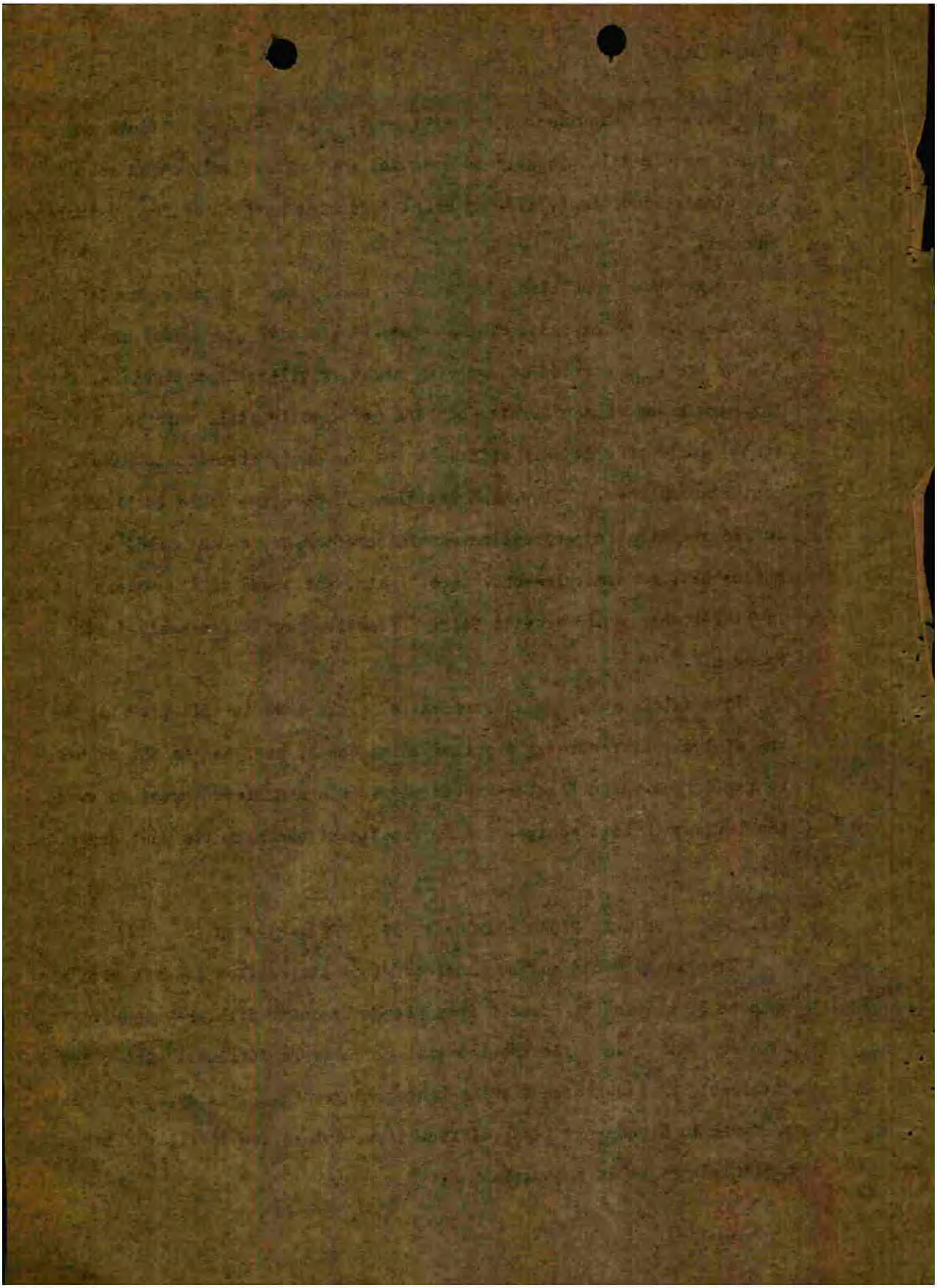
view radar and missile-control equipment, fighter-bomber attacks on ocean targets will probably be executed most effectively under zero visibility conditions, i.e. at night or during periods of fog or inclement weather.

Under these conditions, of course, hardly any fighter aircraft defenses need be expected of the enemy. Defensive air operations could, in any case, be carried out only by night or all-weather fighters, and the high speed of the fighter-bombers (even while still carrying their bombs) would make it very difficult for the enemy aircraft to make contact with them. Ship-based antiaircraft defenses would be limited to radar-controlled ammunition--antiaircraft rockets controlled by guide-beam, for example--and, here, again, the speed of the modern jet fighter-bomber would provide fairly effective protection against its being hit.[4]

In a future war, the bombardment of ocean targets will probably be one of the most rewarding missions which can be assigned to the fighter-bomber forces. The fighter-bomber represents a serious threat to even the largest of battleships, and is capable of becoming its most dangerous enemy.

VII. DEFENSIVE OPERATIONS AGAINST ENEMY FIGHTER-BOMBERS

This study would not be complete without a section dealing with the methods of protecting oneself from attack by enemy fighter-bombers. It is clear that this whole problem will become more difficult as the speed attainable by the modern fighter-bomber increases. Even so, a way must be found to circumvent these difficulties, unless one is willing to capitulate right in the beginning.



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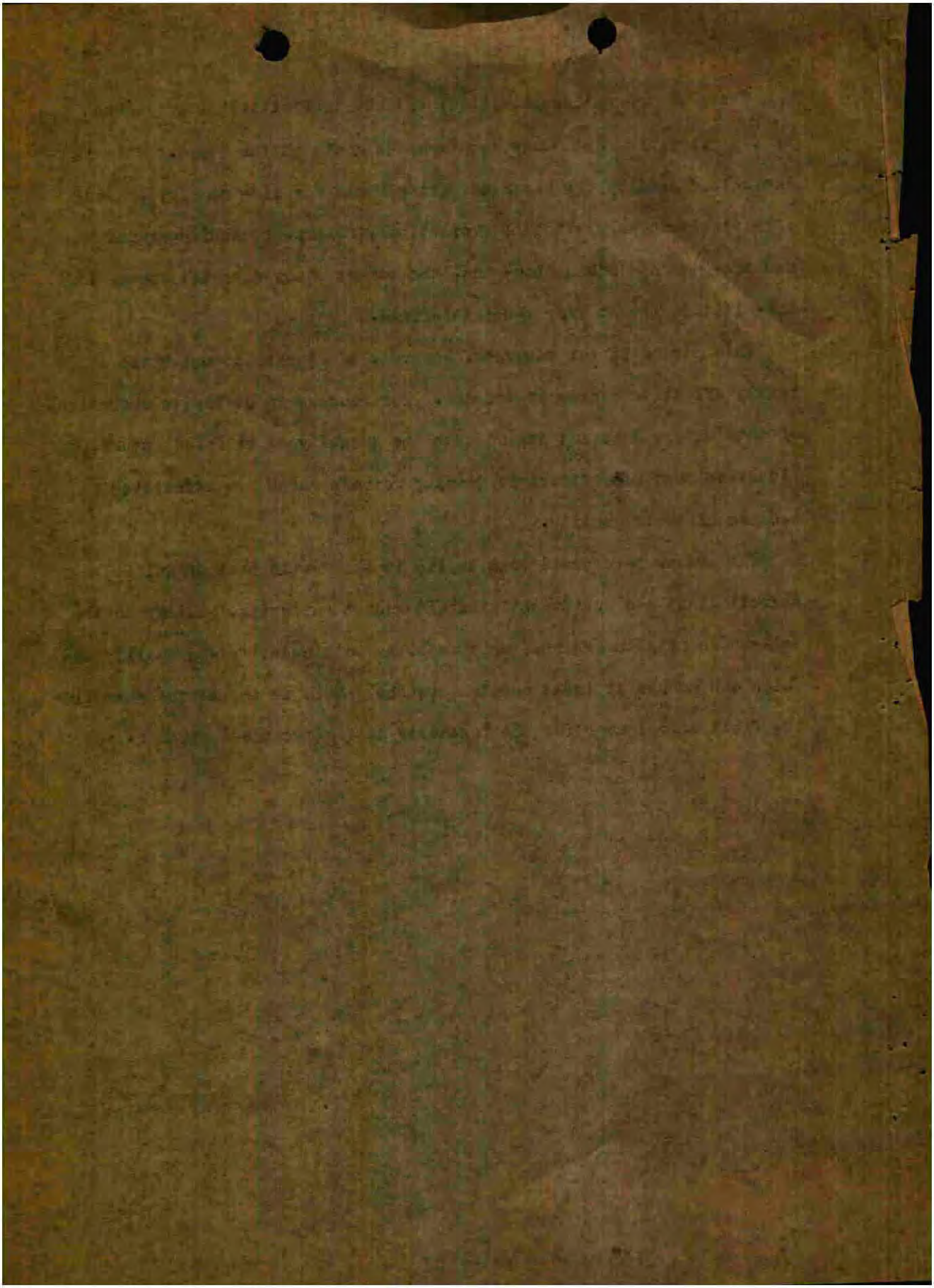
There is one rather primitive, but not ineffective method based on the principle that "many dogs are the death of the hare". This is the method used by the Russians during World War II - namely, opening fire simultaneously with all available artillery, including ground machine-guns and submachine-guns, the moment enemy aircraft appear in low-altitude flight over the battlefield.

This method is not adequate, however, if we wish to establish a really effective system of defense. For success in defensive operations of this nature does not depend upon the quantity of expended ammunition alone; we must also strive to develop methods which are effective because of their quality.

The answer here would seem to lie in the development of multiple-barrell light and medium antiaircraft rocket batteries, similar to the well-known "Stalin organ",[5] which combine both quantity and quality and which can assure at least partial success. This is an extremely rewarding field of endeavor for the ingenuity of the technical experts.



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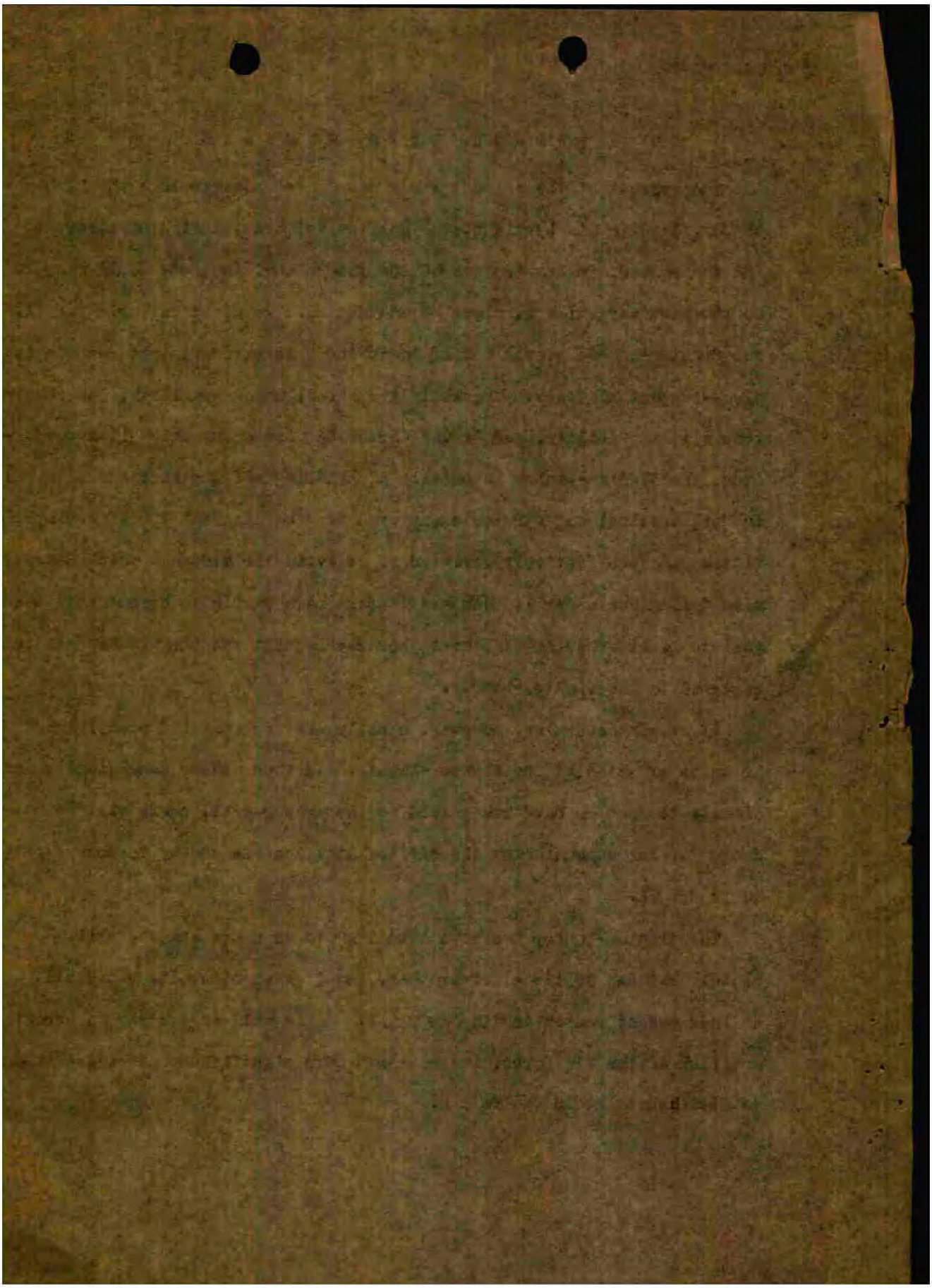
CONCLUDING REMARKS

The purpose of the present study was to demonstrate that the fighter-bomber, despite its hybrid status halfway between the fighter aircraft and the bomber, is an airplane of the future and, in fact, would seem to be the most versatile airplane of the future. As early as World War II, the fighter-bomber proved itself to be the best aircraft type for use in close-support missions. Thanks to its speed, maneuverability, and excellent climbing ability, and to the threefold fire power which it incorporates, the fighter-bomber is capable of handling all the missions involved in both tactical and strategic employment. The disadvantage of its hybrid status can be effectively obviated if we avoid the mistakes which Germany made during World War II when her leaders were unable to agree as to the goal to be attained in fighter-bomber development and the missions to be assigned to the fighter-bomber.

If we can determine, however, exactly what we want and exactly what is to be expected of the fighter-bomber, and then adhere consistently and closely to what we have recognized as the proper goal, there will be no danger of our encountering the difficulties experienced by Germany during World War II.

The fighter-bomber has come into its own as a new weapon, still closely related to its elder brother, the fighter aircraft, but still, an independent weapon in its own right. It is well on the way to becoming a pillar of the air force, and more and more significance can and should be attached to it in the future.



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FOOTNOTES

Chapter 1:

1. The author owes his familiarity with these events and their consequences to his experience as a member of the Organisation Staff of the Reichs Air Ministry during the years from 1933 to 1936, and as Chief of this Staff from 1937 to 1939.

2. See "Luftfahrtausbildung in der Reichswehr, Teil II" (Pilot Training in the Reichswehr, Part II), by General der Flieger F. Felmy, Retired. Karlsruhe Document Collection.

3. See Galland (General of the Fighter Forces during World War II), Die Ersten und die Letzten (The First and the Last), Wiesbaden, 1953, page 98. All references to Galland cite the German edition.

4. Churchill, Memoiren, Volume II, Part 2, page 21 (German edition).

5. According to official reports of the Luftwaffe High Command (contained in the Karlsruhe Document Collection), German losses were only 49 (20 Do-17's, 18 Me-109's, 3 Me-110's, and 1 Ju-88); moreover, this figure also includes the losses suffered during the night of 15/16 September, so that the actual losses during the daytime attack may be assumed to have been even fewer.

6. Churchill, Memoiren, Volume II, Part 2, page 28: "We brought down 183 enemy aircraft, keeping our own losses down to fewer than forty. Although reports released after the war indicate that the enemy's actual losses during those days were only fifty-six aircraft, the turning-point in the Battle of Britain must be considered 15 September 1940."

7. Churchill, Memoiren, Volume II, Part 2, page 13.

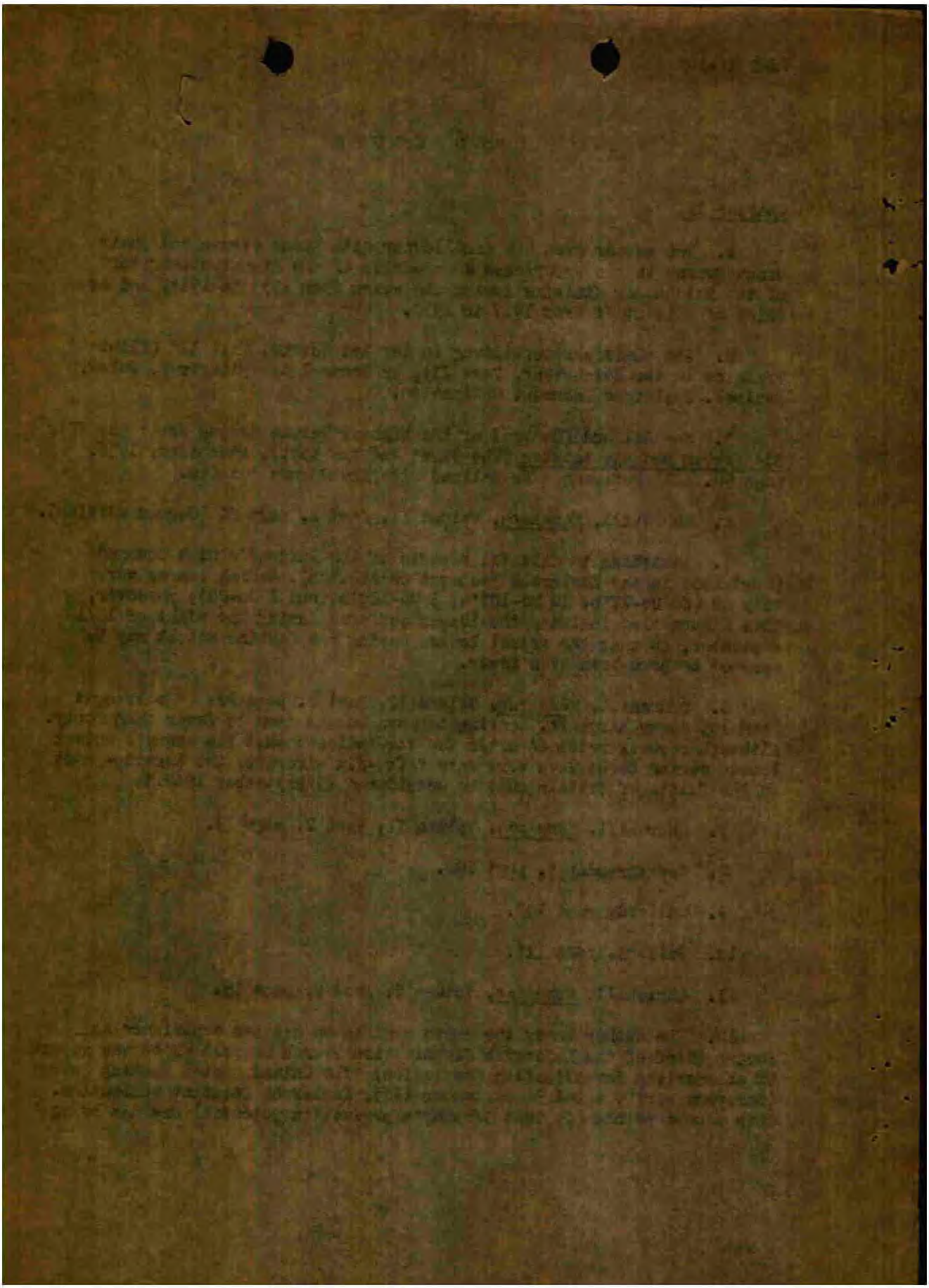
8. See Appendix 5, page 180.

9. Galland, page 109.

10. Galland, page 111.

11. Churchill, Memoiren, Volume 2, Book 2, page 15.

12. The author bases the above remarks on his own experience as former chief of the Luftwaffe Organisation Branch as well as on the report of an American Investigation Commission, "The United States Bombing Survey (European War)", dated 30 September 1945, Karlsruhe Document Collection. This report points out that Germany's production potential was not being



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Chapter 1--continued

fully exploited at the beginning of the war (pages 17 and 18). As an example, as late as 1941 Jeschonnek, Chief of the Luftwaffe General Staff, requested only 300 fighter aircraft per month, although Feldmarschall Milch, as Chief of the Luftwaffe Procurement and Supply Service, had offered him 900 per month. A historical evaluation of the actual production capacity attainable during the war years, however, does not belong in the present study, but should be reserved for a special project.

13. Galland, pages 110-111.

14. According to Galland, (page 239), Peltz' appointment as Commander, England, took place in "early August" after a conference between Goering and Hitler. On page 236, however, Galland mentions that this conference was also attended by "several high-ranking Luftwaffe officers", including "General Korten, Jeschonnek's successor as Chief of the Luftwaffe General Staff". Thus, the meeting can hardly have taken place before Jeschonnek's death, which occurred on 18 August 1943, but must have happened later, perhaps at the end of August or the beginning of September.

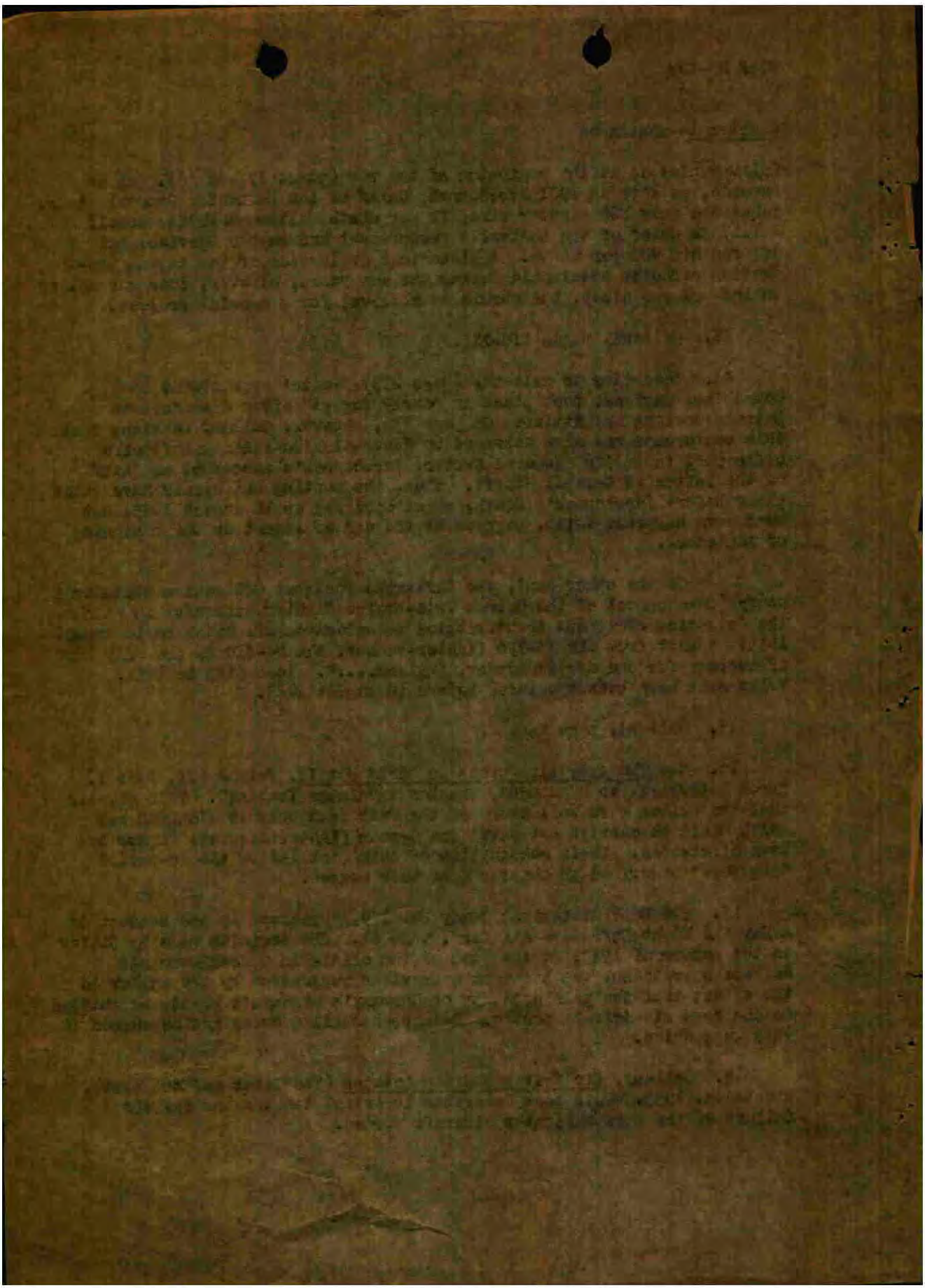
On the other hand, the Karlsruhe Document Collection contains a study (Development of the German Twin-Engine Fighter Aircraft) in which the following statement is attributed to Feldmarschall Milch on 18 August 1943: "Apart from the FW-190 fighter-bomber, the Me-410 is the only hope of success for the new Commander, England....". According to this, Peltz must have been appointed before 18 August 1943.

15. Galland, page 240.

16. See The Army Air Forces in World War II, Volume III, Part I, "From POINTBLANK to OVERLORD", Chapter 1 "Winter Bombing". This reveals that the Allies were well aware of the fact that neither OVERLORD nor ANVIL could be carried out until the German fighter aircraft forces had been eliminated. Their recognition of this fact led to the so-called "Big Week" described in Chapter 2 of this source.

17. See USAF Historical Study No. 179, "Problems in the Conduct of a Day and Night Defensive Air War", page 81. The decision made by Hitler in the summer of 1943, at the peak of the crisis in German home air defense operations, was based on a previous suggestion by the author to the effect that the main activity of Germany's armaments plants be shifted to the home air defense sector. Reichsmarschall Goering had concurred in this suggestion.

18. Galland, Die Ersten und die Letzten (The First and the Last), Wiesbaden, 1953. This book describes in detail the reasons for the failure of the German fighter aircraft forces.



Chapter I--continued

19. See page 63 ff, this study.

20. Galland, page 350 ff. An excerpt from the record of a conference at the Office of the Chief of Luftwaffe Procurement and Supply on 17 August 1943 (see Karlsruhe Document Collection, C), would seem to counsel modification of Galland's statements. According to the excerpt, Hitler had forbidden the exclusive development of the Me-262.

21. See Galland, pages 348/9.

22. See Galland, page 352.

23. From the stenographic record of a conference with Goering on the Obersalzberg, 29 May 1944, Microfilm roll 5, Karlsruhe Document Collection.

24. See Appendix 3.

25. See page 87 ff, this study.

26. See Galland, page 102.

27. Based on a personal interview between the author and General der Flieger R. Meister, Retired, on 7 April 1954. General Meister was Chief of Staff, VII Air Corps, at the time of the action on Crete.

28. Ibid.

29. Excerpts from the record of a conference held by Feldmarschall Milch at the Reichs Air Ministry on 10 September 1943, Microfilm roll 14, Karlsruhe Document Collection.

30. This has reference to the air superiority of the Russians, which varied according to time and place.

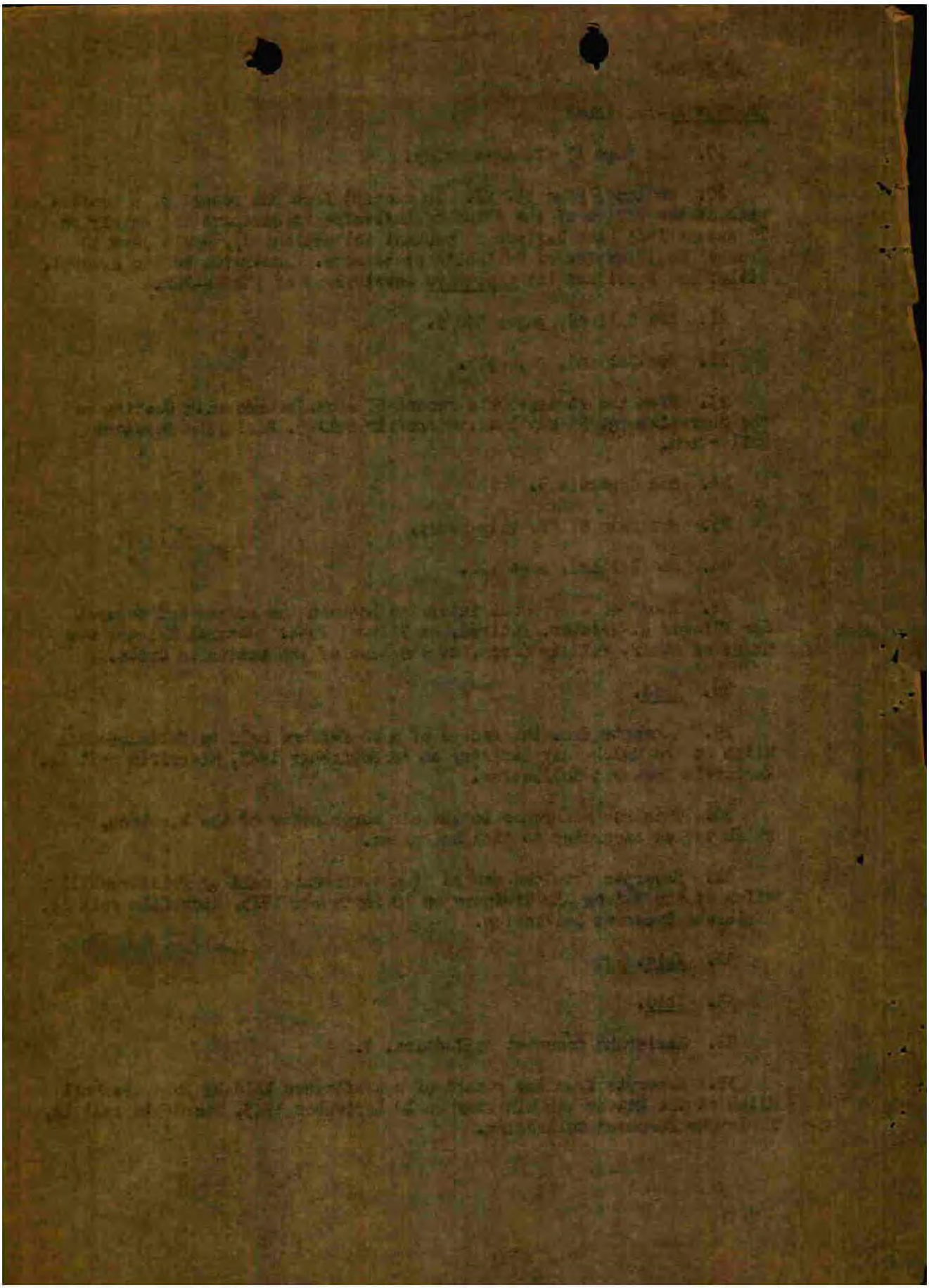
31. Excerpts from the record of a conference held by Feldmarschall Milch at the Reichs Air Ministry on 10 September 1943, Microfilm roll 14, Karlsruhe Document Collection.

32. Ibid.

33. Ibid.

34. Karlsruhe Document Collection, C.

35. Excerpts from the record of a conference held by Feldmarschall Milch at the Reichs Air Ministry on 10 September 1943, Microfilm roll 14, Karlsruhe Document Collection.



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Chapter 2:

1. Karlsruhe Document Collection (G).

2. Karlsruhe Document Collection.

3. This was a fighter squadron composed of Spaniards who had volunteered for service with the German Luftwaffe.

4. See the study "Balkan-Feldzug des VIII Fliegerkorps", by Colonel Hans Wilhelm Deichmann, Retired, Karlsruhe Document Collection.

5. Ibid., pp. 36 and 37.

Chapter 3:

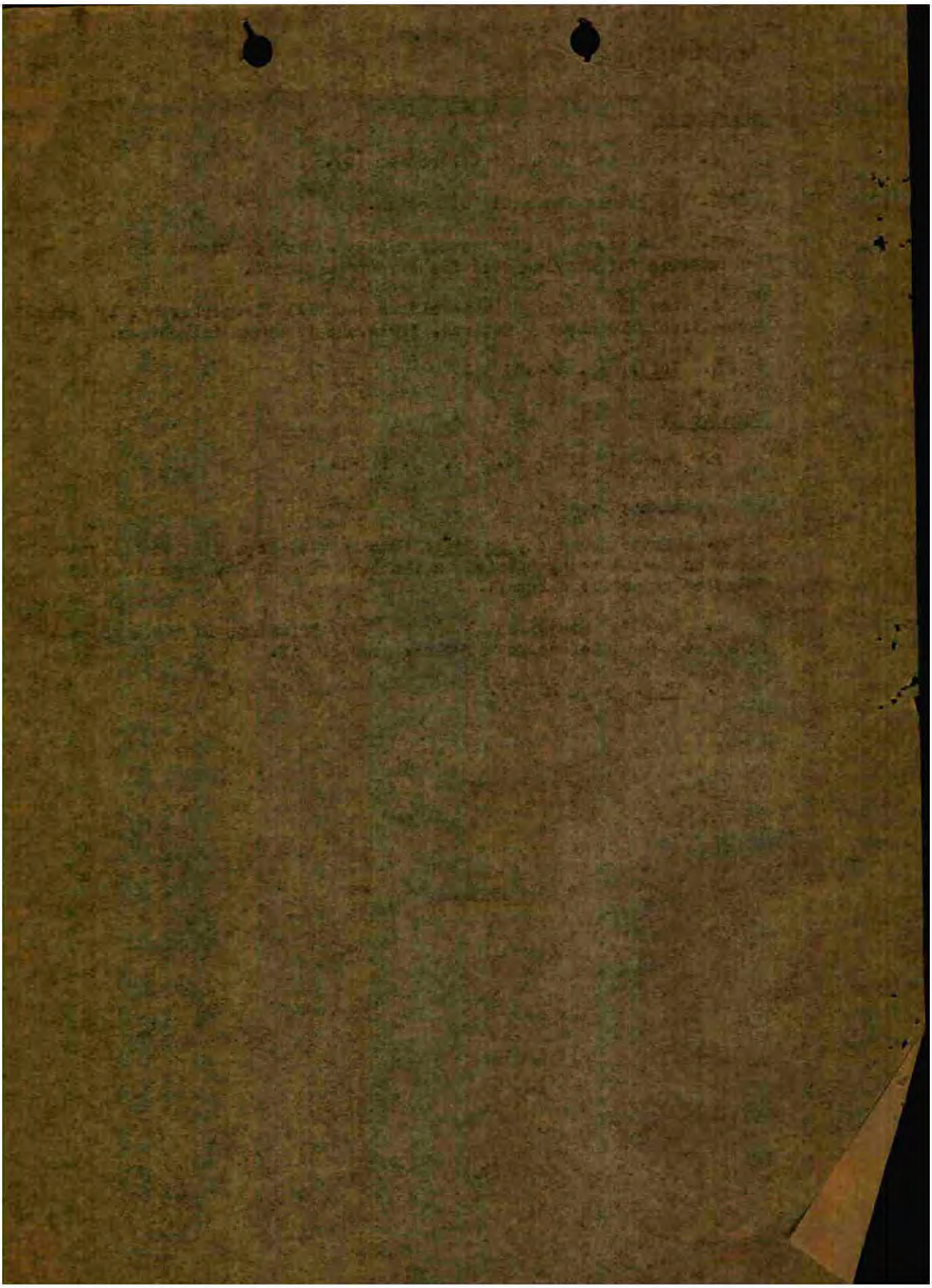
1. See USAF Study No. 179, pp. 112-115.

2. Ibid., p. 113.

3. Werner Baumbach, Zu Spät? (Too Late?), page 241; the illustration shows an Me-109 being carried on the back of a Ju-88, the so-called "Mistle" composite aircraft.

4. See USAF Historical Study No. 179, "Problems in the Conduct of a Day and Night Defensive Air War", page 116 ff.

5. Ibid., page 105 ff.



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